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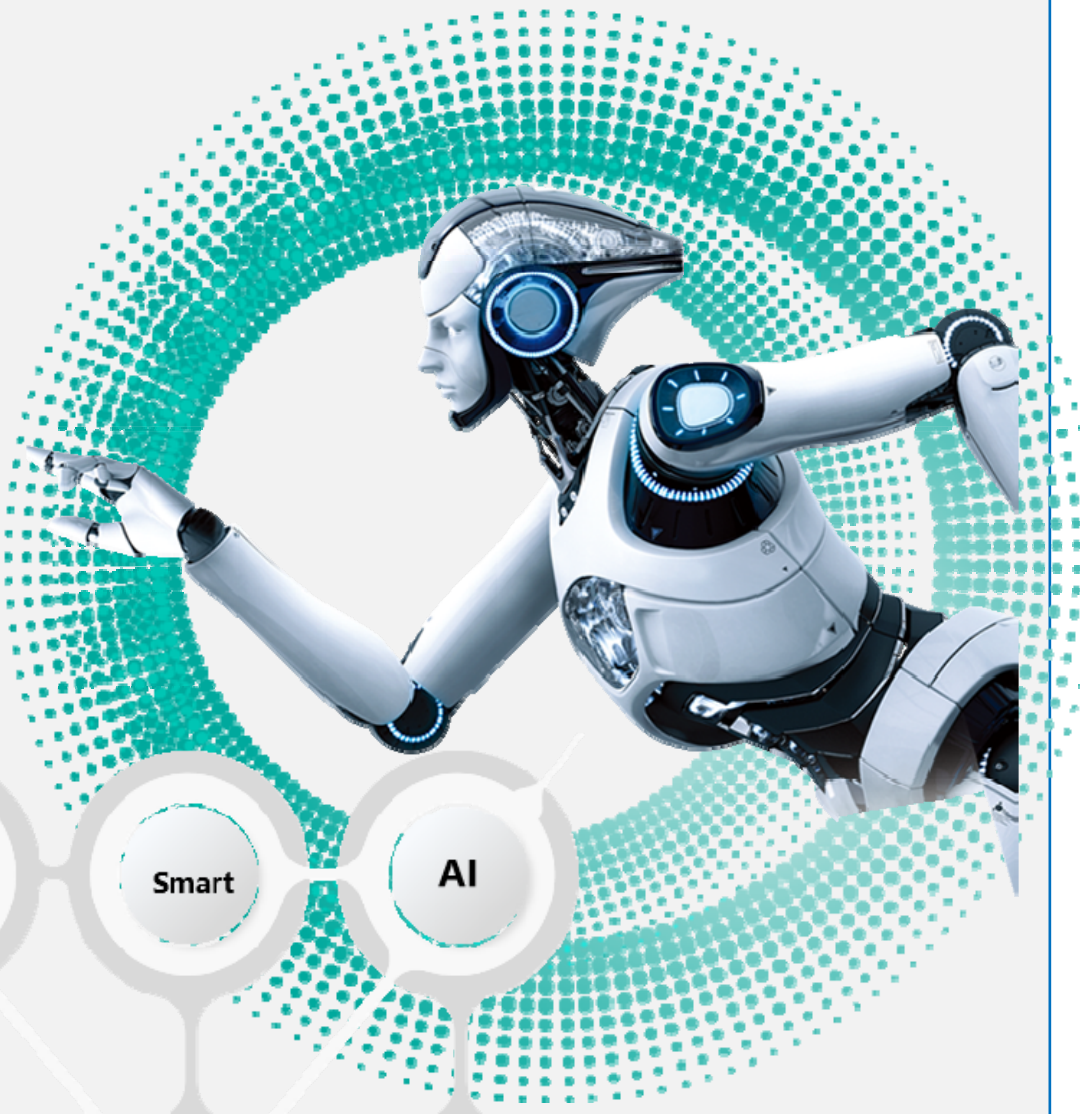
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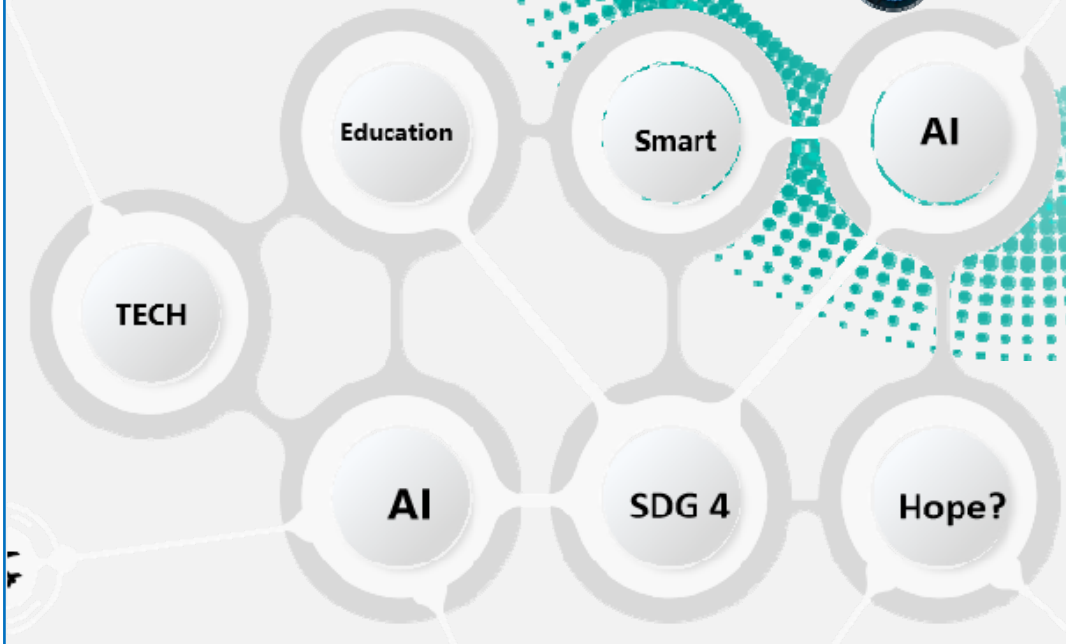
Proceedings

International Conference for Media in Education

Artificial Intelligence in Education

Shenzhen
People's Republic of China
23-25 July, 2019





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Introduction

Background

The International Conference for Media in Education (ICoME) was initiated in 2002 by Korean Association for Educational Information and Media (KAEIM) and Japan Association for Educational Media Study (JAEMS). ICoME has been held twice in China: The first one was in 2012 at Beijing Normal University and the second in 2015 at the Northeast Normal University. This year it is coming to Shenzhen, China, during 23rd to 25th July. Our 2019 theme is Artificial Intelligence (AI) in Education. The Conference is jointly held by the Southern University of Science and Technology (SUSTech) and the UNESCO International Centre for Higher Education Innovation (UNESCO-ICHEI). The China Association For Educational Technology (CAET) provide academic guidance.

AI is a convergence of a widening spectrum of frontier technologies, and it has garnered the potential to bring new possibilities for sustainable development and societal change (UNESCO, 2019). In particular, AI has the potential to accelerate the process of achieving Sustainable Development Goal 4 (SDG 4) on the provision of inclusive, equitable, quality education and lifelong learning opportunities. It promises to reduce barriers to access, automate management processes, analyze learning patterns and optimize learning processes with a view to improving learning outcomes. However, the penetration of AI in education comes with concerns about ethics, security and privacy protection. And in the absence of policy intervention, the commercial deployment of AI may also exacerbate digital divides and deepen existing learning inequalities.

Meanwhile, AI is fueling disruptive changes across sectors, and therefore is raising fundamental questions about how education can prepare individuals to live and work together with AI effectively and to foster inclusive societies. It is posing new challenges pertinent to all areas of education such as policy planning, promoting equity and gender equality, curriculum and resources development, teacher education, and skills development.

To maximize AI's benefits and mitigate its potential risks, it requires system-wide planning and collective actions to rethink and reinvent the foundation of education, as long as inputs from all stakeholders, including policy makers, system managers, and teachers, and others. The conference will start with keynote speeches, followed by a series of parallel discussions, workshops and debate. During the conference, exhibitions and workshops will be organized by high-tech companies, as our efforts to bridge the theory and practice.

Goals and Objectives

ICoME 2019 aims to build a platform for scholars, technicians, and entrepreneurs to:

- Navigate the policy making and institutional administration regarding the integration of AI to the educational sector for future development;
- Exchange information on the latest AI trends around the world: how these trends are shaping the landscape of teaching and learning? What knowledge and skills are needed for students for the future workplace? How to conduct scientific observation, evaluation

and research of relevant educational phenomenon?

- Promote the international collaboration for equitable, inclusive, and transparent use of AI in education: how to create lifelong learning opportunities for all, how to empower education in developing countries, and how to approach the gender and ethical issues?

More than 300 participants, including representatives from universities and international organizations, leaders of the AI industry, academic experts, policy makers and practitioners will participate in ICoME 2019.

Theme and Subthemes

Under the theme of ***Artificial Intelligence in Education***, ICoME 2019 seeks to facilitate high-level discussion, knowledge sharing, sector-wide strategy planning, and partnership incubation. Keynote speeches given by the leaders from the education sector and the AI industry, plenary panels, breakout sessions will be organized under the following sub-themes:

- AI in Online Education
- Social Media and Educational Communication
- AI in Education Ecosystem
- Machine Learning
- AI in Humanistic
- Ethics in AI
- Innovative Schools and Future Education
- Data-based Learning Interventions and Learning Analytic
- VR/AR/MR for Learning
- Innovative Learning Space: Maker Space, Learning Center
- AI in Sustainable Development Goal 4(SDG 4)
- AI in Primary and Secondary School Education Forum

01

Chapter 1:

AI in Online Education

Digital Storytelling as Career Education through Online Collaboration

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Abstract: This paper reports a case study of digital storytelling as a career education for international students who intend to come to work in Japan. Through online collaboration with Japanese students, they create a few minutes of video to introduce themselves to Japanese companies.It is quite hard for international students to get a job in Japan since they are struggling to describe what they want to and can do in the Japanese context. Therefore, the authors conducted a pilot project using digital storytelling through online collaboration among international students and the Japanese students aiming (1) to provide experience of collaboration with Japanese students, in which they can develop intercultural awareness, especially focusing on Japanese culture and (2) to develop (reconstruct) their story based on that awareness. This research identifies evidence on the use, and impact of using digital storytelling as a career education for international students aiming to work in Japan. This paper shows an introduction part of the research as a mid-term report.

Key words: Online Collaboration, Career Education, Asian Countries, Storytelling, Video Production, Employability

1. BACKGROUNDS AND OBJECTIVE

1.1. The situation and issues of career education of international students

This paper reports a case study of digital storytelling as a career education for international students who intend to come to work in Japan. Through online collaboration with Japanese students, they create a few minutes of video to introduce themselves to Japanese companies.

Firstly, the authors describe the situation and issues of career education of international students who are in Japan or who will come to Japan for work. Japanese government publishes Employment Policy for Foreign Workers (Ministry of Health, Labor and Welfare 2019). Its' policy for accepting foreign workers responds to the challenges of securing human resources to support the country's social life and industrial infrastructure, as well as overcoming the labor shortages (Keidanren 2018).

Japanese companies pay more attention to have international students as a worker because of globalization and labor shortages. The employment rate of international students, however, is

not high as Japanese students. Nabeshima(2015) mentioned that one of the reasons is the gaps between what the international students want/can do and what the companies required them to do. The international students intended to work in Japan as highly skilled foreign professionals in international fields using their experience and skills as international students. On the other hand, Japanese companies tend to employ them to promote diversity and globalization in their company (Ministry of Economy, Trade, and Industry, 2012). Therefore, there are gaps among Japanese companies and international students in term of expectation of working. The Ministry of Economy, Trade, and Industry reported in 2012 that 40 % of Japanese companies answered, "Not satisfied either/both qualitatively and quantitatively. Nabeshima (2015) explains that Japanese companies feel difficulties in assessing the talents of international students. From the standpoint of the international students, it is not clear for them what kind of personnel the companies want to employ. From the standpoint of the Japanese companies, it is not clear what kind of talent the international students have.

Higher education institutions that have international students are trying to identify what kind of career support should be implicated for them (Sato et al., 2007). Some focus on the students attempt to fit into Japanese companies. Others provide "Basic business manner education of Japanese companies," "Advanced Japanese language education used in the business scene," "Cultivation of employability skills" and "cultivation of preliminary educational knowledge and communication skills to work in Japanese companies" .

By the way, the concept of "employability" mentioned above is critical in thinking of career education for international students. The definition of Cambridge Dictionary (2019) shows that employability is the skills and abilities that allows one to be employed. According to Nabeshima (2015), one of the approaches to cultivating employability is focusing on the student's "narrative" to express their motivation, personality, characteristics, belief, and value.

Narrative is very powerful means to start conversation. Narrative can be developed through conversation. It indicates that the collaboration with Japanese helped international students to develop their narrative together with new awareness and viewpoints on Japanese culture and languages.

Kadoma et al.(2019) also indicate that it is crucial to provide opportunities for international students to experience teamwork and develop their comprehension of actual situations and expressive power in Japanese. Even though those who own N1(Japanese Language proficiency) measure the level of understanding of basic Japanese, they feel difficulties in communication with Japanese because of lack of experience of working with Japanese (Kadoma 2019). Besides, since they do not know about Japanese culture on job-hunting, they feel difficulties in introducing themselves in spite of their various and unique experiences in their career. Therefore, it is important to make opportunities for international students to have collaboration with Japanese.

1.2. Digital Storytelling as a career education for international students

The authors employ digital storytelling to enhance international students' comprehension of actual situations and expressive power in terms of employability through collaborating with Japanese students.

Digital storytelling involves the creation of a few minutes of video that integrates multimedia materials, including photos, participant voices, drawings, and music. This method has potential to develop intercultural narratives beyond sites through online communication.

Digital storytelling is not about expressing thoughts and opinions by a computer. It is about completing stories collaboratively with others who do not know well about the persons. The facilitator will help them to color and complete their story through conversation. The facilitator is not a relationship between the teacher and the student who teaches one-sided knowledge and method, but it is a relationship with the participant and exists as a companion for allowing the participant to create work independently. Takeuchi (2019) started a workshop for career education for ten years of students using digital storytelling and reported that they developed and completed their story under the facilitation of Japanese university students.

Given this interactive and collaborative production process and the significant potential of digital storytelling created between those from different background, international students are able to express their opinion externally and develop intercultural awareness (Sandra 2016). It is not always convenient to express their thoughts in the form of language or image and to understand from others. It is a common occurrence that there is a difference in understanding between what one wants to convey and what others accept in conversation with the facilitator. It is possible to correct the use of the language by oneself, to change it into an easy-to-understand composition, to change a used photograph, or to develop it as a work delivered to another person.

Therefore, this research aims to identify evidence on the use, and the impact of using digital storytelling created among international and Japanese students collaboratively as a career education through online communication. In the conference, the authors introduce how the digital storytelling through online communication are created and what was the role of facilitators take to create storytelling collaboratively.

2. RESEARCH METHOD

The author currently conducts this practice at Meiji University with Japan Association for Promoting of Internationalization (JAPI) since April 2019. The international students, in this paper, are those who study Japanese in India, Myanmar and Indonesia. And the Japanese who create digital storytelling with them as a facilitator are Japanese and international students who study in Meiji University as a full time.

To develop employability, the international students create digital storytelling, including an explanation in language to clearly express and his/her motivation, personality, beliefs and values under collaboration with Japanese students.

The theme of the story is about “work to me”. The following eight steps are cooperatively conducted;

(1) An international student creates a story (script) by himself/herself
(2) The international student sends it to facilitators of Meiji University
(3) Facilitator at Meiji University colors his/her story by sharing questions and comments
(4) Facilitator sends back the story with questions and comments to the international students
(5) The international student completes the script in referring to the questions and comments
(6) The international students take a record by a sound based on the script

(7) The international students complete the video as digital storytelling including photos, participant voices, drawings, and music

The authors asked for research collaborators through JAPI and got one from Myanmar; Ms. X. Ms. X has been studying Japanese for three years. Through Japanese animation, she knew the high quality of Japanese service Industry and started to think of working in Japan. Now she is preparing an entry sheet and participating in an internship to work in Japanese companies.

The authors collected data of (1) online communication and (2) interview from Japanese students as a facilitator in order to the process how the digital storytelling through online communication are created and what was the role of facilitators take to create storytelling collaboratively.

The results will be introduced in the conference in order to have discussion with audience about the use, and impact of using digital storytelling as a career education for international students aiming to work in Japan.

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Survey Research for Collaborative Online International Learning

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Abstract: Distance education is a method of education where a teacher and learners are separated by time and space. Now we are in e-learning era which fully integrates ICT technologies. Collaborative online international learning, COIL is one of such examples. Aiming to develop an instructional design that everyone can carry out COIL, this study conducted two surveys. The first survey was conducted in the fall of 2018 with 163 respondents to understand the students' experiences with international communication using smartphones, and its relationship with self-confidence. The second survey was conducted in the winter of 2019 to find out the students' preferences for the device among Bring Your Own Device, a laptop computer, smartphone or a tablet computer, to participate in COIL. Forty-four students participated in this study. The results of the first survey showed that most of the students wanted to be able to speak in English, but they have not made use of smartphones to exchange emails, to make voice calls, or to make video calls with people abroad. Furthermore, the results of the second survey showed that their preferred device for COIL was not statistically different among these three BYOD devices. The comments from the students were also analyzed qualitatively to understand advantages and disadvantages of these devices for online communication. These results will serve as basic data to design the instructional design for COIL.

Key words: COIL, Distance education, Instructional design, BYOD

INTRODUCTION

Distance education is a form of education that a teacher is separated from learners in space and time (Perraton, 1988). Distance education is divided into three eras. In the first era, distance education used postal service, and it mainly targeted to adult learners. In the second era, distance education started to include mass media such as broadcast, and it became available in various ways. In the third era, distance education was characterized by the integration of e-learning. Internet technologies have powerfully influenced on education, and the quality was much improved (Akahori, 2019). It reduced the barriers from time and space, so that life-long learning has become one of the options for learners, as is the case for Massive Open Online Courses (Keskin, Koutropoulos, Waard, Metcalf, Gallagher, Anzai, Buyuk, 2018). Distance education also supported learners who want to learn a special field to get further knowledge than what

they can do at formal education by paying some extra fees (Rieser & Dempsey, 2013. Now, the learners can learn in their own pace by choosing the programs, and education has become more open to people who wish to learn (Anzai, 2015). In addition, distance education has become more interactive than before (Reiser & Dempsey, 2018).

Research has been progressed along with the development of technologies for distance education. Anzai and Akahori (2016) studied the dimensions of language learning with MOOCs for English learners, and they identified that Open Learning, Academic Self-efficacy, and Intercultural Communications are the three dimensions for learning with MOOCs. Watanabe and Kougo (2017), developing a short form of the e-learning orientation scale, examined the scale's reliability and validity, investigated the changes in learners' e-learning orientation using the scale, and examined the causal relationship among the scale's question items. They found that completion of the e-learning course has positive effects on e-learning orientation. Hatakeyama, Kawaguchi, and Wakiyama (2019) studied the effects of online English program on junior high school students, and they found that it lowered the students' barrier toward English and enhanced motivation to study English. Takahashi, Ohno, & Matuda (2018) applied ICT to elementary school English education programs. They found that ICT supported English education such as Skype and tables is an excellent way to promote English education at an elementary school. Takino (2019) carried out online English conversation, and found that the junior college students improved their English skills, and felt English closer to themselves. As is discussed, online education can enhance students' motivation for learning and language proficiency.

METHODS

This study consists of two sections. The first section concerned with students' online communication experience using a smartphone, and its relationship with self-confidence. The second section concerned with the students' preferences for the BYOD devices as a collaborative online international learning.

The first part of the study was conducted in the fall of 2018. 132 Japanese university students in Tokyo responded to the survey. There were 100 males and 36 females. The grades of these students were four freshmen, 62 sophomores, 42 juniors, and 28 seniors.

The second part of the study was conducted in the winter of 2019. Forty-four students responded to the survey in total. The students were asked to select the best device for collaborative online international learning.

RESULTS and DISCUSSION

Study 1. Students' online communication experience using a smartphone, and its relationship with self-confidence

Study 1-1. Students' experience of online communication using a smartphone

Question 1 asked, "Do you want to be able to communicate in English?" 77.2% of the students responded positively, 2.9% responded neutral, and 19.8% responded negatively. Thus, it can be said most of the students want to be able to communicate in English. Question 2 asked, "Using

a smartphone, have you emailed to overseas in English?" 78.7% of students responded no, while 21.3% responded yes. Question 3 asked, "Using a smartphone, have you communicated with someone abroad in English through SNS? 75% of the students responded no, while 25% of the students responded yes. Question 4 asked, "Using a smartphone, how often do you make a voice call using a smartphone?" There were 26.9% of the students who do not make a voice call, while there were 73.1% who make a voice call. Among them, 52.2% of the students did twice a week, 10.4% three or four times a week, 7.5% five or six times a week, and 3% every day. Thus, it is found that voice call is popular among university students. Question 5 asked, "Using a smartphone, have you made a voice call to someone overseas in English?" The majority of the students, 89.6%, responded no, while 10.4% responded yes. Thus, it is found that most of them have not experienced voice call to overseas in English using a smartphone. Question 6 asked, "How often do you make a video call using a smartphone?" 78.5% of the students said they do not make a video call, 2.2% three to four times a week, and 19.3% once or two times a week. Thus, it is found that the majority of the students do not use a video call using a smartphone. Question 7 asked, "Have you made a video call to someone overseas in English?" As is expected, 93.4% said they have not, where as 6.6% of them had the experience. Thus, it is found that online video call is not widely spread among university students. The general overview of the survey results is presented in Table 1.

Table 1. General overview of the students' expertise using smartph ones.

Students' experience and the language used	Voice call	Video call	Email	SNS
Japan in Japanese	80.0%	78.4%		
Overseas in English	10.4%	6.6%	21.3%	25%

Study 1-2. Students' experience of online international communication using a smartphone and self-confidence and

In this section, the study examined whether if there is a statistical difference in self-confidence between the two groups: a group with experience of an international voice call in English and a group without. The results showed that the respondents with the experience of international voice call in English had higher self-confidence than those without, $t(132) = 3.60$, $p < .001$.

Table 1

Students' Experience of International Voice Call in English with a smartphone and Self-confidence

	International Voice call in English	N	Mean	Std. Deviation	Std. Error Mean
Self-confidence	no	120	1.8417	1.57179	.14348
	yes	14	3.4286	1.45255	.38821

Furthermore, the study investigated how the experience of international video talk in English affect self-confidence. A test was conducted, and it is found that the respondents who had experience of international video talk had higher self-confidence than those without, $t(133) = 2.97$, $p < .005$ (See Table 2).

Table 2

Students' Experience of International Video Call in English with a smartphone and Self-confidence

	International Video call in English	*N*	*Mean*	*Std. Deviation*	*Std. Error Mean*
Self-confidence	*no*	126	1.9206	1.59801	.14236
	yes	9	3.5556	1.58990	.52997

Study 2-1. Students' preference for BYOD

As a result, 20 students selected a laptop computer, thirteen students selected a smartphone, and eleven students selected tablet computers. X2 test was conducted to find out if there was a statistical difference among these three categories. There was no statistical difference among them with X2 = 3.045, and df = 2. Thus, it is found that the students' preferences for the device for collaborative online international learning were the same or similar among these three devices.

Table 3.

Chi-Square Test for Preferred Device as a BYOD

	Observed N	Expected N	Residual
Laptop computer	20	14.7	5.3
smartphone	13	14.7	-1.7
Tablet computer	11	14.7	-3.7
Total	44		

Table 4.

Test Statistics

	Devices
Chi-square	3.045[a]
df	2
Asymp. Sig.	.218

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 14.7.

Study 2-2. Students' Comments about online international communication using BYOD

Below are some comments from the students about the reason of their preferred device among a laptop computer, a smartphone, and a tablet computer.

Smartphones

- According to the number, the results showed that a laptop computer proceeds smartphones, but we should recommend using smartphones, because everyone has a smartphone but not

a laptop computer.
- Both laptop computers and smartphones should be used for COIL, because a cross-platform application is better to do COIL.
- Smartphones are most carried around device among the options. The number of smartphone users is increasing year by year.
- Smartphones do not depend on Wifi environment, while laptop computers do.

Laptop computers
- Many students selected laptop computers or smartphones, because they own these devices. The larger number of students preferred laptop computers because they have wide screens or we can open many windows at the same time, which is convenient when we conduct discussion or presentation.
- University students have both a laptop computer and a smartphone, rather than a tablet computer. Moreover, we can use a wide screen or open many windows at the same time is useful for discussion and presentation for COIL.
- The display should deliver clear information for learning. So, the device they use must not be a technical bottleneck of the amount of information delivered. With this in mind, the realistic option could be a laptop computer or a tablet. They are powerful enough to deliver real-time information for communication.
- A laptop computer can move many applications simultaneously.

Tablet computers
- There are fewer university students who tablet computers compared with laptop computers and smartphones.
- Tablet computers have a bigger screen than smartphones.

Others
- Everyone should be able to choose the most familiar device.

In summary, these two surveys identified the following important points. From the first survey, it is found that only around 10% of the students had experience of an international voice call or video calls in English, in spite of the fact that 77.2% of the students wanted to be able to speak in English. Thus, when online international communication is designed and implemented, a small step approach should be taken. In addition, the study found that the students who have experience of an international voice call or video call had significantly higher self-confidence than those who do not. Thus, it can be assumed that international communication through voice or video calls may enhance the students' self-confidence. From the second survey, it was found that there was no statistical difference in preference of the BYOD, laptop computers, smartphone, and tablet computers. However, the students' comments showed that laptop computers have the advantage of the widescreen, and flexibility to open multiple application at the same time. As for the advantage of a smartphone, they pointed out that smartphone is the most available device at any time, and they can carry out online communication without Wifi environment.

As a limitation of this study, it should be noted that the university students who answered the second question about BYOD preferences were the students who were required to bring laptop computer every day. In other words, laptop computers were always with them as a smartphone. If the question was asked to a different group of the students, there might be different results.

Further study should be conducted to understand the preference of device among BYOD.

CONCLUSION

This study provides the basic data to develop instructional design for COIL. Having in mind that the students lack in the experience of international communication with smartphones, the instructional design should be carefully crafted by small step method. The students are already there in front of teachers, having high motivation to acquire English as a Lingua Franca, and they have sufficient devices to carry out COIL.

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Game Dilemma and Breakthrough of Education from the Perspective of AI*

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Abstract: At present, the wave of revolution in artificial intelligence (AI) is sweeping in with swift and violent momentum. The deep integration of AI and education has given birth to a new educational form of "AI + education", which has impacted the traditional educational model, changed the roles of teachers and students, caused the change of teaching methods and learning ideas, and brought challenges and opportunities to the development of education. On the basis of comprehensively grasping the social context, policy background and industry background of "AI + education", this paper analyzes the influences of AI on school construction, the roles of teachers and students, teaching methods and educational ideas, then probes into the game dilemma between reason and sensibility, between cooperation and substitution, between demand and supply, and between final learning and lifelong learning in "AI + education", finally puts forward some corresponding solutions.

Key words: Artificial intelligence; Educational reform; Game dilemma

1 INTRODUCTION

1.1 Social context

With the rapid development of Internet, cloud computing, big data and AI, human's production, human's life and learning styles have been seriously challenged. For example, the AI Go Program "Alpho Go" takes human chess spectrum as sample, uses complex artificial neural network to carry on the supervised study, and learns the way to play with human chess player(Silver D & Huang A, 2016); Then "Alpho Go Zero", adopts unsupervised learning, starts from the very beginning and self-study, and finally defeats its predecessor "Alpha Go"

* 基金项目：“赣鄱 555 英才工程”领军人才培养计划［赣才字[2012]1号]专项资助;
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with an absolute advantage of 100 to 0, using artificial neural network to improve search quality, producing high quality walking method by iterating over and over again(Silver D, Schrittwieser J, Simonyan K, et al, 2017). On October 31, 2018, the Political Bureau of the CPC Central Committee held the ninth collective study on the development status and trend of AI, then highlighted the importance of mastering the key core technologies of AI for speeding up the establishment of a new generation of key common technology system of AI. AI has been attached great importance to by the government.

1.2 Policy background

Therefore, in order to seize the important strategic opportunities to conform to the development of the times, China has issued a series of policy texts to promote the process of "AI + education" one after another. For example, In July 2017, the Development Planning of New Generation AI put forward the strategic goal of "three steps", which tried to accurately grasp the development trend of global AI, improved the development of economic and social, education science and the intelligence level of national defense application in an all-round way. In April 2018, the Ministry of Education issued the Action Plan on AI Innovation in Colleges and Universities to guide them to further enhance the ability of scientific and technological innovation, talent training and service to the national demand in the field of AI. In the same month, the Education Informatization 2.0 Plan was proposed to contribute to the reform and development of education, teaching, management and service, through promoting the mode reform and ecological reconstruction of education supported by new technology, based on new technologies such as AI and other new technologies, which has set off the trend of collaborative development of AI fusion education.

1.3 Industry background

According to the 43rd Statistical Report on the Development of China's Internet, AI has been applied in many vertical fields, such as medical health, finance, education, security and so on, forming "AI" industry application terminal, system and supporting software. These events have attracted the attention from the public in many fields, and the performance in education has given birth to an educational model— "AI + education". The precision and individualization function given by AI has greatly enriched the representation form of educational content, changed learners'learning styles, and brought about era changes to the education industry.
Promoting the deep integration of AI and education is not only in line with the trend of the development of the times, but also advocated by national policy. At present, there are a large number of related literature on AI + education in China, but there are only a few articles focusing on how to deal with the relationship between the two. As a result, how can we effectively give full play to the maximum benefits of AI + education? This is also the purpose of this paper. After expounding the social context, policy background and industry background of AI + education, this paper analyzes the great influences of AI in education, probes into a series of debates brought by AI + education, and puts forward some corresponding countermeasures.

2 Innovation in AI enabling educational reforming

2.1 Impacts on school construction

2.1.1 Reforming the training target

The essence of international competition is the competition of comprehensive national strength

centered on economy and science and technology. The wide application of AI, cloud computing, big data and other emerging technologies has promoted the promulgation of information education policies such as The Ten-Year Development Plan of Educational Informatization (2011-2020) and the 13th Five-Year Plan of Educational Informatization, which has affected the training objectives of all kinds of schools at all levels. As stipulated in the Ten-Year Development Plan for Educational Informatization, the basic education schools should "reform and break through education teaching method, then promote students' self-learning ability in information-based environment through the improvement of the information construction and application level of schools"; the vocational education schools should "improve students' information technology vocational ability and enhance their social service ability by comprehensively improving the level of information and the teaching level of vocational education"; the higher education schools should "improve students' digital application ability and scientific research innovation ability by building green, safe and civilized digital campus and information support system of Scientific Research Innovation" .

2.1.2 Reforming the training content

The reform of the training target is bound to inevitably lead to the change of the culture content and the evaluation standard. "The training content in school not only has the general cognitive value, but also has the value of forming people. "(Ye Lan, 2006) At the moral and ethical level, the real education is directly to the heart and teach individual to be human, which cannot be questioned and has never changed. In addition, at the level of academic research, the content of the school culture in the era of AI has been continuously reformed with the development of new technologies and the strong driving of economic and social demand, including "cultivating high level AI innovation talents and teams, cultivating compound talents, which means focus on cultivating vertical compound talents who could pass through AI theory, methods, technology, products and applications, and master AI + economy, society, management, standards, law and so on."(The state council, 2017) After that, there are many schools holding microfilm competitions, robot competitions, 3D printing creative competitions and other activities to promote learners' mastery and application of AI.

2.1.3 Reforming the management of school affairs

School refers to the service-oriented organization of systematic educational activities for educators in a planned and organized manner, which integrates teaching and management. At present, some developed areas in China have established a computer network for supporting education, teaching and various management. For example, for school, the Educational Administration Online System can promote to arrange teachers' work, students' learning and major schools events' announcing; for staffs, the Signing-In System is implemented on and off work, strictly managing daily work; for students, the Electronic File System is implemented to record students' academic performance, rewards and punishments; for school materials, the Equipment Archiving System is implemented, then receiving and dispatching must be electronic archiving, which is benefit in managing public property openly and transparently; In the case of post-registration, the Online Reservation is put into effect, and various accounting work can be reserved, classified and shunted through special website, which can reduce the reporting personnel' working pressure and save time. With the support of applied technology, this kind of information network accelerates the speed of information flow and the efficiency of resource sharing between schools, promotes the information exchange, resource sharing and scientific

research cooperation, effectively realizes the beautiful vision of "class pass, everyone pass and school communication", as well as promotes the rapid development of education and scientific research in China.

2.2 Impacts on teachers and learners

2.2.1 Changing the relationship between teachers and students

The multi-source and accessibility of information change social distribution stage of information resources and the relationship between people's ownership of it. The source of students' learning knowledge comes not only from classroom teaching, but also from other kinds of portal sites and video resources. Most students' learning ability and acceptance ability are generally higher than those of teachers, and their abilities may even be higher than teachers in some fields for most of them belonging to the digital indigenous people in the era of AI. As said by Confucius, "for a trio, there must be my teacher" (《Analects of Confucius》), although "a teacher does not have to be good at his disciples, and disciples does not have to be inferior to their teacher" (《On the Teacher》•Han Yu), educators need to maintain lifelong learning and keep self-reinforcement with information technology, adopt an educational model that tends to be democratic, grow up and learn together with students. This will also subvert the traditional cognition of "classroom authority, teacher authority and textbook authority", and further cause the change of teacher-student relationship.

2.2.2 Changing the way of learning

"Learning style is a combination of cognitive, emotional and physiological factors, showing relatively steadily how a learner perceives, interacts with, and responds to learning environment."(Keefe J. W., 1979) It is one of individual factors that affects the way and effect of learner's learning. In addition, learner's learning style is also influenced by learning environments and medium preference. AI and its derivative products have changed learning methods and learning environment to different extent, thus changing learning styles and cognitive ways of learners.

The intelligent and open advantage of AI provides learners with opening and sharing service, Wikipedia, Baidu encyclopedia and other network knowledge bases provide convenient and fast network resource services as well as rich and diverse forms of knowledge representation. These change the time-space structure, so that it not only breaks the limitation from class, but also breaks the restrictions on the object of education, the content of education and the place of education, and helps learners to realize the transformation from one-way learning to multi-learning, and from formal learning to informal learning. "Everyone can learn and always can learn everywhere"; the self-control and man-machine-coordinated AI provides learners with independent, personalized and interactive services, and learners can customize learning plan according to their knowledge reserve and learning styles, turning passive absorption into active learning. For example, learners can use Jinshan Ciba software to select oral, listening, word learning and other services according to their needs and their own ability; they can use Youdao Translation, Baidu translation and other network multilingual translation systems to help reading foreign language materials quickly; they can use Nvivo, Citespace and other software for convenient and fast data combing service. The education under the background of AI is a new education mode of intelligent education cloud service platform, based on AI technology.

With the needs of learners as core, cultivating learners' high-level thinking ability as orientation, it "pushes personalized learning content, generates personalized learning paths and develops personalized learning evaluation for learners"(Fu Die, 2019), which is committed to improving learners' independent learning, deep learning and lifetime learning ability.

2.2.3 Influencing learning effect

AI is a double-edged sword, which not only can enhance learners' interest, initiative and enthusiasm, and learning effect, but also can easily distract learners and reduce learning effectiveness with its own unknown temptation.

In the era of AI, the application of computer has been extended, including learning resources constructing and personalized push, which results in changing human learning environment. On the one hand, hypertext technology and multimedia technology are integrated, knowledge is presented in front of the public through the expression of text, image, sound and video. In fact, "the dispersion of energy required by rich forms of knowledge representation will further aggravate cognitive fatigue, then weak learners' learning ability and reduce our understanding. So when we supply our brain with raw materials for thinking, not the more, the better. "(Nicholas Carr,2015) On the other hand, in order to seek personal interests, there are also many merchants provide violence, obscene, games and other bad temptations in the web or APP, such as some homework software. Teachers arrange homework online, then students can complete the homework online. But the system often pushes Mini Game after students finishing their homework. As a result, students spend more time playing games with competing with their classmates for the ranking of the game. However, they have no abundant time to do homework and do it carelessly, which greatly influences their learning effect. In addition, a study conducted in 2015 by the Organization for Economic Co-operation and Development (OECD) about the impact of computer use on student performance suggests that "the higher the frequency of computers using, the worse the 'digital understanding' of students in getting information from the network and analyzing their contents, which is in response to the Program for International Student Assessment(PISA)."(OECD,2015)

2.2.4 Promoting lifelong learning

Lifelong learning is a way of learning under the background of lifelong education, including autonomous learning, learning to learn and lifelong development.

Firstly, the awareness of lifelong learning is the source of motivation to maintain lifelong learning. The concept of lifelong learning is the spiritual doctrine for individuals to maintain lifelong learning habits and the spiritual pillar of learning behavior. The relationship between lifelong learning view and learning is a two-way relationship: a correct learning view can enhance learning belief and promote learning, and the learned knowledge can in turn adjust the learning view. Inspirational stories and "Soul Chicken Soup" on intelligent network platforms have a certain influence on individual learning concept and sets a good example for individual lifelong learning.

Secondly, autonomous learning ability is the basis of maintaining lifelong learning. With the support of intelligence, learners' learning styles and contents have broken through the limitation of traditional class teaching organization form, and many kinds of mixed learning methods, such

as online class learning and online knowledge acquisition, have been increasingly sought after by learners. In this form of learning, their learning initiative and enthusiasm have a greater and greater impact on the learning effect.

Finally, learning to learn and learning ability is a necessary condition to maintain lifelong learning. In the face of Internet, wireless communication network, satellite and other messy channels, computers, mobile phones as well as other convenient and fast terminals emerging in digital technology, network technology, mobile technology and other emerging technology background, Human beings unwittingly produce the role fusion in the participating cultural atmosphere, and play the role of communicator and recipient of information at the same time. In personalized and autonomous intelligent platform, individuals can produce, share and disseminate information at anytime anywhere. Then, the public are attracted by the credibility of information, the scientific nature of resources, and the backtracking of sources. In the era of information explosion, it is one of the necessary abilities for lifelong learners to learn how to screen and identify information, create and disseminate information, as well as equip with scientific learning ability.

3 The game dilemma and breakthrough of AI + education

3.1 The dispute between reason and sensibility: balancing teaching and educating

The word "education" means that "teaching, what is done above, what is done below; raising and adopting children to make them good".(Xu Hanshen, 2012) Contemporary writers' understanding of oracle bone inscriptions "education" is to nurture and grow, which includes not only material love, but also spiritual education based on edification and cultivation. Students' physical and mental health is one of the decisive factors in their learning results. Therefore, as an educator in the process of teaching and educating, teachers not only have the responsibility of guiding learning and morality, but also need to take care of learners' physical and mental health. A man with extensive knowledge, moral integrity and lead by example, can be called a teacher who has the ability of teaching and educating; to love students means the teacher will input emotional, communicate, guide as well as doing anything in student-oriented. Education is a bilateral process of teaching and learning between teachers and students. It is a two-way communication between people from body to spirit, "the education of human soul, not only the accumulation of rational knowledge and cognition"(Emmanuel Kant., 2005). Therefore, education combines rationality and sensibility, teaching and educating.

"AI + education" is a modern educational model supported by AI technology, which provides digital learning resources, personalized push and other services. Its essence is that educators use AI to carry out teaching work; its core question lies in whether the two are the main position rather than whether AI will replace the role of teachers. Naturally, educators and Educatees still play a dominant role in the whole process of education, while AI only plays an auxiliary role. Educators can take AI as means and forms of education, then impart knowledge of social communication, emotion and values through diversified application of technology; they also can comprehensive analyze students' physical and mental conditions and help learners to live a healthy life and healthy learning through big data monitoring system. "The purpose of education in the era of AI is to distinguish people from machines and to maintain human nature."(Chen Xiaoshan, 2018) Therefore, teachers should realize that students are the center, teachers are still the main body of education and enable learners by AI in the AI + education model. There are not

only rational knowledge transfer, but also emotional edification; not only technical rationality, but also human's sensibility.

3.2 The dispute between Cooperation and substitution: be good at using external resources

With the rapid development of Internet and computer technology, there is no doubt that AI has been widely used as a revolutionary technology. However, it is accompanied by the questioning and thinking of whether AI will bring technological hegemonism or not.

In the field of education, "technical determinism" and "whether AI will replace the status of teachers" have aroused the deep thinking for many scholars. From the practical point of view, AI and its derived new application technologies have been slowly combined with teachers' work or even completely replaced it. For example, there are special correction scanners in the aspect of correcting objective questions; the network resource database can assemble the test papers at random or according to the needs of the users in the aspect of test paper assembly; we can use the Juku batch network to reduce the workload, etc, in the aspect of English composition correction. Big data collected individual interests, their own situation and other data, can privately customize learning materials suitable for users with tailoring to personality differences, which is difficult to do for the teachers who have been in the teaching organization form of class teaching system for a long time.

"It is better to learn for a moment than to think all day long; be good at using external resources is the way to be better than ordinary people."(《Persuasion to learn》•Xunzi) Since AI is "the intelligence realized on machine by artificial methods, or the natural intelligence that human use machines to simulate the natural intelligence of humans and other organisms"(Jia Jiyou, 2018), teachers should make use of AI to become an AI teacher and co-existing in collaboration with it. Just as if you climb to the top, you will see more far away; if you speak along with the wind, the listeners will hear more clearly (《Persuasion to Learn》•Xunzi). "Technology can amplify outstanding teaching, but no great technology can replace mediocre teaching."(Tao Xiping, 2018)

3.3 The dispute between demand and supply: precise personality Service

With the improvement of human living standard, the main contradiction of our country is the contradiction between diversified, individualized demand of education and single, extensive supply of resources. Students mainly learn knowledge from the traditional class teaching system oriented to collective teaching, which is divorced from the needs of the society. This is also the root of the contradiction. With the continuous development of information technology and AI, the drawbacks of class teaching system are increasingly exposed. Under the basic organizational form of classroom teaching, teachers arrange teaching activities, which limits students' initiative and independence to a certain extent; immobilization and formal teaching limits giving full play to students' creative and practical operation ability; it is difficult to take the individual differences into account in large class teaching, which is not conducive to teaching students according to their aptitude.

Under this kind of educational background, the advantages of AI + education are more and more obvious. The network breaks the space-time limit of learning, enables learners to "learn at anytime, anywhere", and changes one-way learning into multi-directional learning, which

greatly endows students with the initiative and independence of learning; the combination of pictures, videos and other forms of knowledge representation greatly attracts learners and helps them to associate and memorize relevant knowledge points; with the introduction of online courses such as Moocs and flipping classroom, personalized push service is realized according to the actual situation of students, which solves the diverse personalized learning needs of individuals. Therefore, if teachers want to maintain their competitiveness, they should proceed from the actual needs of students, "take their learning needs as the leading factor, take their learning needs evaluation as the premise and basis of teaching design, and take meeting learners' learning needs as the ultimate pursuit and quality evaluation criterion of teaching activities"(Ou Bengu, 2012).

3.4 The dispute between final learning and lifelong learning: one cannot stop learning

"Lifelong learning is the only way for humans to respond to change and sustain development."(Zhong Zhixian, 2015) The conservative and path-single traditional education is limited to the school education stage, neglects the knowledge dissemination way such as library, film, television, etc. The AI + education in the era of AI provides learners with life-long learning, including life-long learning time, wide range of learning content, opening of the learning space as well as flexible and independent learning style, which arouses controversy among learners about terminal learning and lifelong learning.

From educational informatization 1.0 to educational informatization 2.0, from AI 1.0 to AI 2.0, "Social needs are constantly changing, the information environment is constantly changing, and the foundation and objectives of AI are constantly changing."(Pan Yunhe, 2018) What remains the same is the rule of survival of the fittest, and the urgency of keeping pace with the times. In AI environment, the update speed of information and technology is constantly increasing, clearly showing the importance of continuous learning and self-strengthening. Therefore, no matter any group needs to learn, the bilateral activity of "teaching" and "learning" will eventually develop in the direction of "lifelong learning". It is worth noting that there has given a definite voice of this debate in the field of vocational education. Since its core purpose of education is to train high-quality labor talents for the construction of China, however "the technology of skilled talents is either on the way to the digital improvement of AI, or in the danger of being replaced by the robot; if not being charged in time, their energy will constantly be consumed, leading to the possibility of being thrown into the low-end employment market at any time"(Xie Qingsong, 2018) in the era of AI. Obviously, one-off and phased final learning is difficult to meet the needs of social survival and competition, so it is bound to need maintaining lifelong learning. "One cannot stop learning. Cyan, taking from blue, but bluer than blue; ice, condensating of water, but colder than water."(《Persuasion to learn》•Xunzi) Consequently, under the impact of AI technology, the concept of lifelong learning should be established and brought into the lifelong education system, learners should carry out the concept of lifelong learning, stimulate the internal motivation of self-development, and always maintain their own social competitiveness.

4. Conclusion

It is a long-term and lasting process for China to build a modern-oriented, world-oriented and future-oriented powerful nation. In this process, emerging technologies are accompanied by the influence on traditional education, the panic of technological hegemony and the reflection on the nature of education. While the self-styled education is not in line with the needs of era

changing and social development, it is essential to promote the deep integration of education and technology in the era of AI, then to keep the essence of education and draw on support from technology in the continuously updated science technology and information technology.

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A calm thinking on the heat of "artificial Intelligence + education" --- analysis based on teaching new Constructivism

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Abstract: Artificial intelligence is innovating and transforming the entire education and teaching process at an unstoppable speed. It creates opportunities for the intelligent transformation of education and teaching and enhances the efficiency of education. At the same time, artificial intelligence no longer evaluates students with a single one-sided standard. Too much emphasis on efficiency, training each student's innovation consciousness, complete personality and interest ambition. Facing the raging momentum of the reform boom, we need to cool our thinking, take the new constructionism as the foundation, seek the rationality and scientific basis of "artificial intelligence + education", realize the promotion of educational value, and provide ideas for the implementation of education in the era of artificial intelligence.

Key words: artificial intelligence; education; new constructionism

With the ingenuity of artificial intelligence technology, education is the first to be affected. Its development is pushing the research of “artificial intelligence + education” in full swing. Currently, under the strong support of new generation information technology such as big data, cloud computing and Internet of Things, and strong capital promotion. Artificial intelligence education has achieved deep commercial application in the areas of speech recognition assessment, intelligent scoring and correction, home search and online Q&A. Researchers generally believe that artificial intelligence + education no longer evaluates students with a single one-sided standard. Instead of overemphasizing efficiency, we will cultivate each student's innovative consciousness, complete personality and interest ambitions, fully consider the teaching methods of teaching students in accordance with their aptitude, reduce teachers' teaching pressure, and achieve scientific education goals.And whether this revolution caused by artificial intelligence in the field of education can really bring a beautiful picture to human education. For the era of educational technology change, we need to think quietly. Based on the theory of new constructionism teaching, we will A multi-faceted study was conducted.

1. Research Status of Artificial Intelligence Education

The technological change in education for artificial intelligence is unprecedented. The New Media Alliance Horizon Report (2017 Higher Education Edition) states that as artificial intelligence and natural user interfaces enter mainstream applications, many universities are designing machine learning algorithms and touch devices. In order to more realistically interact with humans, intelligent devices can accurately analyze and predict students' knowledge, hobbies, and practical operation levels.[1]

Bayne developed the intelligent teaching assistant Botty based on Mutu learning and applied it to teaching practice. He found that the intelligent teaching assistant can make the relationship between teachers and students more harmonious and effectively improve the teaching effect.

In 2017, the "Notice of the State Council on Printing and Distributing the Development Plan of a New Generation of Artificial Intelligence" clearly pointed out that "the development of intelligent education, the use of intelligent technology to accelerate the promotion of personnel training mode, teaching method reform."Research shows that the application of artificial intelligence in education mainly focuses on student modeling, student behavior modeling, predictive learning behavior, early warning out of school risk, learning support and evaluation, and resource recommendation.Although experts and scholars at home and abroad have taken a positive attitude towards educational artificial intelligence, since artificial intelligence technology itself is still evolving and developing, the application of educational artificial intelligence is far from mature. Therefore, we must always be under the craze of education reform. Keep a cool head, recognize the problems in the application of artificial intelligence education, and solve these problems to form a specific implementation strategy or path.

2. New constructionism theory

In today's rapidly developing networked era, most of our learning methods are acquired through the network, but networked learning faces two major problems, information overload and fragmentation of knowledge.

In the face of these two problems, we put forward corresponding countermeasures, just like bank deposits, we should learn to save by the sum of zero, and learn to construct our own knowledge system, so the new constructivism came into being.

The new constructivism theory is based on the classical constructivism theory combined with the characteristics of intelligence and information age. it constructs the meaning of classroom teaching in three stages: learning, application and innovation, concrete including five parts: situational, retrieval, selection, writing and communication. In the contextualization part, compared with traditional constructivism, the neo-constructivist theory emphasizes that the explicit knowledge expressed in words, words or symbols requires the teacher's lecture delivery, and the abstract knowledge is closely related to the individual's practical experience. Tacit knowledge does not require the teacher's story to be completed.In the search section, the neo-construction theory emphasizes that classroom teaching needs to search the vast amount of knowledge and information on the Internet to make it orderly and integrated.In the selection part, the neo-constitution theory emphasizes that the selection is to continue the search process, in which to avoid overloading the information, it is necessary to solve the individual needs and problems as a "dual center."The writing part is a very important topic in the neo-constitution learning theory. It is regarded as a cyclical process from “integrated writing” to “individual rewriting” to “creative reconstruction”.The communication part contains the two parts of “collaboration” and “conversation” in the classic constructivist theory. Collaboration is the communication in action. The mutual help solves complex problems. The conversation is the language communication. The knowledge and uniqueness are obtained through language communication. The insight[2], through human-computer interaction, breaks through the obstacles of time and space, puts students in a virtual environment, and personally experiences and understands the background of theoretical formation.

3. Based on the cold thinking of artificial intelligence education under the new constructionism

The cold-thinking theory of artificial intelligence education under the new constructivism

explains the transformation and realistic trend of the learning mode under the technological space of the intelligent age. It analyzes from a series of complicated ways within the learner. The theoretical guiding significance.The new constructionism effectively guides the correct learning posture of learners in the context of revolutionary technology. In addition, the theoretical basis of information technology and teaching integration should focus on three aspects: First, the theoretical basis provides knowledge for information technology and teaching development. On the basis of the theory; the theoretical basis for the information technology and teaching integration development to provide research problem domain and delineate the research boundary; third, the theoretical basis provides a methodological basis for the integration and development of the two.[3] This necessitates a shift in the perspective of research, from a focus on learning to a combination of teaching/study in the field of teaching and its new field.

3.1 Viewing the value of education from the theory of new constructionism

According to neo-constructivism, the duty of teachers is not only to graft the knowledge of predecessors onto the minds of learners, but also to teach students to graft themselves. In the network era, it is very important for students to learn to graft themselves, since students are the real subjects of learning. Visible under the new constructivism, the value of education lies in the use of new media network technology is a tool to let the students take the initiative to construct their own knowledge system.

The core literacy system of education includes three major areas and six goals. The three major areas involve “independent development”, “social participation” and “cultural foundation”, while the six goals are expressed in “learning to learn”, “healthy living” and “responsibility”. Acting as "practical innovation", "humanity" and "scientific spirit".The cultivation of personality and the publicity of humanity are the eternal standards of education, and it is the inevitable logical choice for the inner development of the main position of classroom teaching.As the first productivity of education, information technology, while improving the information literacy and communication and cooperation ability of teachers and students, also serves as a tool and means of education and teaching, and plays a pivotal role in teaching resources.[4] According to the analysis of the value of education in the theory of new constructionism, we can find that the value of education belongs to the category of humanistic value system. Education and technology are the relationship between purpose and means, and the relationship between utilization and utilization.Then the intangible magnified ideology of scientism will be a nuisance to humanism, and the abuse of "convenient" technology will make the education concept of life-based education squander.Educators should grasp the logical relationship between educational technology and educational value, and ask questions from the meaning and spirit level as the internal norms for measuring the development of technology. Educational value leads the development direction of education and strives to bring students from the world of technology. The abstraction returns to the nature of human beings, publicizes the personality of the people, and the technical attention gives way to the promotion of the value of education.[5]

3.2 The arrogate of teaching technology

In the practical application of educational technology under the guidance of new constructionism, the basic concepts in the teaching process have been newly interpreted.On the basis of expanding the scope of learners and cooperation models, the intelligent education model also plays an important role in cultivating students' independent thinking and innovation ability in practice.Throughout the current situation of high school mathematics education and teaching,

the more important aspects of education and teaching are embodied in two aspects: the teaching subject gives way to the teaching object; the teaching method dominates the teaching purpose. The advent of new technologies will inevitably have an impact on traditional educational technology, and conflicts may occur during the running-in process. Modern educational technology and traditional teaching techniques play their unique strengths in the classroom time and space. The two are not antagonistic. It is mutual assistance, mutual integration, and benign interaction, jointly promoting the steady development of education and teaching, achieving educational goals, and embodying the essence of education.The value of teaching technology is related to both the subject and the object. Without a party, the value of teaching technology will cease to exist. Once the balance of the two parties loses balance, it will lead to the overcrowding of teaching technology, which will have a certain impact on the value of teaching technology.

In a specific teaching situation, the purpose of teaching technology and teaching techniques, modern teaching techniques and traditional classical teaching methods are often intertwined and interpenetrated, and even tend to be vague and unclear.Even the purpose of teaching is annihilated in the wave of teaching technology and technology, and the purpose of education has become dying and lifeless.Science and technology guides the dominant teaching thinking, and the educational evaluation space is converged to the "scientific" of teaching technology. When the educational technology thinking extends to every teaching link in each class, then the "original intention" of educational technology will deviate from the structure and operation track of the original educational method.Regardless of the internal and external perspectives of education and teaching, letting the traditional educational technology be put on the wedding dress of science and technology will undoubtedly take the essence of education away from the students, and the concept of education will also become Fragmented.[6] Another situation is that in the attitude of "sticking to the ground", modern education technology is freed from classroom teaching, and the scientific and cultural knowledge is transmitted in a diligent manner. However, many abstract problems are difficult to be visualized. I can use the auxiliary tools such as cai to deal with abstract problems but become confusing.

3.3 The role of the educator is dislocated

The new constructivism teaching method advocates encouraging students to carry out colorful and individualized independent learning through the network outside the classroom; through the sharing and exchange in the classroom, select the content that everyone is interested in to carry out collaboration and inquiry. Further deepen the study; under the teacher's demonstration and guidance, gradually realize the processing and integration of knowledge fragments, and finally realize knowledge innovation[2].In the era of globalization of information dissemination, teaching aims to help students lay a solid foundation while forming a good core literacy and become a qualified, sound, "smart" new-age citizen.The wisdom-oriented value has undoubtedly sounded the alarm for classroom teaching. The embodiment of wisdom value requires the benign interaction between the subject and the object. The basic knowledge is the premise. It is the key to cultivate students' literacy. The guidance of teachers is the core of stimulating students' creativity.In the time and space of education and teaching classrooms, the teacher-student relationship is increasingly alienated into the interests of things, and the sense of democracy, equality, and critical reflection is diminished in the classroom.

Habermas believes that technological interest has its own special interest orientation, which is the "technical interest" to control the living world.In the classroom teaching, the benefit

of the teacher-student relationship is maximized, while the teacher-student relationship with the "benefit" as the wind direction belongs to the scientific model: the real teacher-student relationship is established with the principle of seriousness, neatness and rationality. The relationship between teachers and students in science, standards and norms, the construction of teacher-student relationship under the concept of scientism only leads to the network of teacher-student relationship, and the relationship between teachers and students is only a pre-made structure network. And it will be accompanied by the prevalence of classroom hegemonism, paternalistic style and authoritarian teaching; the other is to reflect on the critical relationship between teachers and students, under which teachers establish a reflective practice and strive to create classroom teaching. An atmosphere of justice and equality that exerts a critical force. Under the guidance of this concept, teachers will often reflect: In the classroom teaching, is the role of multimedia cai fully utilized? Can multimedia education implement the concept of wisdom education? Is the teacher-student relationship in the perspective of technology harmonious? Is the evaluation appropriate? Critical thinking will lead to the tendency of teachers and students to nihilism, criticize everything, everything is not, but it is an excuse to evade responsibility. This is worthy of our attention.[7] Balance the role of the educator's role, clarify the relationship of the role of the educator, and examine and reflect on the relationship between the educators with a dynamic, developmental perspective.

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02

Chapter 2:

Social Media and Educational Communication

Learning Japanese Kanji writing method by International JSL Students– Using Kanji Learning Software on Their Smartphones

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Abstract: This study uses smartphone applicationsoftware to learn writing method of Japanese Kanji. International JSL students use the text input function of smart device to learn writing method of Japanese Kanji, practice stroke orderand Kanji radicalrate of pretest and post-testanalyze stroke order and writing method before and after learning, to confirm whether the learners can write the unlearned Japanese Kanji correctlyanalyze the change of correct writing rate of Japanese Kanji before and after learning The main content of the test is to select 30 words in N5 level of JPLT in the pre-test. In the post-test there are 10 words which were used in the pre-test, and 20 new Japanese Kanji wordsBased on the theory of Kanji cognitive psychology, this study aims to improve the ability of international students to understand Kanji radical and to write Japanese Kanji.

Key words: Japanese Kanji, International studentsJSL(Japanese as a second language), SmartphoneText input

INTRODUCTION

1. International JSL students learn Kanji

According to the survey report of the Japan Student Services Organization, until 2018, there are 298,980 international students in Japan, 58.4% of these students are from non-Kanji countries, the number is nearly 174,605. From 2015 to the present, the growth rate of international students in Japan has exceeded 10% every year. For non-Kanji JSL students, learning Kanji is the most difficult part of the process of learning Japanese. For international JSL students, the shape of Kanji is complex, the number of Kanji words is large, and the writing method is difficult. Therefore, this research will study how non-Kanji student learn and practice Kanji writing method.

Firstly, Kanji is a kind of ideographic characters, there is no direct relationship between the font, meaning, and pronunciation of Kanji, which is the biggest difference between Kanji characters and phonetic characters. Therefore, international JSL beginners need to understand the radicals and the structure of Kanji characters correctly, in order to further recognize and understand Kanji words.

Secondly, the international JSL students' mother language is a continuous, linear, series, one-dimensional, analytical character, while Japanese Kanji is an inclusive, planar, two-dimensional, complex character. Therefore, international JSL student needs to improve their comprehension and writing ability through practical Kanji writing method.

Thirdly, based on the theory of cognitive psychology, this study examines and evaluates the learning effect of international students. Learn Kanji based on the radicals firstly, and understand Kanji structure. Acquisition of muscle motility by incorporated motor learning elements. Final, JSL students can automatically understand and write unlearned Kanji, so as to improve the understanding ability of radicals and writing ability of Japanese Kanji.

2. Utilizing smartphone software

Smartphone and tablet computer APPs are being wider use in school, artificial intelligence-assisted apps have become prevalent in learning. Smartphone software provides a language learning environment that is not limited by time and place. Student using fragment times to learning, which realize self-learning and personalize education truly.

Three APPs are used in this study, the APP name is Asahi-JLPT-N5, Kanji first grade, and Kanji writing order. “Asahi-JLPT-N5” is an APP for student learns Kanji radicals of N5 level, there are 56 radicals for N5 level, and 214 radicals under which Kanji characters are traditionally listed in Japanese dictionaries. Help the student learn the basic elements which help memorize complex Kanji and distinguish visually similar ones by providing useful mnemonics.

“Kanji first grade” is an APP for self-learning. This study utilizing the text input function of smart devices. Students can practice and learn writing method, stroke order and Kanji radicals, Kanji structure on smartphone and tablet computer. “Kanji writing order” is one APP for self-test. Student can check writing method by themselves, and also can learn the Kanji writing order during the self-test.

RESEARCH DESIGN & METHODS

1. Research object

The research objects of this study are two international JSL students who are studying at the Aichi University of Education. They studied Japanese at Nagoya University for six months. Both of them have not taken the Japanese level examination. From daily communication, the Japanese level of the research object is about N5, but they can’t fully understand the font, meaning, and pronunciation of Japanese Kanji. The difficulty of understanding Japanese Kanji has become an obstacle for them to continue to improve their Japanese proficiency, which makes it difficult for them to become advanced learners of Japanese.

2. Research agenda

Pre-test did at Jun-7th, 30 Kanji words of the Level N5 were chosen, international JSL students copied them one by one. Whether they can write the Kanji words by correct order, the correct rate of Kanji writing method were checked and summered after pre-test.

There are nine courses will be implemented from the middle of June to the last of August.

Post-test will be done at the beginning of September, the international students will copy 30 Kanji words of the Level N5 too.

The final report will be done from September to December.

3. Research content and theoretical basis

This study using Kanji Learning Software on smartphones, help the international JSL students to learn Kanji writing method, achieve the self-learning and self-test of Japanese Kanji writing method. Specific steps are as follows..

3.1. Kanji elements in the common Kanji words

According to the study of Galina Vorobeva, there are 24 Kanji elements (Refer to Table1) in the common Kanji words. Structural decomposition of Japanese Kanji and understand of their constituent elements contribute to deeply understand the meaning of Kanji. The First course was done at Jun-14th, international JSL students learned 24 Kanji elements which are the basic strokes of Kanji. The Kanji element transforms complex Kanji words into simple symbols that are easy to remember and converts short-term memories with limited capacity into long-term memories with unlimited capacity.

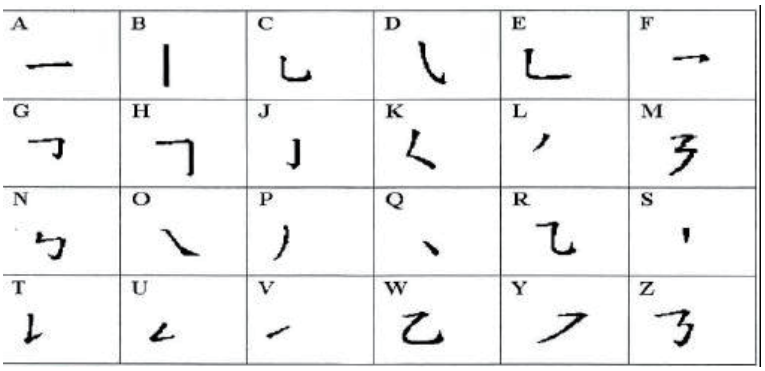


Table1. 24 Basic elements of Japanese Kanji

3.2. Learning Kanji radicals

There are 56 radicals for N5 level, which were made by 24 basic elements, and radicals are also the base part of complex Kanji words. The international students learn Kanji radicals by APP “Asahi-JLPT-N5”. Kanji words are divided into simple Kanji and complex Kanji. Complex Kanji is composed of simple Kanji and radicals. From the meanings of single Kanji and radicals, the learner can deduce the meanings of unlearned complex Kanji words. Adopt organizational learning strategies, learn and classify the radical before learning how to write kanji, and learn how to write kanji by utilizing the radical.

3.3. Learning Kanji structure

Japanese Kanji is a two-dimensional, complex character compared to phonetic characters.

Therefore, the Kanji writing method is different with phonetic characters. There are seven basic structures as Table2. International JSL students learn them and study and recognize the structure from simple words to complex words. Apply organizational strategies to learn Japanese Kanji, classify Kanji structure to seven kinds, help learners understand Kanji structure, and keep a perfect balance of kanji writing method.

Structure	Name	Radicals
	*hen*	氵 冫 彳 忄 扌 子 ネ 示 禾 …
	*tsukuri*	卜 刂 卩 彡 斗 斤 隹 頁 聿 …
	*kanmuri*	亠 宀 冖 八 癶 穴 竹 罒 雨 …
	*ashi*	灬 皿 舛 心 …
	*nyou*	廴 走 辶 麦 鬼 …
	*tare*	厂 尸 广 疒 …
	*kamae*	口 口 冂 門 匚 几 勹 弋 戈 气 …

Table2. Japanese Kanji Structure

3.4. Kanji and Six Categories

Based on the manner in which they are formed or derived, Kanji can be identified into six categories. They are pictographs, ideographic, compound ideographs, phono-semantic compounds, phonetic loan characters and "derivative cognates". Classification of the six categories means that it helps students to understand kanji writing method of new kanji words which they didn't learn before and guess the meaning. In this study, the imagination image is formed in the learner's impression, the six categories help the students to understand Kanji font, Kanji radicals and Kanji structure better than before.

3.5. Self-learning and self-test

There are 6 courses for international JSL students from June to September. This study will be carried out through smartphone software (“Kanji first grade” and “Kanji writing order”) to achieve self-learning and self-test during the learning process. JSL students adjust themselves constantly. It’s a Self-regulated learning process by which a student initiates and sustains systematically oriented cognition, emotions and behaviors to achieve an acquisition goal.

RESULTS AND EVALUATION

1. Pre-test and results

The pre-test was done in Jun-7th, the correct rate of the two research objects is 47% and 30%, and writing order correct rate is 10% and 4%. International JSL students don't know the first stroke, they do not understand the writing order and the structure of kanji. Observe their writing activities, they put the paper at 45 degrees in front of them, the same as they were writing English words and use the pen diagonally, they can’t do the writing action correctly. They do not know the size and the ratio of the radical. Especially for the students from Arabic countries, they

unconsciously write Kanji from right to left like Arabic. It's necessary learning Kanji writing method for international students.

2. Kanji test evaluation project

According to <Basic Kanji Book>, a primary textbook for Kanji beginners, the evaluation measuring Kanji level is divided into four parts: font, reading, meaning, and usage. The focus of this study is to improve the comprehension of the structure of Kanji and the ability to write Kanji. After each course, a small test is conducted to analyze and test whether each goal has been achieved.

2.1. Pre-study part evaluation

International JSL Student should know the basic Kanji character from in font, international JSL students should have the basic ability as follow. After 3 weeks, 6 hours of learning, JSL students can complete the following goals, and they can practice Kanji on the smartphone by themselves.

<1>. Find out the similar element and radicals in different words.
<2>. Distinguish glyphs of similar Kanji.
<3>. Find common parts of Japanese Kanji.
<4>. Recognize the same structure of Kanji.
<5>. Select kanji in the same character from a group.
<6>. Find out the different Kanji words in the same font group.
<7>. Find out the radical.

2.2. Follow-up study partial evaluation and final report

The main content of the test is to select 30 words in level N5 in the Pre-test. In the post-test, there are 10 words which were used in the Pre-test, and 20 new Kanji words. This study will compare the correct writing rate of Kanji writing method between pre-test and post-test, analysis of the proportion of improvement in the correct rate, check out whether the JSL students can write the Kanji order correctly. The correct rate will be summered after post-test and compared with the Pre-test, analyze stroke order and writing method and the change of correct writing rate of Japanese Kanji before and after learning.

COCLUSION

This study Learn basic methods of Kanji writing, after learning basic elements, Kanji radicals, and Kanji structure. Improve the understanding of Kanji radicals and cognitive ability of Kanji structure, use the principle of writing movement to improve the writing ability of international JSL students. This study usage text input function of the smartphone, students can learn and test on their smartphone. At last, this study will compare Pre-test and post-test, analysis the correct rate. If the correct rate of post-test is increased by 2.5 times, this study is considered successful.

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Asahi-LPT-N5 APP

Kanji Ichi nen sei APP

Kanji Kakijun APP

Research Review on Media Literacy Education Since the 21st Century *

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Abstract: With the rapid development of Internet and new media technology as well as their application in education, media literacy, acting as the necessary means of achieving lifelong learning in the new media environment, will play an important role in education field and even civil society. This article has done relevant statistics and analysis on media literacy education since the 21st century, presented some existing research problems, and pointed out some questions that remains to be met, laying a foundation for future research and practice in related fields.

Key words: media literacy, media education, new media, media and information,

INTRODUCTION

Due to the dual effect of technological development and social change, digital media has penetrated into every corner of the world and has become an indispensable part of people's daily lives. Especially with the rapid development of mobile Internet and artificial intelligence, various emerging media technologies and communication practices have reconstructed people's value choices, lifestyles and ideas.

According to the 2019 digital report jointly released by We Are Social and Hootsuite, as of January 2019, the number of netizens was 4.39 billion, the number of mobile phone users reached 5.11 billion, and 3.48 billion people were active on social media. In such new era of media communication environment with such a large group participation, the media is no longer just a proprietary thing of media workers, but also an indispensable tool for civil society life. In this context, learning how to regulate media behavior, develop better media usage lifestyle is a problem that every citizen must face, and this is actually the main content of media literacy education research. Some scholars have pointed out that citizens of the new era are citizens with media literacy (Ashley, 2017). Institutions and organizations around the world have also

* 基金项目：“赣鄱 555 英才工程”领军人才培养计划［赣才字[2012]1号]专项资助;

advocated the need for media literacy education to improve the level of citizen media literacy.

Since the 1930s, media literacy education has become a hot spot for researchers, schools, and institutions in various countries. However, because the development of media literacy education is subject to factors such as cultural background and social organization of countries, there is still no consensus on the connotation, extension and means of media literacy education. However, it is undeniable that scholars from all countries have made significant contributions and influences on the development and progress of media literacy education. This paper tries to systematically analyze the citation information of the published media literacy education research literature (retrieved from Web of Science), combine the literature content to summarize the research hot topics and development trend, extract research consensus, and comprehensively comb the research in this field.

RESEARCH DESIGN & METHODS

1.Research Tools

Our research uses the statistical analysis function of WOS to summarize the bibliographic information, and uses the latest CiteSpace5.4 R3 version to analyze relevant bibliographic information and draw knowledge maps. Citespace is a knowledge visualization software developed by Dr. Chen Chaomei from Drexel University in the United States. It combines a variety of visual analysis functions, mainly used to detect the development of subject knowledge and its research hotspots, frontiers and trends (Yue Chen et al., 2015).

2.Data Source

The citation information in our research is retrieved from the Science Citation Database (Web of Science Core Collection's core collection). We searched for "media literacy education" as topic, title, and keyword. 2,159 related documents from 2000 to May 2019 were obtained, and all the bibliographic information of these documents were exported as text files for subsequent research needs.

RESULT

1.Articles published

Using the statistical analysis function of WOS, we obtained statistics on the distributions of articles published in different years in the field of "media literacy education" since 2000, as shown in Figure 1. It is not difficult to see that from the total number of articles published, the research on media literacy education presents two major research tendency: First, the number of articles maintain sustained growth, especially in 2014-2016, media literacy education research entered a concentrated outbreak period, the number of articles has increased significantly. Second, after 2017, the number of articles has dropped slightly, indicating that the research on media literacy education has declined, it’s also possible that related research has encountered difficulties in achieving effective development or knowledge innovation.

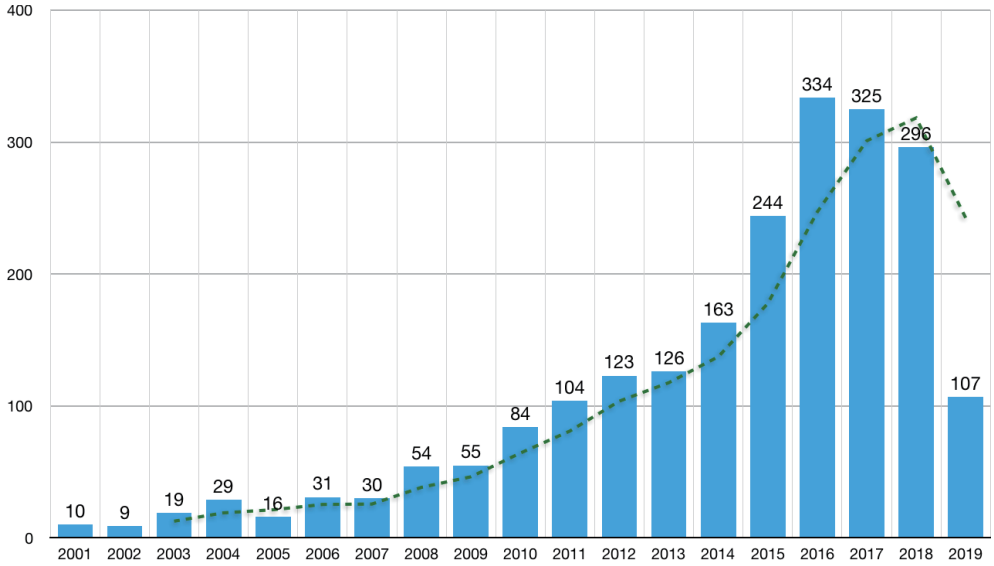


Fig. 1. Distributions of articles published in different years

2.Research areas

Use the "Results Analysis Tools" of WOS, we found that the media literacy education research papers are distributed in 87 research areas, among which the top 10 directions are Education Educational Research, Communication, Computer Science, Social Science Other Topics, Information Science Library Science, Linguistics, etc. (see Table 1).

Table1

Distribution of research area and proportion

Rank	Research Direction	Frequency	Percent (%)
1.	Education Educational Research	1093	49.592
2.	Communication	311	14.111
3.	Computer Science	160	7.26
4.	Social Science Other Topics	134	6.08
5.	Public Environmental Occupational Health	129	5.853
6.	Information Science Library Science	125	5.672
7.	Linguistics	109	4.946
8.	Psychology	102	4.628
9.	Health Care Science Services	62	2.813
10.	Business Economics	58	2.632

Among them, the number of related papers in the field of education and teaching research is the largest, accounting for 49.59% of the total number of papers, indicating the high correlation between media literacy education and education and teaching. In addition, communication, computer science, information science and library accounted for 14.11%, 7.26%, and 5.67% of the total number of papers respectively. It can be seen that media literacy education research also focuses on media content and media technology. On the whole, media literacy education research has spanned multiple disciplines, drawing on experience and nutrition, and has become an interdisciplinary research field.

3.Publication

The top 10 publications in the field of media literacy education are shown in Table 2.

Table2

Distribution of Publication and proportion

Rank	Publication	Frequency	Percent (%)
1.	MEDIAOBRAZOVANIE MEDIA EDUCATION	74	3.358
2.	COMUNICAR	71	3.221
3.	INTED PROCEEDINGS	52	2.359
4.	COMPUTERS EDUCATION	43	1.951
5.	EDULEARN PROCEEDINGS	42	1.906
6.	JOURNAL OF ADOLESCENT ADULT LITERACY	41	1.86
7.	PROCEDIA SOCIAL AND BEHAVIORAL SCIENCES	34	1.543
8.	ADVANCES IN SOCIAL SCIENCE EDUCATION	28	1.27
9.	AND HUMANITIES RESEARCH ICERI PROCEEDINGS	28	1.27
10.	LEARNING MEDIA AND TECHNOLOGY	20	0.907

The top 10 publications totaled 434 articles, accounting for 20.1% of the total number of publications. Among them, the professional journal "MEDIAOBRAZOVANIE MEDIA EDUCATION" in the field of education has the highest number of articles, 74 articles, and the journals ranked 2nd, 4th, 5th and 10th are also in the field of education, which fully demonstrates that Education plays the main body of media literacy education. Ranked 6th "JOURNAL OF ADOLESCENT ADULT LITERACY" is a journal for young people, which reflects the study of media literacy education in all countries are mainly aim at adolescent. Ranked 7th "PROCEDIA SOCIAL AND BEHAVIORAL SCIENCES" is a specialized journal in the field of psychology, it can be seen that media literacy education has also received great attention in the field of psychology, which further demonstrates that psychology provides a theoretical basis for media literacy education.

4.Countries(Regions)

According to the statistics of the countries (regions) from 2,159 articles' author, we took the top ten according to the number of articles and obtained Table 3.

Table3

Distribution of countries and proportion

Rank	Country	Frequency	Percent (%)
1.	USA	595	26.996
2.	Spain	209	9.483
3.	Australia	153	6.942
4.	England	122	5.535
5.	China	108	4.9
6.	Canada	98	4.446
7.	Russia	86	3.902
8.	Germany	80	3.63
9.	South Africa	52	2.359
10.	Turkey	52	2.359

From the perspective of the distribution of countries (regions), the United States, Spain, and Australia have an absolute advantage in the number of publications, and their publications are 595 (26.99%), 209 (9.48%), and 153 (6.94%). In addition, the United Kingdom, China, Canada and other

countries have higher publications, showing the strength and level of these countries in the field of media literacy education, which is closely related to the importance and development of media literacy education in various countries.

China has issued 108 papers, accounting for 4.9% of the total number of publications, showing a large potential for development. However, compared with countries such as the United States and Spain, there is still a gap between the total number of documents and the quality.

In order to further explore the cooperation between different countries (regions) in the field of media literacy education research, we use Citespace software to visualize the knowledge map of the cooperation between countries (regions), and get Figure 2.

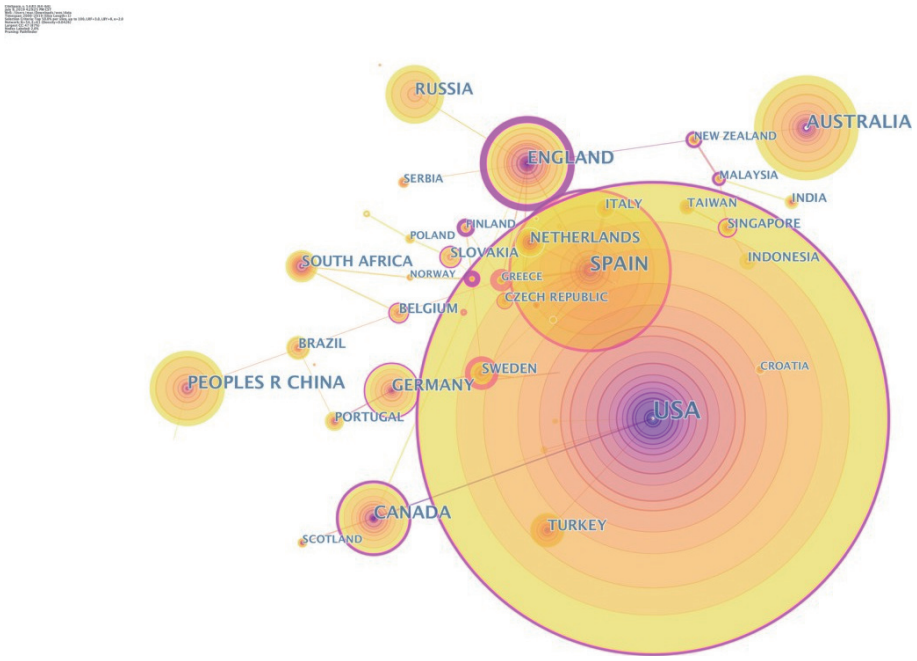


Fig. 2. Knowledge map of the cooperation between countries (regions)

It is not difficult to see that "Spain", "England", "Sweden", "Switzerland", "Singapore" and other nodes have more connections with other nodes.It shows that these countries have more international exchanges in the field of media literacy education research, and have conducted many studies in cooperation with other scholars.

The connection between China and other countries is relatively weak. It can be seen that the degree of integration of China's media literacy education research with international interaction needs to be improved. In general, the research on media literacy education among countries is closely linked, and a number of closely cooperating sub-groups have been formed. Cooperation and development among countries have provided a good space for universal, comprehensive and rapid development of media literacy education on a global scale, it is foreseeable that the future media literacy education will continue to flourish in the world.

5.Institutions

The top 10 institutions in the field of media literacy education are shown in Table 4.

Table 4

Most active institutions

Rank	Institutions	Country	Frequency	Percent (%)
1.	UNIV HUELVA	Spain	23	1.044
2.	NANYANG TECHNOL UNIV	Singapore	19	0.862
3.	ROSTOV STATE UNIV ECON	Russia	19	0.862
4.	UNIV CANTABRIA	Spain	19	0.862
5.	UNIV VALLADOLID	Spain	19	0.862
6.	UNIV HONG KONG	Hongkong China	18	0.817
7.	COLUMBIA UNIV	USA	16	0.726
8.	UNIV GHENT	Belgium	16	0.726
9.	UNIV SYDNEY	Australia	16	0.726
10.	UNIV WISCONSIN	USA	16	0.726

From the distribution of research institutions, UNIV HUELVA, NANYANG TECHNOL UNIV, ROSTOV STATE UNIV ECON, UNIV CANTABRIA, UNIV VALLADOLID ranked in the top five, reflecting the importance of these institutions in media literacy education Strength and contribution. It is worth noting that the three schools in Spain are ranked 1st, 4th and 5th respectively, showing the international influence and strength of Spain in the field of media literacy education. The schools ranked sixth, seventh, and tenth are from the United States, and once again show the strong academic position of the United States in the field of media literacy education. And Chinese institutions have failed to enter the top ten.

Based on the above results, the following points can be found: First, institutions of higher learning and research institutes are still the main and important positions of media literacy education research; second, the academic research institutions of the United States, Spain, Australia and other countries have more output, in terms of the amount of publications, have an absolute advantage. There is a certain gap between China's academic research institutions and the volume and quality of publications and the leading countries in the world. It also needs continuous development and progress.

6.Authors

Table5

Authors of more than 6 papers

Rank	Frequency	Author	Country
1.	15	FEDOROV A	Russia
2.	12	LEVITSKAYA A	Russia
3.	9	AUSTIN EW	USA
4.	8	KUPERSMIDT JB	USA
5.	8	PRIMACK BA	USA
6.	8	SCULL TM	USA

7.	8	STELLEFSON M	USA
8.	8	VALCKE M	Netherlands
9.	7	HOBBS R	USA
10.	7	MERCHANT G	England
11.	7	VRABEC N	Chech
12.	7	WESSELING N	Netherlands
13.	6	CHEUNG CK	China
14.	6	GARCIA-RUIZ R	Spain

We counted the authors and citation authors of 2,159 articles, extracted authors with more than 6 articles, we obtained Table 5.

It can be seen that Fedorov A and Levitskaya A who from Russia are far ahead in terms of the number of publications. Ranked 3rd, 4th, 5th, 6th, 7th, and 9th are all American scholars, accounting for nearly half of them.

The third, fourth, fifth, sixth, seventh, and ninth are all American scholars, accounting for nearly half of them. It shows that American researchers have paid great attention to and contributed to media literacy education. It is worth noting that CHEUNG CK of Hong Kong, China has published six articles, ranking 13th in the volume of publications.

In order to further explore the cooperation between scholars from different countries (regions) in the field of media literacy education, we use Citespace software to visualize the knowledge map of the cooperation between scholars and obtain Figure 3.



Fig. 3. Knowledge map of the cooperation between authors

Figure 3 shows that in the field of media literacy education, there are roughly five "scholars' faction maps", two of which are more prominent: the academic faction which centered on Fedorov A in Russia, and the academic faction which centered on Valcke M in Belgium.

7.Authors

Using Citespace software to perform keyword frequency statistics and co-occurrence knowledge maps on 2159 literature titles, we can obtain Figure 4 and Table 6. Through keyword co-occurrence analysis and explicit word analysis, one can discover the close relationship between the research objects, mine the implicit or potential useful knowledge, and reveal the research hotspots, structures and paradigms of a certain subject or subject group.

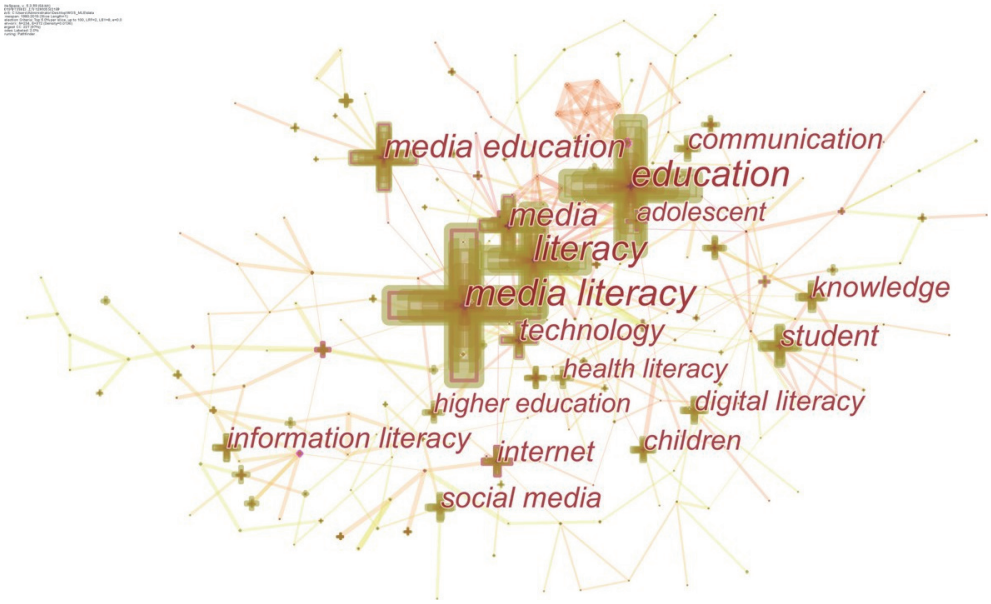


Fig. 4. Knowledge map of the keywords co-occurrence

Table6

Keywords of high frequency and high centrality in the dataset

Frequency			Centrality		
Rank	Keywords	Frequency	Rank	Keywords	Centrality
1.	media literacy	427	1.	media literacy	0.40
2.	education	381	2.	digital	0.39
3.	literacy	312	3.	internet	0.31
4.	media education	188	4.	alcohol	0.31
5.	media	180	5.	behavior	0.25
6.	student	122	6.	prevention	0.22
7.	technology	108	7.	teacher	0.20
8.	knowledge	102	8.	music	0.19
9.	social media	101	9.	media	0.17
10.	internet	101	10.	technology	0.16
11.	information literacy	91	11.	scientific literacy	0.16
12.	communication	91	12.	media education	0.15
13.	digital literacy	80	13.	decision making	0.13
14.	children	78	14.	curriculum	0.12
15.	adolescent	73	15.	television	0.11
16.	health education	71	16.	new literacy	0.11
17.	higher education	71	17.	age	0.11
18.	attitude	69	18.	exposure	0.11
19.	information	67	19.	adolescent	0.10
20.	behavior	66	20.	face book	0.10

Figure 4 and Table 6 reflect the local distribution of the main high-frequency keywords in the media literacy education research literature published in 2000-2019, which can reflect to some extent the current international research themes and research hotspot status in this research field.

As can be seen from Figure 4, the "media literacy" node as the main search term is the most prominent, with the highest word frequency and centrality. The three nodes based on the "media", "education" and "literacy" of the search terms are also prominent. And they are very closely related to each other, surrounded by "media education", "communication", "technology", "higher education", "digital literacy", "student", "social media", "internet", these words are more connected with the large nodes of the center and have darker colors, indicating that these topics are closely related, intertwined and affect each other, and constitute the main research theme of international media literacy education research.

First of all, from the words "media education", "student", "technology", "social media", "internet", "information literacy", "digital literacy" and other high-frequency keywords, it can be seen that media literacy education research is mainly Focus on research on modern social media and multiple literacy. Secondly, from the keywords such as “digital literacy”, “internet”, “behavior”, “prevention”, “technology”, “decision making” and “new literacy”, international scholars attach great importance to digital age technology and the development of the media has an impact on people's behavior and self- development. In addition, the "teacher", "student", "course", "youth", "children" and other keywords with high center degree are the key hubs in the network structure of the media literacy education research map, which connect different research directions. It illustrates the attention of international scholars on the application research of media literacy education and the tendency of the application object, that is, how to carry out various media literacy education practices among the student groups mainly composed of adolescents and children.

8.Cluster

We used Citespace software to cluster 2,159 document by terms, using clusters based on LLR algorithm (the clustering labels obtained by LLR will be more in line with the actual situation and less repeated), and displayed in Timezone mode. As is shown in Figure 5.

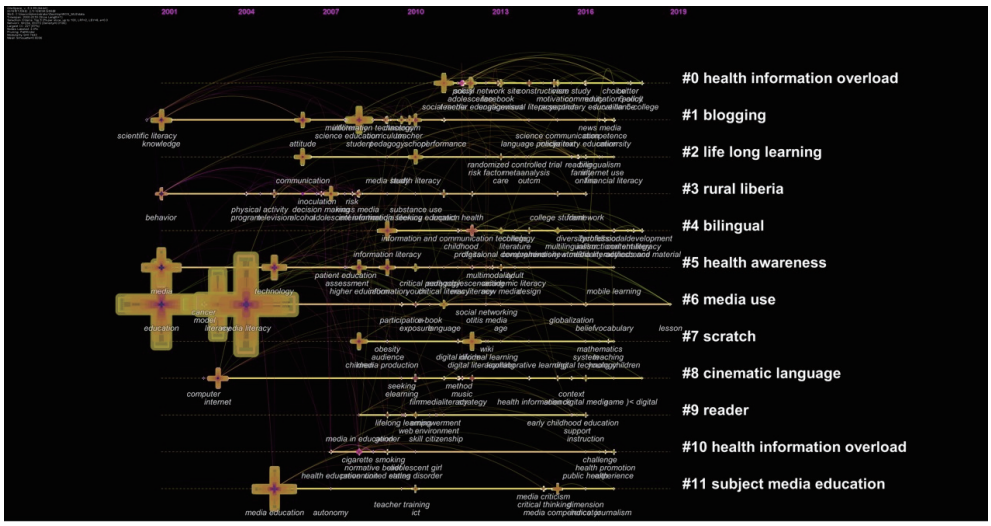


Fig. 5. Knowledge map shown as Timezone model of keyword clustering

As can be seen from Figure 5, after keyword clustering, a total of 12 tags are generated, which reflect the subject matter in the field of media literacy education research. We can specifically analyze them from the following stages.

2000-2007. The media literacy education at this stage focuses on two aspects. One is the discussion of the technical factors, theoretical models, and importance of media literacy education. For example, some scholars analyzed the challenges brought about by technological development and information explosion, and propose the main connotation and importance of literacy education; the second is the empirical research on media literacy education, including the investigation of the use of different groups of media, media attitudes and media capabilities (Hui Zhang, 2016; Maksl A, 2015; Literat I, 2014).

2008-2013. Media literacy education research at this stage is mainly reflected in media participation ability and educational practice. With the gradual rise of the Internet, media technology and social networks, "participatory culture" has gradually been recognized by most scholars, and the importance of media literacy and its education has gradually been emphasized. Scholars from all over the world have carried out extensive and in-depth discussions on the background, approach and content of media education, but the practice in education and teaching is still in a very general research stage, and has not been extended to specific areas.

2014-now. This stage is a stage in the outbreak of research on media literacy education. Specifically embodied in three aspects: (1) A variety of qualities covered by media literacy education; (2) Educational integration of different stages and types of media literacy education (Vandenbrande 2005); (3) Multiple influencing factors and interventions in media literacy education.

DISCUSSION

Based on the above results, we can summarize the main themes of international media literacy education research as follows.

1.Media literacy education and school education

Keywords representing this theme are: adolescents, education, instruction, teaching strategies, universities, etc.

It can be found that adolescents and college students are the main targets of media literacy education. Barry Duncan, former president of the Canadian Media Education Association, said that in the context of global education, media literacy helps students develop a critical perspective on how media work, how to establish intentions, how they are used, and how to evaluate the information presented to them, has an important role (Barry Duncan, 2005).Since the 1930s, the United Kingdom, France, Germany, the United States, Australia, Canada and other countries have begun to set up courses related to media literacy education in various stages of school curriculum. A number of scholars also have explored how to conduct media literacy education, including educational strategies and curriculum implementation. For example, Taylor (2002) analyzes media literacy with a sample of Course implementation from Ontario, Canada, New South Wales and England; Scheibe (2004) uses the curriculum-driven approach

to integrating media literacy into K12's social research, Mandarin/language arts, mathematics, science, health and art curriculum.

2.The key competence and extension of media literacy

Keywords representing this theme are: media abilities, new literacy, media criticism, critical literacy, multimodality, reading, etc.

Media literacy is often defined as a set of abilities that are often considered to be closely related to critical literacy and cultural studies (Silverblatt, 2014). At the beginning of the 21st century, Potter (2004) proposed the theory of media literacy and developed critical theory. Citizens should recognize that media performance is only a “simple reappearance” of reality rather than a “direct expression” of reality, so it is important to develop the ability to critically engage with media and media information in an autonomous and independent manner (Meeus W, 2014).

Different scholars have different views on the related abilities of media literacy. For example, James Potter believes that media literacy includes four areas of cognition, emotion, morality and aesthetics. The Centre for Media Literacy (CML) Establish a media literacy education framework around the core of “deconstruction” (Jolls, 2005). Hallaq (2016) put forward the five-factor core structure of media literacy education, including “moral awareness, media acquisition, media awareness, media evaluation and media production”. Ferrés (2007) have defined the five-dimensional indicators of “language, technology, interaction process, production and communication process, ideology and values, aesthetics” as the capabilities of the new era with media literacy producers.

3.The main purpose and development orientation of media literacy education

Keywords representing this theme are: new literacy, empowerment, information and communication technologies.

All kinds of emerging media, including the media, provide the most participatory expression platform for the entire public. This technological transformation enables the public to gain more rights, opportunity, resources, etc. through active use of new media. Individuals, groups, and organizations have more initiative possibilities and opportunities (Livingstone, 2009). Old media consumers are passive, predictable, isolated, and silent; new media consumers are active, Movable, social, loud, and open (Fernandez Beaumont, 2010). For this phenomenon, some scholars call it "new media empowerment" (Ala-Mutka, 2011). The more important role and function of the development of media technology is to act as the operating system of this society, to facilitate the independent and orderly expression of all citizens in this system, and fully enjoy the freedom of speech in the Internet age (Bundy A, 2004).

What media literacy education needs to do is to base on new information and communication foundations, so that citizens can follow social ethics and laws, and they can also provide various information content that is beneficial to society while benefiting from this platform. Therefore, the main goal of media literacy education is to fulfill the mission of “how to effectively express” citizens, guide citizens to be good at expression, reasonable expression, legal expression, and fully exercise their freedom of speech while maximizing compliance with ethical, moral and national laws, regulations, etc., to effectively spread positive energy (Jiguang Tuo, 2016).

CONCLUSION

This study uses the Science Citation Database (WOS) as the information source, based on the bibliometrics and knowledge map visualization analysis methods, to describe the overall picture of the development of media literacy education. Through the comprehensive analysis of this research field, we can draw the following conclusions.

1.The importance of media literacy education cannot be ignored

There are several widely accepted definitions of media literacy education, such as NAMLE media literacy definition, five core competencies centered on message access, analysis, creation, and reflection (Hobbs, 2011). David Buckingham (2004) defined it as the knowledge, skills and abilities that required to interpret media information, while The Aspen Institute's Report on the National Leadership Conference on Media Literacy proposes the ability to access, analyze, evaluate and communicate (Zhang Ling, 2004). Although the connotation and extension of media literacy education itself has not been unified, the importance of developing media literacy education and cultivating citizens' relevant abilities has long been recognized by scholars and decision makers in various countries (Fedorov, 2007; Feng 2008; Scull and Kupersmidt 2011; Torres and Mercado 2006; Wan and Gut 2008).

Through statistical analysis above, it can be seen that the focus of media literacy education is students such as teenagers and children. Media literacy school education has received full attention and research. However, most scholars have suggested that media literacy has gradually become an essential literacy for contemporary citizens (Area, 2012), and media literacy education is also bound to become an important part of civic education (Dejaeghere, 2009; Gozálvez, 2013). Therefore, school education alone is not enough, but also the strength of the whole society. Therefore, the teacher should also include parents, teachers, administrators, communities, etc., and they must have certain media literacy, can safe, responsible and ethical use media technology and media participation. In other words, media literacy education is closely related to everyone (Jenkins, 2009).

2.The application development of media literacy education and multidisciplinary integration needs to be improved

Media literacy education research has interdisciplinary characteristics, can absorb mature theories from different disciplines, and should become a comprehensive quality education (Tiede, 2015). It can be found that international studies have been carried out from the perspectives of different disciplines such as education, communication, psychology, public health occupational health, etc., in order to explore a powerful fulcrum to build a bridge between media literacy education and other disciplines (Unyial, 2018). However, media literacy education research ultimately needs to step into educational practice.

Although most government agencies and social organizations are committed to the promotion and dissemination of media literacy education concepts, as well as schools offering specialized courses for media literacy education (Christ, 2004). The academic community still pays insufficient attention to this. The application of media literacy education theory and practice is still not much. There are also problems of uneven distribution of countries and unevenness of research objects.

To this end, researchers should not only stay on the discussion of the theory and practice of media literacy education, but also implement it into the application, truly promote the development of national media literacy education.

3.The development of media literacy education in the new media era

The changes in the connotation of "media people" in the new media era have brought about tremendous changes in the connotation of media literacy. Tzu-Bin Lin and other scholars have adopted the "production and consumption type" as one of their dimensions in the framework of the new media literacy ability. Emphasis on the analysis and production of media (Lin T, 2013).

Nowadays, people live in a multi-dimensional communication pattern in which various media and communication modes coexist. The improvement of social democratization and the maturity of modern digital media have made media technology popular and rapid. Media technology has been transformed from the esoteric professional technology to the popular mass technology. The return of public discourse power and the awakening of the audience's subject consciousness also provide opportunities for citizens to use the media, actively participate in and influence the public life discourse space and social politics. “Participating consumption” has gradually become mainstream (Masterman, 1997). Therefore, Scholars not only need to pay attention to the new media technology and the rapid development of new media culture and the higher demands placed on citizens’ media literacy, but also need to pay attention to the new connotation and extension of media literacy with the further development of media technology and media culture.

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Promoting the innovative development of Ideological-political education in high schools with micro-communication

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Abstract: With the quick development of Weibo, WeChat and mobile client, Micro-communication has become the main channel for information acquisition and communication. Ideological-political education in high schools should focus more on the construction of hardware, the establishment of platform, the operation system and so on. Education institution should thrive on building micro-platform, enriching micro-content, fully applying micro-means and activating micro-practice.

Key words: Micro-communication, Ideological-political education, Innovative development

The great new era is full of ideas refreshing, technological reforming and practical innovation. More and more disruptive scientific and technological innovation achievements are consecutively booming and network communication technology is undergoing profound changes. Micro-communication, like Weibo, WeChat and mobile client which continue to rise and grow have become the main channel for information acquisition and communication. Ideological and political educators should embrace the era, follow the trend of the era and take micro-communication as a powerful force to achieve new leap-forward and new vitality. To fully promote the development of micro-communication in Ideological-political education, and vigorously enhance the timeliness and appeal of education, we must strive to build micro-platforms, enrich micro-content, make good use of micro-means, and activate micro-practice Ideological-political education.

1. Micro-communication drives and leads new trends in the development of Ideological-political education

Micro-communication is characterized by miniaturization of carriers, fragmentation of information, fine differentiation of audiences and flattening of structure. In particular, it has a significant advantage of adapting to the fragmented reading habits of the public, which will definitely lead the network communication ecology. Moreover, it will become the most influential and innovative information expression form at present, and show a good application prospect in the field of Ideological-political education.

1.1 Miniaturization of carrier promotes mobile intelligence of educational terminal

With the development of science and technology, network terminals show obvious trend of becoming intelligent, miniaturized and portable is becoming. Up to June 2018, the scale of Chinese netizens reached 802 million, among which the netizens' Internet devices are centralized to mobile terminals. The scale of Chinese mobile netizens has reached 788 million, with 98.3% of them accessing the Internet through mobile phones. With the advent of 5G era, network office, network learning, network social networking and network political participation will become the main style of social life. In the network era, the extension and coverage of Ideological-political education terminals to smartphones possesses objective material basis and strong scientific and technological support and thus can help students get rid of the real dilemma of classroom learning aversion and traditional cramming. Therefore, it can reverse the "information depression" trend of Ideological and political guidance in the school of mobile Internet era, and promote the real full-time and global coverage of Ideological-political education. Using mini-media, such as micro-blog, micro-mail and so on, students can view, publish and update Ideological-political education information anytime and anywhere. In educational communications, scientific research practice, social survey and other learning activities, students can have synchronous classes by using micro-blog chat group, micro-blog reply message and client interactive zone to instantly solve doubts and questions. In other words, "Ideological and political teachers who never attend classes" will become a reality.

1.2 Information Fragmentation Promotes Individual Customization of Educational Content

In the era of internet, information is complex and data is expanding. Netizens' attention has become a scarce commodity. The traditional way of information flooding and long-term reading cannot satisfy the need of netizens, while the fragmented communication which combines fast reading and precise push is favored. The fragmented information is short and concise, the content of the text within 140 words points out the outline of the matter, the video broadcasting in tens of seconds conveys the live hot spot, and the expression packages with size of about 100KB vividly show the emotional mentality. This concise and clear "whisper" is suitable for filling the gap of young students' learning by using fragmented time. Moreover, micro-communication based on big data and cloud computing technology is both "fast" and "accurate", providing young students with search ports, push modes and customized services, which can achieve "power the precise point" in the field of education. With more than 10 million official accounts, Wechat involves information resources in political, economic, cultural, military, historical and other fields. Students can independently subscribe to educational content according to their interests, hobbies and knowledge background, conduct "order-by-order" cross-border learning and interest cultivation, and effectively meet the needs of personalized education. Conversely, educators can continuously enhance the pertinence and attractiveness of education by collecting and observing students' reading habits and preferences. Through analyzing and grasping students' ideological trends and spiritual needs, educator can timely adjust the direction of education and select high-quality resources. Basing on these strategies, the pertinence and attraction of education can be constantly enhanced.

1.3 Audience Segmentation Promotes Infiltration of Educational Environment

The diversification of young students' needs is evident because of the diversity of network information dissemination. The traditional "one-pot, full-house" education has become infeasible. Ideological-political education should pay more attention to multi-channel linkage, multi-form stereoscopic presentation, multi-angle contrastive voice, forming unified

requirements and personalized expression, political guidance and life infiltration, dominant publicity and irrigation. The network education environment is deeply integrated with the recessive implantation. Micro-communication brings high-quality media together, including official media such as "Xinhua News Agency", "Military Journal Reporter", "People's Daily", "Learning Powerful Country", and original media such as "Learning Group" and "Keeping pace with the Party". It can quickly build "information dissemination matrix", use "fission effect" to form a large-scale publicity boom and mainstream momentum, and thus help young people quickly locate their positions and find the right direction. Micro-communication innovation integrates a large number of media presentation technologies and thus can realize the packaging, coding, translation and transformation of information content, from simple text to combination of sound and painting, video embedding, animation and color painting, 3D simulation and so on. It endows the education form with more ability of penetrating and shocking which caters to the cognitive habits of young people, and can imperceptibly form spiritual infiltration.

1.4 Flattening Structure Promotes Interactive Sharing of Educational Ways

Micro-communication inherits the distinct characteristics of network decentralization and equality. Because of the low cost of use and low technology threshold, it gives the audience unprecedented strong network participation and voice rights. Successively, the flattening of information creation, transmission and diffusion structure are promoted, and thus it can promote the non-linear influence and connection between the audience to become more closely and smoothly. Micro-communication, with such a social characteristic, can eliminate the boundaries between the subject and object of Ideological-political education, making ideological interaction, confrontation of ideas and emotional contact more frequent and closer, which is conducive to further stimulating students' educational initiative and creativity. At present, the majority of young students have strong subjective consciousness, independent thinking ability, criticism and rebellious mentality. Through the establishment of "educational advice group", students are encouraged to freely comment and give suggestions on the contradictions existing in current education, which can break the traditional communication type of "you ask and I answer" and "proposition composition". With the help of interactive voice mode of micro-dissemination, the students can be promoted to move in the same direction with teachers.

2. The Development of Micro-communication in Ideological-political education in High schools is Moving Forward Forcefully

Only embracing the times can we create the future. Micro-communication has become the most widely spread, the largest audience and the most timely mode of communication. It is the result of the times and the inevitable trend for Ideological-political education to actively integrate and actively use micro-communication. In recent years, the media at all levels have set up official micro-blogs and Wechat official accounts, developed high-quality clients, and the new media communication matrix of Ideological-political education has thrived. All of these strategies have laid a solid foundation for the innovative development of Ideological-political education on campus.

2.1 High-Quality Official account Enhances Education Initiative Leadership greatly

In recent years, adhering to the construction goal of "stronger in politics, stronger in communication and stronger in influence", Party organizations at all levels attach great importance to the integration and development of traditional media and emerging media, and

actively "seize the beach" of mobile new media. "People's Daily", "Seeking Truth" and other central military organs and media official accounts have large audiences, strong information authority and clear political orientation. They are the mainstay and banner of political communication. In the "2008 National Party Newspaper Integration and Communication Index Report", the number of fans of "People's Daily" is the highest, exceeding 58 million. The average number of Weibo accounts in each party newspaper is 12 articles per day, with an average reading amount of 96,000 times per article, 20 times and 10 times as much as the average reading amount of Wechat and headline articles respectively, which has achieved good social repercussions. The official account of Wechat in the central newspaper has strong dissemination power, and some municipal Party reports are outstanding. 288 Party newspapers have launched Wechat Official account. The average number of articles read daily with Wechat is more than 100,000. The average number of articles read by 13 kinds of party newspapers, including 7 local and municipal Party newspapers, is more than 10,000. The original public slogans such as "Study Group" and "national feelings" have depth, sharpness and affection, sing for the great journey of national rejuvenation, and call for the fundamental interests of the people, and so on. These high-quality official accounts with distinct layers, precise service and deep grounding gas have jointly created the mainstream propaganda and communication matrix, which makes positive energy firmly occupy the main position of the network, and greatly enhance the initiative, pertinence and effectiveness of Ideological-political education.

2.2 Characteristic Client Effectively Stimulates Educational Innovative Performance

As an important carrier medium of micro-communication, mobile client is easier to enhance the user's stickiness to media content because it can not only push information precisely but also have the characteristics of rich function embedding, diversified forms of expression, concentrated interaction and participation. In recent years, the Central Propaganda Department and all levels of propaganda departments, high schools have launched "learning hegemony ideological and political" and "Learning·Power" and other smartphone dedicated clients, which integrates ideological education, theoretical learning, leisure and entertainment. A whirlwind of "ideological and political exclusive supply" has been blown up. Among them, "Learning·Power" is developed by the Research Institute of Ideological and Political Affairs of the Ministry of Propaganda and Publicity. It explores an organized, managed, guided and service learning mode to make learning more diverse, personalized, intelligent and convenient. These special clients taking "propaganda, connection, service, sharing" as their core functions, having controllable access security and strict authorization, can not only take the openness of the Internet and the systematic requirements of theoretical learning into account, but also effectively shield the influx of bad information. At the same time, the "second classroom" of Ideological-political education has been fully developed through opening up "authoritative think tank", "complete core database", "enrich cultural resource bank", and "Intelligent Learning Behavior Analysis System", Ideological-political education reporting the works of making the country rich and the military strong and, dialogizing major ideas and viewpoints, telling tales of inspiration and success, and observing the frontiers of scientific and technological development. Moreover, users can fully feel the influence of education because not only the description of words is cordial and exquisite, the picture matching is real and vivid, the video intervention is appropriate, original clips are short and films are vigorous and masculine, but also a large number of music, poetry, film and other forms of expression are assisted. Finally, participation willingness and innovation potential have been greatly released through setting up "moments" and "snap shoting" functions to encourage the publication of shared ideas, innovative, emotional pictures, opening message boards, discussion groups to have students communicate freely, education..

2.3 High-quality online courses enhance the penetrative influence of education continuously

With more and more mobile video live broadcasting room, open class client and MOOC platform being constructed, a new online video micro-course, which is situational and can support a variety of learning modes, has become popular. The micro-course is flexible. It transfers fragmented knowledge points within 5 to 10 minutes. At the same time, it has its own systematicness and coherence of theory. Therefore, it is easy for young students to read quickly and learn randomly. On the other hand, it can meet the educational needs of young students who prefers including teaching in entertainment and seeking new and innovative ideas due to its delicate design, vivid expression form and rich novel teaching content. Moreover, it can effectively promote the mass classroom construction because it is simple in creation and it is convenient for young students to display their talents and inspiration due to its multi-ways and embedding functions. At present, many high schools have launched "micro-class" and seized "micro-position", regularly uploading excellent lectures of experts, scholars and famous professors. The influence of micro-class has become more and more popular through displaying major themes in micro-form, express great principles in micro-expression, promoting and sharing excellent works on the whole network. many party schools and ideological and political research centers regularly conduct "micro-class" and carry out deep analyzing of hot spots, explaining of difficult points, guidance of key points, answering question to have the education to achieve "three or five minutes is not too short, three or five people are not too many". With students self-produced and updated learning micro-video, micro-animation, micro-broadcasting detonating the network from time to time, thumbs-up and on-demand rate being rising, micro-lessons have become a popular mode of education for young students.

3. Using Micro-communication to Seek New Breakthroughs in the Development of Ideological-political education

Micro-communication, as a cutting-edge network of the times, is the junction and excavation for the integration and innovation of Ideological-political education and information technology in the new round. Ideological-political education in school should grasp the general requirements of high moral values establishment and people cultivation, the new characteristics and new laws of network communication in the "micro-era". It should focus on the aspects of work design, platform development and operation system, and actively use micro-communication to promote education to achieve new breakthroughs, achieve new development and renew vitality.

3.1 Pay attention to strengthening scientific overall planning, accurate and effective top-level work design

Ideological-political education is the key course to fulfill the fundamental task of high moral values establishment and people cultivation. We should pay attention to scientific overall planning, precise promotion and optimizing top-level design. First, we should adhere to scientific research and judgment. The periodic analysis of educational situation should be focused. Aiming at the characteristics, rules and hotspots of network micro-dissemination, using decision-making and analysis systems such as big data and cloud computing, basing on systematic and scientific analysis such as algorithm matching and mathematical modeling, the educational situation, educational emphasis and educational benefits of micro-dissemination should be fully researched and judged so as to form a directive Analysis Report assisting series of Party committees in high schools on making planning decisions for the next step. Second, we should insist on being

leaded by problems. More attention should be paid to the study of the Party's classical theory, innovative theory and the origin, composition and development of the socialist ideology with Chinese characteristics in the new era of Xi Jinping. In the process of implementing micro-communication education, we should adhere to the dialectical unification relations of political and academic rationality, value and knowledge, constructiveness and criticism, theory and practice, unity and diversity, dominance and subjectivity, and indoctrination. We should strengthen the theoretical summary and research of Ideological-political education through micro-communication in order to make efforts to innovate and develop Marxism in the 21st century and contemporary China. Third, we should adhere to accurate integration. We must pay more attention on reasonable design of micro-communication education guidance system, scientific planning of work plan, full use of authoritative theoretical education resources for authoritative guidance, integration, careful exploration of the special demand and personality characteristics for different students (training categories, family environment, social experience, professional orientation). In view of special theoretical difficulties, social hot spots, students' doubts, the scientific and unified communication content system with precise construction of the times, ideological, and professional characteristics should be constructed to ensure that the Ideological-political education of micro-communication closely related to students' reality, the theoretical frontier, the pulse of the times, and constantly promote the reform and innovation of Ideological-political theory education.

3.2 Concentrate on building a comprehensive education platform with shared resources and powerful functions

In order to adapt to the new characteristics of communication mode and young students' reading habits in the network era, we should focus on creating micro-positions, using micro-means and realizing micro-expression. First, it is expected to enrich the micro-content. It should be focused on political guidance, ideological cultivation and cultural incentives, actively tapping the potential of red tradition, deducing tradition, eulogizing heroes, reproducing history, educating young students to follow the red blood. On the other hand, attentions also need be paid to calling for the brand of campus characteristics vigorously, displaying campus culture, College culture, dormitory culture, using real, three-dimensional and full-featured traditional culture to promote national feelings. Another efficient way is enthusiastically promoting the advanced models around us, putting vivid characters on the Internet and pushing the heroes around us will give birth to the sense of honor and responsibility of young students. Second, we should enrich micro-forms. We need to construct a system of theoretical learning and construct a large online classroom of independent learning, random learning and full-time learning to promote the dissemination of scientific theory on line. The micro-class creation activities should be regularly carried out to expand and strengthen micro-lectures, micro-reading, micro-video, micro-animation, micro-broadcasting and so on, and to incorporate teaching into entertainment. We ought to advocate "photographers" and "creators" in high schools to excavate cultural products and promote the digitized transformation of school history museum and the memorial hall so as to educate and inspire students with literature. Third, we should activate micro-practice. We need to carry out Micro-public welfare activities widely, such as "donation of funds", "public offerings", "patriotic expeditions", "online marathon", "off-campus fellowship activities" and other micro-activities, organize micro-discussions such as "security discussion", "my views on Sino-US trade war", issue micro-propaganda such as "peaceful creation", "civilized courtesy" and launch micro-competitions such as "learning star" and "the most beautiful party member" to deepen the quality of education with innovative and appropriate practical activities.

3.3 Formulate and perfect steady and vigorous normal system mechanism

Taking the long-term mechanism as the grasp, we should build strong talents teams, regularize operation supervision, strengthen incentive orientation, and constantly explore and enhance the micro-dissemination benefits of Ideological-political education in high schools. Firstly, we should set up talent training mechanism. President Xi pointed out that "the key to give a good ideological and political theory course lies in teachers, and full exploring their enthusiasm, initiative and creativity." We should strengthen the media literacy training of Ideological and political teachers, improve the ability of "micro-media" discourse communication, get the ability of using micro-communication to carry out Ideological-political education, and shape a group of spiritual watchers of network ships. On the other hand, the potential of young students' knowing network, loving network and being good at network should be fully explored, and the "red opinion leaders" and "self-media talent" campus must be well cultivated. At the same time, the controlling of new carriers and the using of new means should also be promoted through broadening the horizon of employment, exchanging and employing network media talents, and promote. Second, we need to improve the operational supervision mechanism. We must strengthen the leadership and guidance of Party committees at all levels on the micro-communication of Ideological-political education, complete the working system of Ideological-political education, enhance the network censorship and supervision of official micro-blog official accounts, campus self-Media and clients, implement the whole process of acquisition, editing and publication for the record so as to ensure the micro-communication with seriousness of politics, the purity of information content and the scientificity of operation system. Third, we should implement incentive mechanism of rewards and punishments. It is supposed to establish campus micro-communication media database, monitor user volume, click-through rate and activity real-time, evaluate content quality, original proportion, reprint scale, social effects and other indicators periodically, and qualify micro-communication effectiveness by ranking, direct voting, school evaluation, so as to achieve the goal of promoting construction by evaluation and promoting excellence by awards. Thus, the micro-dissemination of Ideological-political education can achieve tangible results.

Instructional Design for Collaborative Online International Learning using ZOOM and Smartphones: A case of an invited speaker from overseas

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Abstract: This study explores an effective instructional design for Collaborative Online International Learning (COIL) with which every teacher can implement when he/she wishes. COIL has high potential to enhance students' awareness of English as a Lingua Franca, and deepen their learning about the specific subject matter through presentation and discussion in English with students and a teacher from overseas.
This study was conducted in May 2019 in a media class at a Japanese university in Tokyo. To lower the restrictions from the cost and the formal learning environment, this study integrated ZOOM, free remote conferencing service using cloud computing, and smartphones, instead of school-owned desktop computers. In this way, this study stepped forward to lower the restrictions from the cost and school's educational environment. A media specialist in Open education was invited to give an online talk and interacted with the Japanese students for about one hour. After this, the class discussed online interactions learner-content, learner-learner, learner-teacher, learner-device, and learner-culture interaction. As a result, it is found that COIL is an effective instructional design to enhance students' understanding in a specific field and to enhance their motivation for learning as well as awareness of English as a Lingua Franca.

Key words: COIL, Distance learning, mobile learning, English as a Lingua Franca

INTRODUCTION

This study explores an effective instructional design for Collaborative Online International Learning (COIL) with which any teacher can implement when he/she wishes. COIL has high potential to enhance students' awareness of English as a Lingua Franca. Lingua Franca is a term to refer to "communication in English between speakers with different first languages" (Seidhofer,

2005). In addition to such awareness, the students can deepen their learning about the specific subject matter through presentation and discussion in English with students and/or a teacher overseas.

Distance education is defined as "the family of institutional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in contiguous teaching would be performed in the learner's presence, so that communication between the learner and the teacher must be facilitated by print, electronic, mechanical, or other devices" (Moore, 1973, p.664). COIL is a new form of distance education which fully adopt internet technologies to get over spatial and time barriers from traditional learning. Ministry of Education, Cultural, Sports, Science, and Technology in Japan gave grants for selected universities. Their aims are two folds. Firstly, they aim to strengthen the development of global human resources. Secondly, they aim to strengthen the globalization of education at the university level. As a result of their selection, six national universities, one prefectural university, two private universities were accepted as Type A project, and one private university as Type B project. Those lucky universities are Chiba University, Tokyo University, Tokyo University of Foreign Studies with International Christian University, Tokyo University of Arts, Kagoshima University, Ryukyu University, Osaka University, Sophia University with Ochanomizu University and the University of Shizuoka, Nanzan University, and Kansai University. These schools are expected to play leading roles to carry out COIL. However, these universities are just the tip of an iceberg of all universities. What we need is a COIL instructional design that we can carry out wherever we are.

There are some issues that the teachers need to solve before the implementation. First of all, they need to find the right partner for their physical classes. What this means is that they need to find a partner whose specialty fits the targeted area in the conventional class. Personality is also a fundamental issue, since COIL is designed and implemented based on mutual trust by two teachers who are physically taking apart. Moreover, ideally, the partner should better have sufficient experience in online teaching and learning, so that they can give a lecture or lead the online discussion comfortably with the students in a conventional classroom. They also need to be able to use English as a Lingua Franca, since English is a common communication tool. Another issue is the time difference. Since the time for the physical class is already fixed, teachers need to work out without much flexibility of scheduling. Finally, the cost is also important, since most teachers carry out COIL without financial support from a school, or the government.

To solve some of these potential problems, this study used smartphones and ZOOM, a free remote conferencing service using cloud computing, instead of a non-portable video conferencing system and encouraged the students to use their smartphones instead of school-owned desktop computers. According to the Ministry of Internal Affairs and Communications (2017), the ownership of smartphones records as much as personal computers; both of the devices are owned by approximately 70% of Japanese households. Also, there is a tendency that the ownership of smartphones has been rising, though that of personal computers was declining in 2016. It is a popular device among Japanese university students, and most of them bring it to school. Thus, it can be a good option to integrate when we design COIL, not depending on school-owned desktop computers. Regarding ZOOM, the participants can join the online learning without exchanging personal information, as is the case for Skype. They only have to click the URL which is delivered by the host or type in the number for the ZOOM meeting to join the online meeting. As another big advantage of ZOOM is that the participants can use both

personal computers and mobile devices such as smartphones or tablet computers. Quality of voice and video are very clear during the online meeting (Okumura, 2018). The cost is for free if the host does not add additional options.

Regarding the instructional design for the COIL, there are mainly two types. One is a traditional teacher-centered instructional design, and the other is a learner-centered instructional design. With the former type, a teacher gives an online lecture from abroad, and he/she interacts with the learners in another country. Anzai, the first author, implemented an online international exchange with a professor in Malaysia. She used Skype as a conferencing tool, and school owed desktop computers. At another occasion in 2018, Anzai (2018) conducted COIL experiment in a laboratory setting, where two Australian students joined in her experiment, and ZOOM was used at the first time in her study as an application for Web conferencing system. A second type is a form of Active Learning based on Social Constructivism. The students make presentations or discussion with the students overseas, and it is assumed that the students will deepen their understanding through these activities. She collaborated with a teacher at a private university in the US. The Japanese students were studying media communication, and the students in the US were studying Japanese. The Japanese students made a presentation and discussed with them. ZOOM was used as the Web conferencing system.

After a series of studies, the authors in this study conducted COIL aiming to find out an effective instructional design for COIL which every teacher can implement when he/wish wishes. It is expected that COIL has high potential to enhance students' awareness of English as a Lingua Franca, EFL. It is also expected that it will deepen their learning about the specific subject matter through presentations and discussion with a teacher and learners from overseas.

METHODS

The COIL was conducted in May 2019 in Tokyo, Japan. It was in a relatively small class. There were ten students on the day of the COIL. There were seven Japanese students and three international students who came from China, USA, and Malaysia. Most of the Japanese students have experience of living in English speaking countries. Thus, they do not have much trouble communicating in English. The purpose of this class was to study Media communication by learning about Open education. Regarding the syllabus of this class, first, the students studied the main features of Open education. Then, they learned about Massive Open Online Courses as a new form of Open education. To deepen their understanding of MOOCs and Open education from a global perspective, a professor who specialized in MOOCs and Open education was invited to the class from Malaysia, using ZOOM. After this Web conference, the students developed their projects about MOOCs and Open education.

To realize the COIL environment, special care was given to the selection of the invited speaker and devices for the Web conferencing. Both Japanese and Malaysian professors specialized in educational technology and had done extensive research in Open education and MOOCs. All of the participants, both teachers, and the students, used English as a Lingua Franca. Most of the students are either returnees or international students, so that they did not have difficulty to communicate in English. A CALL was used for this class, so each student was equipped with with a desktop computer, but it did not attach a camera, so their smartphones are encouraged to use for the COIL.

The result of this paper is based on the discussion with the students. The first section centered

around interaction (Moore & Kearsley, 1996). The students' reflections were analyzed in term of Moore's three kinds of interactions (Moore, 1973): learner – learners interaction, learner-content interaction, and learner-teacher interaction. Also, Anzai's two dimensions: learner–device, and learner–culture interaction were included. The second parts of this study concerned with the students' perception of the COIL to enhance EFL proficiency, the specialized field, and the perception of amrtphone as a device for COIL.

RESULTS and DISCUSSION

Interaction

The students and professor's reflections were analyzed qualitatively in terms of Moore's three kinds of interaction, and Anzai's interaction.

1. learner-learner interaction

There were mainly two kinds of opinions. One side said that learner could help each other when she could not hear the professor well due to some problem with Internet connections. On the other hand, there was a student who pointed out that there was no communication between the learners.

Below are some examples of the students' reflections.

- There was interaction between me and my friends who were sitting in the same group. We helped each other when we could not fully understand what the teacher was saying since it was online, and sometimes it was hard to hear.
- There was no learner-learner interaction. In my opinion, it is very difficult for learners to interact with other learners online. This is because while teachers are talking, other learners cannot communicate each other if it is online.

2. learner-teacher interaction

There was good quality of learner-teacher interaction. The invited speaker encouraged the students to speak up their opinion, and the Japanese professor also supported the atmosphere of positive participation in the discussion. These are some examples from the comments from the students.

- The professor's interaction with us was great. She asked us about our opinions and what we would like to know more about MOOCs.

3. leaner-content interaction

The invited speaker requested to distribute her PowerPoint slides in advance, so that the students could learn more about the subject matter, though we did not share the screen of the computer nor smartphones synchronously online. The slides were very helpful to enhance the students' understanding of the subject matter. Below is an example of the students' reflection.

- While I was listening to the professor's talk, I did some research about MOOC on the internet to get more information besides the slides she distributed.

4. learner-device interaction

Smartphones are handy, and all students always carry, so there was not anything to prepare to establish the learning environment. ZOOM is a user-friendly application, and they used it smoothly without much explanation. Since the internet condition was not very good on that day, there were students who used school owned desktop computers which do not have cameras. They thought that they can reduce the burden to the Internet by using only audio data. They reported that they should have shown up on the screen to have better communication with the professor. Below are examples of the students' reflection.

- I used a computer to listen to the talk, but since I did not have video function with that computer, I could not show my face to the teacher while talking. If I could show my face, that would be better to interact with the teacher.
- The network was not good, so it was sometimes hard to listen to others' opinion.

5. learner-culture interaction

According to the students' reflection, much of learner-culture interaction came from language. It seems that there were sometimes difficulties in understanding what each other was saying since both sides were using English as a Lingua Franca, beside the internet connection was sometimes cut off. However, this is a very important part of our learning because in the real world, English is used as a Lingua Franca and the communication situation is not always perfect. These aspects should be experienced and understood by the Japanese students. Other than the language, there seemed not much learner-culture interaction. This is partly explained that all the participants have international experience, so that cultural gap did not become a big issue.

To summarize, interaction can be illustrated, as shown in Fig. 1. , using a network analysis. These two-way arrows indicated mutual interactions (Kadushin, 2012). As is described, two central nodes are two teachers in Japan and Malaysia. They interacted frequently, to proceed the online session. The nodes surrounded them are the students. As the arrows indicate, there were active interactions between teacher-teacher and learner-teacher. This teacher-centered approach worked well, especially when there was important knowledge teachers wanted to share with the students. At the same time, it should be noted that learner-centered vs. instructor-centered, or constructivist vs. behaviorist approaches to teaching and learning are not mutually exclusive. The choice is not selecting one over the other, but how much emphasis on putting on one design criterion for an induvial learner at each point in time (Saba & Sheare, 2018).

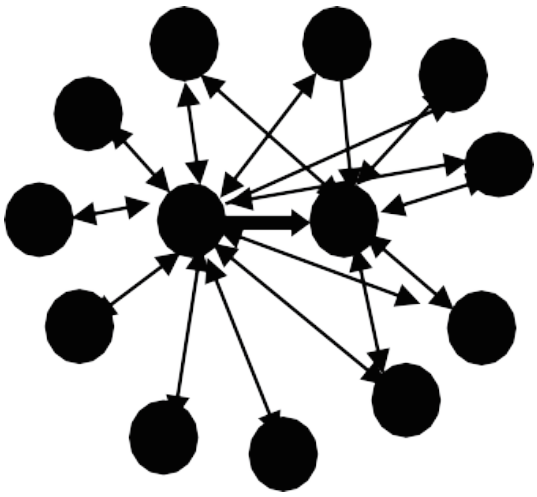


Fig. 1. Interaction of a teacher-centered COIL

Students' perception of COIL: English as a Lingua Franca (ELF) proficiency

The first part of the second section concerned with the students' perception of the COIL with a view of enhancement ELF proficiency. They perceived that the teacher's centered COIL would enhance their listening skills but not speaking skills. There were also some students who perceived that COIL would help improve their English by listening to English which is spoken by people around the world. Thus, teachers should clearly explain that the situation of World Englishes where a larger number of the population uses English as a second or as a foreign language than those who use English as native speakers. This global learning is a wonderful opportunity to recognize this fact. Besides, the technical problem of howling should be much resolved for the next online learning. Below is an example of the students' comments.

- It would help me improve my English, especially listening. This is because there are so many teachers or professors who are from America at our university. However, by using online learning, I can listen to English which is spoken by people all over the world.

Students' perception of COIL: Specialized field

The second part of the second section concerned with the enhanced knowledge about a specialized field. This is one of the strongest advantages of COIL, since we can invite specialists from around the world. We do not have to limit our learning within a walled classroom. Below are some examples of the students' comments.

- The students need to have a certain level of language proficiency. In my case, I am confident in English, so it was a good opportunity to learn about MOOCs.
- Through COIL, we can learn the subject from various teachers in diverse countries, so that we can widen our perspectives.

Students' perception of COIL: Smartphones

The third part of this section concerned with smartphone usage in COIL. We all agreed that using smartphones is a good, convenient way to conduct COL, and the students were fascinated by transcending space by using their daily device. One disadvantage of the smartphone was the screen size, which is relatively small. However, when we want to use the device which everyone has at hand, this option is too hard to deny. Below are some examples of the students' comments.

- Although sounds were sometimes howling, and it was hard to hear what the professor said, I had a great opportunity to learn about MOOCs. A few decades ago, it was impossible to communicate with professors from different countries. However, the Internet allowed us to take their class no matter where the professors and we are. As long as we can understand English to a certain extent, COIL will be great learning way for us to study new thing and learn things deeply.
- I think a smartphone is a wonderful tool for Collaborative Online International Learning. It is very lightweight, long-lasting battery life and easy access to the internet connection can help facilitate virtual learning anytime and anywhere.

CONCLUSION

In summary, it is found that COIL is an effective instructional design to enhance students' understanding in a specific field and to enhance their motivation for learning as well as

awareness of English as a Lingua Franca. There is an extended nature of community in online learning. By integrating Web technologies, a traditional classroom can extend, expand the planetary community where learners can join, interact, and collaborate (Anzai, 2011). To fully understand the effects on learners' perceptions and learning outcomes through COIL, further qualitative and quantitative studies are definitively needed.

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Research on the Construction of Public Emotional Model of Educational Public Opinion in Social Media

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Abstract: Education public opinion is the sum of emotions, attitudes, opinions and behavioral tendencies that people have in various historical events, educational phenomena, or educational problems. In order to grasp the public's concern and attitude, and to find the development trend of public opinion in the field of education. Our research based on the most influential social media platform in China—Sina Weibo. The purpose is to construct the public sentiment model and the guidance measures of the education public opinion. The SVM, K-NN, DT and NB algorithms are used to construct the public sentiment model. Finally, we constructed a hierarchical sentiment analysis model based on SVM.

Key words: education public opinion; machine learning; natural language processing

INTRODUCTION

Social media which has developed with Web2.0 not only broadens people's horizon but also provides a space for free expression of personal emotions. According to the authoritative statistics of China Internet Network Information Center (CNNIC), by the end of 2018, the number of Weibo users accounted for 42.3%1* of all netizens. Through social media, people may learn about events happening around them anywhere anytime, follow their favorite stars and express their feelings. They may forward hot events on Weibo and participate in discussions to air their own opinions and show where they stand. Therefore, timely understanding social public attitudes towards specific events and clearing public doubts accordingly are of great significance to dealing with emergencies.

Some scholars defined sentiment as the attitudes and emotions held for a certain event within specific time and space. Regards to education sentiment, some Chinese scholars described that it's the sum of varied emotions, attitudes and opinions communicated on the internet by network

* China Internet Network Information Center. The 43rd China Statistical Report on Internet Development.

users regarding intermediary education matters such as education events, education phenomena, education behaviors and education policies (ZUO Mingzhang et al,2011). Sentiment analysis on social media has become one of the research hotspots while emotion analysis constitutes a vital part of sentiment analysis. However, few studies on education sentiment analysis in social media have been conducted, leaving a blank to fill in. Meanwhile, hot events in the education field often produce great influences in social media, such as the academic cheating exposed in the early 2019 which triggered heated discussions on social media such as Weibo with hundreds of millions of times. This paper illustrates an hierarchical approach to classification of education sentiment and emotions combining the latest event of campus violence in a university.

RELATED WORK

1.1 Sentiment Analysis

At present, research methods of sentiment analysis include two forms: first, emotion dictionary and rules are combined to classify emotions pursuant to the number of positive words and negative words in the text; second, machine learning is adopted. Some characteristics of the text are chosen to indicate the training set and the testing set. Then, classifiers such as Na.ve Bayes, maximum entropy and support vector machine are used to classify emotions (XIE Lixing et al,2012).

Satisfying progress has been made in the emotion analysis of Weibo sentiment in English. Some Researcher found out network users emotional attitudes towards events through their analysis of Weibo texts on a large scale. Paltoglou et al (2012)used unsupervised approach to conduct sentiment analysis in social media such as Twitter, divided the text into subjective and objective parts, and carried out a classification research on the positive and negative emotional polarity of the text.

Besides, studies on public emotion analysis in Chinese Weibo sentiment analysis were started quite late but so far, significant results have been achieved: Li Yan et al(2013) improved TF-IDF to solve the problem caused by sparse key words, and meanwhile conducted sentiment analysis of hot topics based on the word cutting method of emotion dictionary. Zhao Xiaohang(2016) obtained the Weibo text of the Tianjin explosion incident for emotion analysis by expanding negative emotional terms in 30 fields from four dimensions and building the emotion analysis dictionary based on the emotion vocabulary of Dalian University of Technology.

1.2 Hierarchical Classification in Emotion Analysis

Currently, the majority of emotion classifications focus on binary classification (positive and negative) or triple classification (positive, neutral and negative), and most emotion analysis methods are based on flat classification. For education sentiment incidents, it's found in our analysis that the problem of extremely imbalanced emotional tendency existed. For instance, in the incident of this study, the number of negative emotions is overly high while the positive and neutral texts fall short. The application of flat classification cannot help increase the accuracy of the model.

So far, some researchers have proposed to enhance the accuracy of sentiment analysis in Chinese social media in an hierarchical manner. LIU Baoqin et al(2015) put forward a Na.ve Bayes based multilayer emotion analysis approach according to Ekman's classification of six

basic emotions, and showed in the experiment that the accuracy of such approach increased to some extent compared with traditional flat classification. XIE Lixing et al(2012) adopted the emoticon-based rule method, the emotion dictionary rule method and the emotion analysis method based on hierarchical SVM structure in their study and realized that the approach based on hierarchi8cal SVM has greater accuracy. HE Yue et al. collected the Weibo blogs regarding Beijing smog in 2015 and constructed a two-layer classifier based on Na.ve Bayes for emotion analysis of the text.

1.3 Sentiment and Emotion Analysis Framework

This paper put forward a processing framework for sentiment and emotion analysis, as shown in Fig. 1. The input of the framework is Weibo text which goes through preprocessing, word embedding and classifier, and finally the classification results are output.

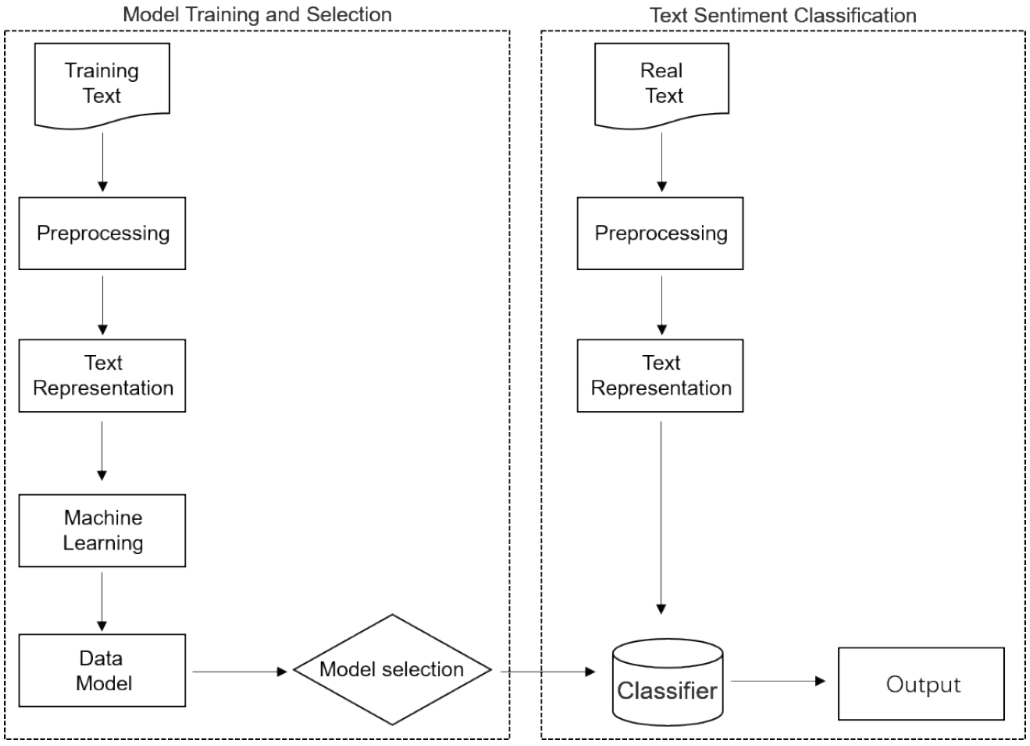


Fig. 1 Processing Framework for Sentiment Analysis

1.3.1 Preprocessing

The preprocessing stage includes noise text cleaning, word cutting and removal of stop words.

In blogs posted on Weibo which is different from the official text, people may add hashtags, emoticons and forward according to their needs. Therefore, if Weibo texts are adopted without processing, the accuracy of the text classification will be inevitably weakened. Hence, the first step of the preprocessing is to remove these noises, including URL and hashtags in the blogs (such as #校园欺凌#) and mention a blogger (such as @晋中公安), etc. This paper used regular expression to match related contents and delete the results, such as re.sub("\#([\S\s]*?)\#","",txt) which can delete all hashtags.

One of the differences between Chinese and English is that there's no spacing between words

in the Chinese text. Therefore, after text cleaning, word cutting needs to be carried out. We tested two popular word cutting tools (Python environment): pynlpir and pkuseg, and found that the word cutting effect of the former on Weibo text is not as desirable as that of the latter. For example, important words such as "Weibo", "hot search" and "bully" cannot be correctly cut in pynlpir. Yet, pkuseg offered a Weibo word cutting model which was trained on the basis of Weibo text, which means it is more accurate in word cutting. Its disadvantage is that its word cutting speed is slow on our operating system (Windows 10). The developer concluded in the tool file that it's caused by the defects of Python language. Given limited budget, eventually we chose pynlpir as the word cutting tool. As for the inaccuracy of word cutting, we built a word cutting dictionary on our own which contains 43 sentiment words, as shown in Fig. 2. In light of stop words, we referred to the public stop word table, including punctuations and prepositions (such as "这", "是" and "那"). In addition, we analyzed the collected text and supplemented universal words that did not exist in the original dictionary such as "tab space" so as to increase the accuracy of removing stop words.

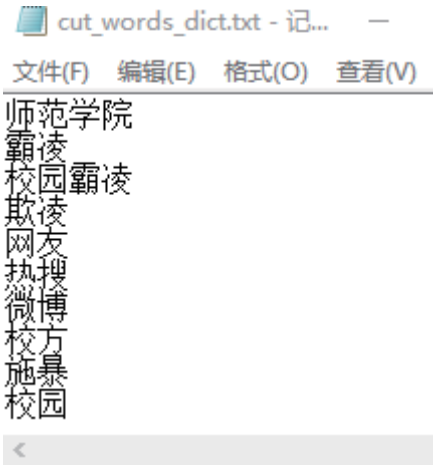


Fig. 2 Self-Built Word Cutting Dictionary

1.3.2 Test Representation

Word embedding refers to conversion of the text into something that can be understood by computers. The current calculation methods for word embedding include Bag of Words and Word2Vector, etc. The former is a convenient word embedding approach but it only focuses on whether some words exist in the document but ignores the relationship between words. For instance, there's an immense difference between the meanings of "白猫抓住老鼠"(the white cat catches the mouse) and "老鼠抓住白猫"(the mouse catches the white cat). Nonetheless, Bag of Words regards them as the same meaning. Despite such problem, it performs well in classification of junk mails. In 2013, Google came up with an open source tool, that is, Word2Vector(Mikolov,2013) which can be trained on large-scale datasets, and the trained word embedding (model) can well measure the similarity between words. The algorithm behind the tool is a kind of superficial layer neural network, with two models of CBOW and Skip-Gram being provided. The input of the CBOW model training is the word embedding corresponding to words related with a specific feature word, and the output is the word embedding of the specific word, as shown in the right part of Fig. 2. The input of the Skip-Gram model is the word embedding of a specific word while the output is the word embedding of the context corresponding to the specific word, which is displayed in the left part of Fig. 2. In terms of application, CBOW is more suitable for a small quantity of datasets while Skip-Gram

demonstrates excellent performance in large-scale datasets. The Weibo corpus disclosed on the interest is adopted for the word embedding training in this study, being 120,000 (60,000 logs for positive and negative respectively), and Skip-Gram is selected for the training model.

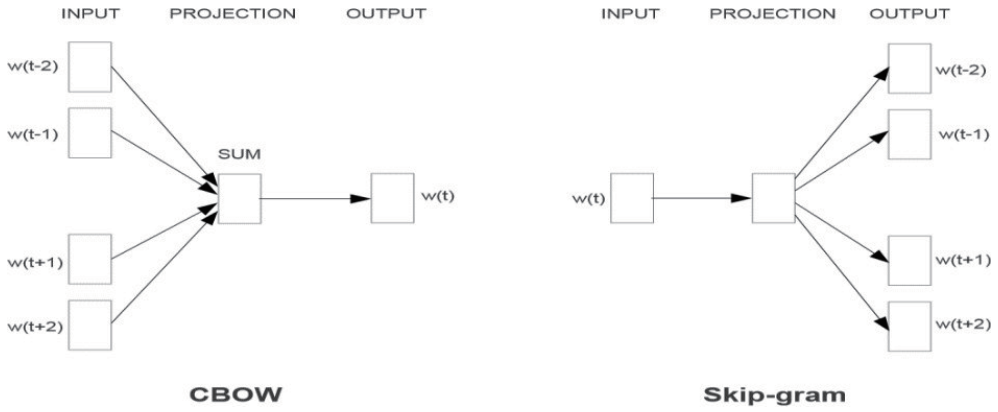


Fig. 2 Two Models of Word2Vector

1.3.3 Classifier

Text classifier is the classification function or a model learned through training based on certain text dataset. Such classifier can project the given text in one of the given classes. The training data used in this study derives from Sina Weibo, being classified with manual labeling.

1.4 Hierarchical Structure of Emotion

The emotion analysis model set up in this paper is shown in Fig. 3, including two layers: the first layer is about judgment of subjective and objective tendencies; the second layer is about the judgment of subjective tendencies.

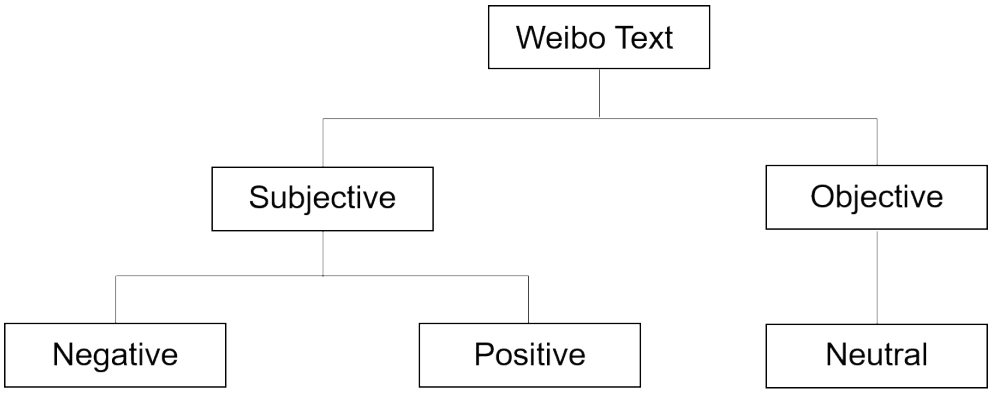


Fig.3 Hierarchical Sentiment Emotion Analysis Model

Through analysis of the collected text, it's found that there are a great number of news reports of the campus bully incident or blogs that forward such news reports. Some blogs just describe the incident and some popularize related legal knowledge, such as " 'Giving insulting nickname is also bullying! And violators of laws in universities should be severely published!' Campus bully incidents have been frequent in recent years and how much do you know about it? No matter what your age is, if you suffer from campus bully, you should stand up to it and timely report

it to the police! The law will support you!!! Click ↓↓ @Jinzhong Public Securities @ Shanxi Public Securities"（【"起侮辱性绰号"也属欺凌！严惩涉校违法犯罪！】近年校园欺凌事件时有发生，对于校园欺凌你了解多少？不管哪个年龄阶段，如果遭受校园欺凌，应该勇敢站出来，及时报警！法律给你撑腰！！！戳↓↓@晋中公安@山西公安）. This kind of blog does not show emotional tendency so it's an objective text. Meanwhile, some blogs take advantage of the heat of the topic in their publicity, such as "#campus violence# the embedded multi-grid bookcase with the door frame design effectively utilizes the space. The living room is the busiest area where friends can gather together. The spacious sofa is just prepared for them. In spare time, you may read, listen to music and talk about it in the living room, and the quiet home suddenly becomes lively."(#校园暴力#门边设计的嵌入式多格式书柜有效的利用了空间。客厅是小伙伴们聚会最热闹的区域，宽敞的沙发就是为他们准备的。闲时呼朋唤友，聚在大齐的客厅里，看书听歌，聊音乐，平时安静的家便热闹了起来.) Riloff et al(2003) pointed out that objective text would cause disturbance in the emotion analysis process so subjective and objective texts should be classified. In this field, quite a few Chinese scholars have conducted studies. Li et al(2011) proposed an approach of sentiment and non-sentiment classification by collaborative online learning. YANG Wu et al(2013) extracted the subjective and objective clue features of the Weibo text, and explored the best way of selection in the 2-POS model. In the end, with feature words, subjective & objective clues as semantic features, and the 2-POS model as the grammatical feature, they employed Na.ve Bayes classifier to
respectively study their influences on the classification results. Texts which expound facts are deemed as objective texts in this paper, such as news reports, popularization of legal knowledge and advertising publicity. The emotional state of objective texts is defined as neutral.
Subjective texts are divided into positive and negative. Analysis of the texts We found that negative emotions such as: "笑死我了，什么垃圾学校"; positive emotions such as: "加油，把搜索顶起来" and so on. The subjective and objective text is more conducive to us to understand the public's emotional state of hot events.

1.5 Analysis Method

We will build a model for each layer by selecting different algorithms, and finally select the best model through the evaluation strategy. Specific algorithms include: SVM, KNN, DT, NB.

METHODS & RESULT

2.1 Experimental Data

We selected Sina Weibo blogs related to the campus bully incident which were then classified by five students. For the sake of preciseness, two students were assigned to compare them and single out texts with the same classification results as the corpus of this study. The corpus was classified into four types, that is, subjective, objective, positive and negative in which the objective text is regarded as neutral.1485 logs are completed, and the specific logs for each type are listed in Table 1 below.

Table 1 Statistics on Varied Types of Text

Text Type	Subjective	Objective	Positive	Negative	Total
Number	365	333	352	433	1485

2.2 Experimental Evaluation

We use the following strategy evaluation model include the precision P, the recall rate R and F-Score.

Precision P suggests the proportion of correctly classified samples in the samples in which the classifier is labeled as positive (the first layer in this paper indicates subjective emotion and the second layer represents positive emotion), as shown in Formula 1.

$$P = \frac{TP}{TP + FP} \quad (1)$$

The recall rate is a measurement of coverage, that is, how many samples are reckoned as positive, which is listed in Formula 2.

$$R = \frac{TP}{TP + FN} \quad (2)$$

F-Score is designed to solve the contradiction between the precision and the recall rate, as displayed in Formula 3 where β is used to measure the importance of P and F. When β=1, it means P and F are equally important; when β<1, P is more important than F; when β>1, F is more important. Here, we assume that β is equal to 1, meaning that P and F are equally important.

$$\text{F-Score} = (1+\beta^2) \times \frac{P \times R}{(\beta^2 \times P) + R} \quad (3)$$

2.3 Model Selection

The two-layer model we constructed first evaluates each layer separately, and evaluates the SVM, KNN, DT, and NB algorithms respectively. Using the model evaluation mechanism described above, F-Score is used as the final evaluation method. The specific data is shown in the following two tables, SVM performs better in both levels. So we chose SVM algorithm to build a Hierarchical SVM model for Sentiment Analysis.

Table2 First Level Result

	Precision				Recall				F-Score			
	SVM	NB	KNN	DT	SVM	NB	KNN	DT	SVM	NB	KNN	DT
Objective	0.72	0.67	0.64	0.59	0.72	0.73	0.77	0.72	**0.72**	0.70	0.70	0.65
Subjective	0.79	0.79	0.80	0.75	0.79	0.74	0.69	0.63	**0.79**	0.76	0.74	0.69

Table3 Second Level Result

	Precision				Recall				F-Score			
	SVM	NB	KNN	DT	SVM	NB	KNN	DT	SVM	NB	KNN	DT
Negative	0.79	0.71	0.70	0.73	0.71	0.69	0.74	0.74	**0.74**	0.70	0.72	0.73
Positive	0.63	0.57	0.58	0.61	0.72	0.58	0.54	0.59	**0.67**	0.57	0.56	0.60

2.4 Hierarchical SVM Model for Sentiment Analysis

Through experiments, we find that SVM has better performance in both levels, so we construct a

hierarchical SVM algorithm for lyric emotion prediction(Algorithm 1).

Algorithm 1. Hierarchical SVM model for Sentiment Analysis

```
Input:
Doc=(file)
Output:
Sentiment Classification Result : Sentpredict
1: Docvec = Word Embedding (Doc)
2: CLF_1, CLF_2 = load SVM model ('SVM_1.model', 'SVM_2.model')
3: result_1, result_2 = Predict results using SVM_1.model and SVM_2.model
4: for i=0,i< len(result_1):
5:     if result_1[i] = objective:
6:             Sentpredict[i] = objective
7:       else:
8:           if result_2[i]=positive:
9:               Sentpredict[i] = positive
10:          else:
11:              Sentpredict[i] =negative
12:end for
13: return Sentpredict
```

According to the model we constructed, 109 microblog texts were randomly selected for prediction, and the prediction results were submitted to the manual for evaluation. 62% of the classification results were the same as the manual evaluation classification results, which indicates that the proposed algorithm has certain effect on sentiment classification. .

CONCLUSION & FUTURE WORK

Because the person which labeling the text have certain subjectivity emotion, the text labeling cannot be accurately discriminated. Although it has been selected many times, it cannot guarantee that the corpus is perfect. At the same time, since the Weibo text may contain multiple emotional attitudes at the same time, the classification we make is Just classify one text as an emotional state. Also the corpus of this paper comes from Weibo blogs about the campus bullying incident. The trained model is not generalized enough for other sentiment and emotion analyses in the education field. In the future, more sentiment texts regarding education will be trained to enhance the generalization capability of the model.

Being enlightened by the practice of school to timely clarify facts and reduce the number of texts conveying negative emotions on the internet by denying rumors, next, we will combine the epidemic model to study the spread of education public opinion information on social media.

ACKNOWLEDGEMENTS

We would like to extend our sincere gratitude to postgraduates Man Zhimin, Song Yuying, Qiu Furong and Hao Qing, who major in Modern education technology, Tianjin Normal University, and undergraduate Fang Beibei in class of 1805, Ge Huixin in class of 1705 for their contribution to text labeling.

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The Theoretical Framework for Teachers' Media and Information Literacy

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Abstract: Media and information literacy (MIL) is one of the most important competences of the digital citizens, plays a vital role in their digital lives. In the media and information literacy education in school, teachers act as instructor and guide student to master the skills of MIL, so it is necessary to improve teachers' media and information literacy. From the perspective of teachers, this paper aims to set up a framework of MIL to investigate teachers' MIL. Based on the proposed indicators, such as 'Global Media and Information Literacy Assessment Framework', which was published by UNESCO in 2013, a theoretical framework was established subsequently in this research. However, a 4-dimension 7-element model (MIL consciousness, MIL cognition, MIL competences, MIL ethic) was expected to evaluate teachers' MIL, and this model can also support the further empirical research on MIL.

Key words: Media and information literacy (MIL), teachers, 4-dimension 7-element Model

INTRODUCTION

With the continuous maturity and development of media technology in the digital age, emerging media, mainly digital networks and new media, have begun to sprout and flourish. The cyberspace has been continuously expanded. Although "the network has no scale", "human beings are literate." Correctly handling the relationship between media information and people and society is a must for citizens in the era of media integration. This is also internationally. A consensus reached. A learning society where everyone learns, can learn everywhere, and learns from time to time, needs to cultivate the media and information literacy of citizens (learners) to promote the networking, digitization, personalization and lifelong learning of learners. As an educator, teachers should walk in front of the trend of the times, actively adapt to the era of media integration, and enhance the ability of media and information literacy.

Why do teachers need to improve media and information literacy? On the one hand, teachers

themselves need to have certain media and information literacy, which can measure their media and information literacy ability, so that teachers can carry out daily teaching reflection to promote their progress and development effectively (Felini, 2014); Teachers also play a role in teaching and educating people. They should have the relevant teaching knowledge and teaching ability to enhance students' media and information literacy, thus promoting the development of student media and information literacy (Hobbs, 2010).

Related Concept Evolution

Media and information literacy is a complex concept. Its production is based on the development of media literacy and information literacy. It is a dynamic and developmental concept that constantly injects new connotations with the changes of the times. The development of media and information literacy has evolved over a long period of time. Before the concept of media and information literacy was clearly defined by UNESCO, there were two branches of information literacy and media literacy.

1. The concept of "media literacy" was first proposed in 1933 by the British scholar Levis and his student Dennis Sampson in the cultural criticism book "Critique of Cultural and Environmental Cognition", due to the diversity of concepts and the medium of concept. The diversity of the goals of literacy education has not yet formed a unified definition. Media literacy includes the ability to acquire, understand, and create (Buckingham, 2005); refinement into five capabilities: acquisition, action, analysis, etc. (Hobbs, 2010); and Chinese scholars generally believe that media literacy is contact, cognition, participation, and the ability to use the media.

2. Information literacy was originally derived from library information retrieval. In 1974, it was first proposed by P. Zurkowski of the United States, referring to the use of information tools and major information sources to solve problems. UNESCO believes that information literacy is the ability to identify, find, evaluate, organize and effectively produce, use and exchange information and solve problems (UNESCO, 2005). Domestic scholars generally agree that information literacy is the ability to use a variety of information tools, especially multimedia and network technology tools, to identify, acquire, evaluate, apply, integrate and create information to achieve a specific purpose.

3. Media and information literacy is based on media literacy and information literacy, and has become a literacy through the development of the times. UNESCO defines media and information literacy as the ability to use a variety of tools to capture, retrieve, understand, evaluate, use, create and share information and media content in all forms of carrier, critical, ethical and effective ways, the ability to participate in personal, professional and social action (UNESCO, 2013). The concept of this definition focuses on the initiative of the audience, emphasizes the broad participation of the audience, promotes the promotion of citizens' media and information literacy, and can be seen that it has the cultural and social significance of media and information.

With its powerful digital processing technology and network interaction technology, the new media has created a new media landscape and cultural form. The traditional media literacy with the core of critical consciousness has been difficult to adapt to the public's survival needs in the information environment. Participatory culture and the formation of a communicative society

puts higher demands on the media literacy of the public.
Some scholars believe that media literacy and information literacy are intertwined at the level of "device" and "dao", forming a dialectical unity of "dao" and "device". Information literacy has experienced the development of “device” and “Tao”, while media literacy has been expanded horizontally from the “Tao” level, while gradually strengthening the research on “Device” itself. The trend of integration is obviously, and education is proposed. Technology as a fulcrum to build a bridge between media literacy and information literacy.

Related and Theoretical Literacy Concept

Media literacy and its related theories are influenced by many factors such as culture and media environment. There are great differences in culture, geography, audience and so on. Different scholars are based on different media literacy theories and different research groups. On this basis, there are many different theoretical framework models related to media literacy.
In foreign countries, media literacy development has undergone four paradigm shifts: immunization, screening, critique, and empowerment (J. Lewis & S. Jhally, 1998). The representative theoretical frameworks are: the conceptual framework of media literacy personal ability proposed by the European Union in 2011; the three cornerstones of media literacy cognition proposed by James Potter (2004), namely, personal positioning, knowledge structure and skill tools; On the basis of predecessors, three modes of media literacy are proposed, namely, ability mode, knowledge mode and understanding mode.
Domestic research on media literacy started late. According to the collection results of the literature, in 1994, the Chinese Academy of Social Sciences Institute of Journalism Xia Shangzhou’s "China needs ‘media literacy’ " introduced "media literacy" to China for the first time, then 1997 The research on the significance, content and methods of media education published by Prof. Bu Wei in the first issue of Modern Communication marks the beginning of the study of media literacy education in China. Since then, media literacy has begun to receive extensive attention from domestic experts and universities. Domestic scholars have absorbed and extended the concept and paradigm of foreign media literacy research, and began to “localize” innovation in the theory of (Wang Fan, 2007; Zhang Shuyu, 2010); New media literacy research, caused by the development of new media technology after entering the 21st century (Wang Tiande, 2011); Media Literacy Tower (Lu Feng , 2017), media and information literacy research (Lu Hao, 2013; Wu Shujuan, 2016) and so on.

Teacher's Media and Information Literacy Framework

The researchers stressed the need for empirical research and measurement of media literacy in education. Hobbes (2010) encouraged the research community to develop meaningful tests for new teachers to measure their ability to implement digital and media literacy teaching practices in their curriculum. In doing so, she emphasized the importance of tools to measure teachers' abilities in media literacy.

Considering the continuous and rapid developments in the field, competencies were formulated to be as timeless and generic as possible. However, the competencies were clustered based on their thematic similarities, which resulted in three clusters: using media; understanding media; and contributing media (Driesen et al. 2014; Meeus et al. 2014b). These clusters of competencies can generally be found in competency models for media education (Tiede et al. 2015). For example, there is a table 1 that displays a systematic framework of criteria and indicators of

quality for MLE in Italian elementary schools (Felini, 2014).

Table 1 Systematic framework of criteria and indicators of quality for MLE in Italian elementary schools

Criteria of quality	Sub-criteria (areas of investigation)
a) Teaching methods	Methods and techniques used in working with students
b) Actors	Centrality of children
	Teachers' training
	School/family relationship
	Involvement of media professionals
c) Organization	Structuring of the MLE course
	Use of equipment
	Documentation and dissemination of results
d) Underlying MLE theories	Awareness of the goals of the activity
	MLE concept
e) Originality	Originality of the MLE activity and its contents
	Originality of the media message produced by students during the activity
	Originality of the teaching methods

Although media and information literacy have many benefits for students in today's digital society, the lack of teachers' preparation for teaching media and information literacy skills suggests that there is a gap between students' social rationality that is a media literacy and sustainable preparation for teachers (Sarah Gretter, Aman Yadav, 2018).

In addition, Sarah Gret and Oman Yadav (2018) explored the factors and beliefs behind pre-service teachers' intention to teach media and information literacy in future classrooms based on the theory of planned behavior. The results of the survey show that although pre-service teachers are positive about media and information literacy as a basic skill of students, they do not believe that this should be emphasized in teacher education programs. Many people do not see other stakeholders, including faculty, school administrators, and parents, who need to model teachers in the media and information literacy to help pre-service teachers develop confidence and integrate them into their future work.

Global Media and Information Literacy Assessment Framework

In June 2013, UNESCO held the MIL Global Forum for Partnership on MIL in Abuja, Nigeria. This year, UNESCO published two heavyweight reports: The Media and Informational Literacy Policy and Strategy Guidelines, which recognizes MIL as a key capability for all citizens to survive in the 21st century. And realize that cultivating universal MIL requires policy support from various countries; Global Media and Information Literacy Assessment Framework: Country Readiness and Competencies, the concept of MIL, A series of related issues such as core elements, competency requirements indicators, education, and policies are explained.

Table 2 MIL's core elements and competency requirements

elements	MIL Competencies
Access: Ability to identify needs, have search capabilities, and ultimately retrieve and access the information and media content needed.	1. Explain and express information needs through multiple channels to clarify the characteristics, roles and scope of information and media content; 2. Search and locate information and media content; 3. Fast, efficient and standardized access to information, media content, and media and information providers; 4. Use a variety of methods and tools to retrieve and temporarily store information and media content;
Evaluate: Understand, evaluate information and media content.	5. Understand the need for media and information providers in society; 6. Assess, analyze, compare, express and apply primary criteria to assess retrieved information, sources of information, and evaluate social media and information providers; 7. Evaluate and certify the information and media content, sources and providers collected; 8. Integrate and organize the collected information with the media content;
Creation: Create, utilize and track information and media content.	9. Create new information, media content or knowledge in a novel, ethical and innovative manner based on a specific goal; 10. Use appropriate channels and tools to communicate information, media content and knowledge in a rational, legal and efficient manner; 11. Engage with the media, with information providers, in an ethical and efficient manner through self-expression, cross-cultural dialogue and participation in democracy through various methods; 12. Monitor the impact of created and disseminated information, media content and knowledge.

"Four-dimensional Seven-element" Model

Based on the global media and information literacy assessment framework proposed by UNESCO, this study draws on and absorbs better media and information literacy related theories and research, and media and information literacy in the country. The developed situation, combined with the existing theoretical and empirical research on media and information literacy, from the perspective of teachers, theoretically constructs a theoretical framework for the evaluation of the development of teachers' media and information literacy in the country. The teacher's media and information literacy can provide a theoretical reference for improving the media and information literacy of Chinese citizens.

Based on the global media and information literacy assessment framework, this study proposes a "four-dimensional seven-element" model based on its indicator dimension, which is mainly composed of four first-level indicators and seven second-level indicators. The four dimensions refer to media and information literacy awareness. MIL consciousness, MIL cognition, MIL competences, MIL ethic, each large dimension indicator contains several small indicators, followed by a number of detailed evaluation criteria (Since these standards are still in the stage of scrutiny and expert verification, they will not be shown here because of the rigor of academics.) to measure media and information literacy.

The following table is a theoretically proposed "four-dimensional seven-element" model of media and information literacy.

Table 3 The "four dimensions and seven elements" model of media and information literacy evaluation

Primary indicator	Secondary indicator
MIL consciousness	Emotional attitude
MIL cognition	Cognition
MIL competences	Obtain
	Evaluate
	create
	participate
MIL ethic	moral

In the "four-dimensional seven-element" model of media and information literacy evaluation, which is initially constructed in theory, each dimension is a first-level evaluation index, and seven of the elements are the second-level evaluation index under the corresponding dimension. The indicator under each dimension has its intrinsic meaning:

1. An emotional attitude under MIL consciousness, which refers to towards a particular category of media information container. Bias to obtain information through a particular media channel, and positive or negative tendency to obtain media information.

2. Cognition under MIL refers to the understanding of the inherent attributes, characteristics and functions of the media and information itself, as well as knowledge of the media ecological environment (including the operation process of media information, production methods) and so on).

3. MIL competences are divided into four secondary indicators: acquisition, evaluation, creation, and participation. Acquisition refers to the ability to obtain high-quality information efficiently according to the needs of a certain method; evaluation refers to pattern recognition of the contacted media information, dare to question, objectively evaluate the media information and form their own unique insights; It is to aggregate, manage, use and create new information on the basis of existing media information resources; participation refers to the participation of media information dissemination, and increase the participation of individual communities in public affairs, thus forming a new media information paradox. It includes the awareness of participation (the possible consequences of participating in media activities and the potential risks involved) and the involvement of public activities in the media and information environment.

4. Morality under MIL ethic refers to the moral cognition and morality in the interaction between people, people and media, between people and society in an environment of understanding and solving the "human-media-social" integration. Emotional, ethical behavior and other issues, consciously assume the media ethics and responsibility.

The Future and Prospects

Given the technical and socio-cultural characteristics of the new media, people now expect to be able to build a satisfactory evaluation system for media and information literacy. In order to

find out the shortcomings in current media and information literacy capacity, a new assessment can be more accurate measurement of media and information literacy. Although this study only constructs the evaluation framework of media and information literacy theoretically, it still has significance for the empirical research to be carried out later. It is true that the evaluation framework may have shortcomings, but it will be continuously refined and revised in the later empirical research process.

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03

Chapter 3:

AI in Education Ecosystem

How to Improve the Education in the "Intelligent +" Era: Evidence based on Quantitative Evaluation

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Abstract: this study from intelligent technology changes the education of "basic direction" and "action in" two levels to explore the path planning: first, using fuzzy comprehensive evaluation method and treatment of education administrators, researchers, education industry, schools, four groups of user feedback, get the domestic intelligent technology to change the basic direction of education, more in line with the education behavior main body of anticipation for the future development of intuition; Furthermore, the hierarchical relation of basic direction was determined by primary and secondary factor analysis of fishbone diagram. Finally, this paper systematically Outlines the action approach model of domestic intelligent technology reform education from the "bracket layer", "power layer" and "target layer", and determines the focal point and tendency of the development path of intelligent education in China. Finally, this paper analyzes the difficulties and challenges existing in the intelligent technology reform of education system, and predicts the future development direction of intelligent education. This study provides a basis for the formulation of relevant policies and plans of intelligent education in China, and provides an evaluation method for the current development status and trend of intelligent education, so as to reasonably regulate the

Key words: intelligent technology; Intelligent education; The path of action; Fuzzy comprehensive evaluation

I. Introduction

The education system in the age of "intelligence +" is undergoing great changes in its complexity, structure and direction. China has a vast territory and a large population. Different regions and schools have formed their own unique advantages and characteristics in the long-term development process. Many have begun to explore the integration of artificial intelligence and education. Although various fields and regions have not formed a fixed development pattern, the matching of scene, region and pattern is emerging. The era of "intelligence +" has arrived, and it is still in the initial stage for intelligent technology to enter into the field of education and affect all aspects of the education system[1] .There are different levels of knowledge about intelligent technology in the education system. It is of high reference value to discuss the path of intelligent technology reform education by integrating the knowledge of each participant in education. Considering the understanding of intelligence technology there are different levels of understanding, in order to fully respect the different experts in the field of intuitive judgment, this research adopts the fuzzy comprehensive evaluation based on Vague sets determined by means of intelligent technology change the basic framework of the path of education, compared to pure literature, such as brainstorming method has higher reliability, makes the analysis of the results consistent with people more intuitive judgment[2]Then, based on literature review

and analysis of primary and secondary factors, the indicators of action path at all levels are determined, so as to provide referential promotion paths for intelligent technology reform education.

II. Research background

(i) Technology drives educational reform in the "Intelligent +" era

The era of "intelligence plus" has arrived. In the 2019 report on the work of the Chinese government, it is clearly pointed out that we need to expand the " Intelligent +" model, adhere to innovation-led development, foster new drivers of growth and promote the conversion of old ones into new ones[3] .With the coming of "intelligence +" era, the development of education has ushered in the era of intelligent education[4] .Intelligent campus, intelligent classroom, intelligent learning environment, intelligent teaching, intelligent learning resources, education robot and other intelligent technology and education products emerged, education is moving towards intelligent, ubiquitous, accurate and personalized development direction[5] .The development of education in the intelligent age cannot be separated from the support of intelligent technology, which is the core driving force of education development and reform in the new era[6] .Liu Dejian and others through analyses the relation between the technology and the education space and time, put forward the personalized teaching, role change, academic evaluation, the appropriate service, intersection, role change and so on five big artificial intelligence education application potential, at the same time facing education value, teaching experience, security ethics, effective collaborative technology and technology management, and other important challenges[7] .

At the national education work conference in January 2019, it was proposed to establish a scientific concept of education quality, deepen the reform and innovation of education and teaching, comprehensively improve the education and teaching quality of primary and secondary schools, give play to the role of the main channel of the classroom, and create an efficient classroom. Under the action of intelligent technology, the time and space carriers of educational activities have undergone subversive changes, and intelligent campus, intelligent classroom and other products of the intelligent age have emerged. "Intelligent +" in the era of the classroom and classroom has been completely different from traditional blackboard chalk classroom, Rong-huai Huang thinks technology with the depth of the education is embodied in the school level, mainly embodied in the AI deep transformation of classroom teaching, the school and class are intelligent technology under the action of earth-shaking changes, released the potential of teachers and students, the learner's cognitive state is more and more deeper understanding[8]. With the development of cognitive load theory, intelligent technology plays a lighter role in supporting autonomous learning, mobile learning, gamification learning, immersive learning, computer-based simulation learning and other different types of learning activities[9]Technology is increasingly leaning towards learning in support of teaching and learning. In the era of "intelligence +", technology constantly reconstructs educational concepts, educational models and teacher-student relationship by transforming classroom interaction analysis, data mining and analysis, and learning behavior analysis[10] .Existing researches focus on discussing the mode and Angle of intelligent technology reform education, and mostly stay at the level of theoretical demonstration. A few researches focus on the specific design, application and other practices of technology in the development of intelligent education.

(ii) The current situation of intelligent technology reform education at home and abroad

The development of international intelligent technology reform education is mainly driven by the government, research organizations and public welfare organizations. In order to cope with the impact and changes brought by the rapid development of artificial intelligence on society, in October 2016, the office of the President of the United States and the national council of science and technology of the United States jointly released the report "planning the future to embrace the era of artificial intelligence".[11], report to the government and relevant organizations proposed the artificial intelligence development Suggestions and countermeasures, such as strengthening the traditional institutions cooperate with artificial intelligence agencies, search for the correspondency of artificial intelligence and industries, open industry data and construction standard, build and cultivate talent echelon of artificial intelligence, a high-level artificial intelligence expert team to develop products regulatory norms, clear the government responsibility as well as in school courses in artificial intelligence and so on[12] .In response to the global wave of Artificial intelligence, the European Commission published the report Artificial intelligence: Commission takes forward its work on ethics guidelines in April 2019.According to the report, the current development of ai technology has had a positive impact on a wide range of fields, such as health care, energy consumption, traffic safety, agriculture, climate change, economic crisis management, disaster detection, and cybersecurity, but it has also brought a series of moral and legal issues. The future trusted ai can be built from seven aspects: human agency and supervision, robustness and security, privacy and data management, transparency, diversity, non-discrimination and fairness, social and environmental welfare, and accountability mechanism[13], providing solutions to ethical and moral problems. Through to the United States, Britain, France, Japan and Singapore and other countries education application policy analysis, artificial intelligence can be found to promote intelligent technology innovation education are set up relevant institutions, the development of artificial intelligence related projects, strengthen the top-level design, gradually to the intelligent education development framework, emphasis on personnel training and international cooperation, etc., have reference value for the intelligent education development of our country[14].

In the process of domestic intelligent technology reform education, the government is the main driving force, industry is the main driving force, and universities and research institutions are the main innovation force. Enterprises with intelligent industry as the main body are actively engaged in the process of intelligent technology reform education and actively participate in the development of intelligent education in China by continuously introducing intelligent education products. In order to meet the needs of The Times and welcome the new round of scientific and technological revolution, the Chinese government formulated the development plan of the new generation of artificial intelligence in July 2017.[15]We will work hard to integrate the Internet, big data, artificial intelligence and the real economy. In the field of education, in April 2018, the ministry of education released the artificial intelligence innovation action plan for colleges and universities, effectively promoting the pace of talent cultivation, scientific research and discipline construction in the field of artificial intelligence[16]. In order to further strengthen the application of artificial intelligence in education and promote the educational reform to meet the needs of talent cultivation in the "intelligent +" era, China is speeding up the development plan of intelligent education in China to accelerate the deep integration and innovative development of intelligent technology and education[17], it is necessary to study the basis to clear the way for its action of intelligent technology reform education. To promote the process of intelligent technology reform education, we should pay attention to the research and development of technology, the deployment of environment, and the change of school environment based on application[18] .Generally speaking, in the current development stage of intelligent education in China, great attention has been paid to practice and promotion, and there is still a lack of

research on ethics and related aspects, which will be one of the key research directions in the next stage.

III. Research process

(i) Preliminary selection of basic directions

At present, China has carried out a lot of practical exploration of intelligent technology reform in education, such as formulating relevant policies, reforming the talent training system, solving the problem of educational equity, reforming the learning space, and building demonstration zones. Based on the above existing research and analysis, referring to the path and mode of intelligent technology reform in the education system involved in the policies and plans of intelligent education development at home and abroad, and combining with the existing practice and exploration in China, this study selects 35 key words of basic direction (as shown in table 2).

(ii) Research method

The evaluation data of different participants in intelligent education are collected by means of questionnaire survey, and the future expectation and judgment of each participant in intelligent education are evaluated by fuzzy comprehensive evaluation method based on Vague set multiple criteria, so as to probe into the future development path of intelligent technology from the perspective of the whole subject. Fuzzy comprehensive evaluation method based on Vague set multi-criteria decision making has been widely used in the research of performance evaluation and other fields. For example, Cao Zhan et al. used this method to study the preferences of railway passengers in transfer[19]Yin Xiannan et al. studied the risk assessment of intellectual property pledge financing from the perspective of the system[20]By using this method, Wang Hairong et al. Studied the risk decision-making and evaluation of emergency rescue for coal mine gas explosion[21] .Educational research is often faced with the fuzziness and uncertainty of evaluation. Therefore, in recent years, educational research has begun to focus on fuzzy comprehensive evaluation and other research methods. For example, Gao Guangyin et al. based on Vague set and hidden markov predicted the psychological crisis of college students[22]And Li Lanyun et al. conducted fuzzy evaluation of teaching quality based on Vague set[23]

In this study, the ms-based multi-criteria scoring function (as shown in equation 1) developed by Zhang Enyu et al.[25] [26]. The evaluation function is a scoring function based on the absolute difference of membership degree between true and false[27]And the scoring function based on the relative difference of membership degree[28]The new evaluation function is put forward, which avoids the problem that the result of the first two scoring functions does not accord with the intuition, and makes the evaluation result more accord with the intuition judgment of the evaluation experts. Define A new scoring function P(A) for any Vague value A=$[t]_A$, 1 -f_A, where $0 \le t_A 1$ *or less, 0 f or less* $_A 1$ *or less, and* $t_A + f_A \le 1$*, then the degree to which the scoring scheme meets the needs of decision makers can be defined as*:

$$P(A)=\begin{cases} 0, & t_A = f_A = 0 \\ \dfrac{t_A - f_A}{2} + \dfrac{t_A - f_A}{2(t_A + f_A)}, & \text{otherwise,} \end{cases}$$

(iii) Data collection and processing

In 2019, UNESCO and ProFuturo mobile study published during the period of weeks for the sustainable development of the artificial intelligence in education: opportunities and challenges, the work report will promote education fairness, improving the quality of education as a intelligent technology to promote education reform at the core, and a number of countries such as China, Brazil, South Africa case as example, analyzes the intelligent technology to improve learning achievement, increase the education opportunities and enhance the role of teachers' support, etc[29] . On the other hand, technology cuts into the field of education and constantly enriches the forms of education and learning, making modern teaching and learning gradually get rid of the shackles of the rigid model in the industrial age and begin to move towards the future education in a real sense. Based on the above requirements of educational development for technical functions and the existing studies in the literature review, this study selected three criteria --"promoting educational fairness", "improving educational quality" and "enriching educational forms" --as the scoring dimensions of the expert questionnaire. The above list of items of intelligent technology reform education system was made into a questionnaire and sent to experts, including education technology researchers (18/20), business representatives (10/17), school users (25/30), and education administrators (11/15).Each project contains three scoring dimensions: "important," "unimportant," and "unclear." A total of 82 questionnaires were sent out through E-mail during the survey, and 64 valid questionnaires were recovered.

Vague set multi-criteria decision evaluation method is used to conduct fuzzy comprehensive evaluation of the above basic path project of intelligent technology transformation education, as shown in table 1, which mainly includes five steps. The C = $\{C_1, C_2, C_3\}$ is the evaluation set, where C1C. to improve the quality of education2C. to promote equality in education3For "enriching educational forms";The project of ui In the standard C_j The proportion of experts evaluated as "important" and "unimportant" in the total number of people is expressed as t respective l y_{ij}, f_{ij}, $t_{ij}T \in [0, 1]_{ij}+f_{ij}1$ or less, I = 1,...35, j = 1, 2, 3;The project ui In grading criterion C_j The Vague evaluation below is denoted as $A_{ij}= [t_{ij}, 1 -f_{ij}]$.

Table 1 fuzzy comprehensive evaluation steps

Steps	Operating content
Step 1	All items u in the statistical questionnaire *(I = 1,...*,35) in each evaluation criterion C_j(j=1,2,3) the number of experts making "important", "unimportant" and "unclear" evaluations;
Step 2	Transforming the evaluation of various items of the educational basic path of intelligent technology transformation by experts under various criteria into Vague estimate A_{ij};
Step 3	The scoring function P(A) defined in formula 2 measures the score P(A) of each project criterion under expert rating$_{ij}$*);*
Step 4	The OWA assembly function of formula 3 is used to calculate the comprehensive score W of each scoring item under the comprehensive criteria $_{C*}$*(u_i);*
Step 5	According to the W$_{C*}$*(u_i) evaluate and rank all projects in the path of educational foundation of intelligent technology transformation, and select the project with the highest score according to the rules;*

(iv) Determine the basic direction

The data obtained from the survey were processed and calculated by Matlab, and the

comprehensive evaluation scores of all basic directions of intelligent technology reform education were obtained, as shown in table 2.From the results obtained in this study selected f scores of 0.2 or more projects as the basis of intelligent technology education change path, a total of 29 contains the basic path to the project, covering intelligent education technology development, personnel training, in the development of many aspects, such as strategic moves, as determined as part of the "intelligent technology to reform the education action into the road" the basis of the index.

Table 2 comprehensive evaluation scores of each basic direction

Project	Comprehensive evaluation of		Project	Comprehensive evaluation of	
	Score	The sorting		Score	The sorting
Building basic platform for intelligent education	0.89	1	Improve the layout of subjects	0.59	19
Research and development of key generic technologies for intelligent education	0.87	2	Strengthen professional construction	0.58	20
Demonstration and application of intelligent education	0.79	3	We will strengthen personnel training	0.58	21
Strengthen the construction of professional personnel training system	0.78	4	Support innovation and entrepreneurship	0.57	22
Promote international exchanges and cooperation	0.77	5	Cooperate with international organizations	0.57	23
Intelligent education infrastructure platform	0.73	6	Will bring in and go out to combine	0.55	24
Education big data platform	0.71	7	Strengthen cooperation in research	0.54	25
Computing platform	0.71	8	We will strengthen practical cooperation	0.53	26
Educational resource platform	0.69	9	Research on ethics, policies and regulations	0.53	27
Multimodal data acquisition and fusion	0.68	10	Training future teachers	0.52	28
Learning analysis techniques for typical educational scenarios	0.67	11	Science popularization activities of intelligent technology	0.52	29
Educational agent	0.67	12	Strengthen market supervision	0.43	30
Theoretical research on students' cognitive laws	0.64	13	Create an environment for development	0.34	31
Construction of network learning environment	0.63	14	Intelligent technology is open source	0.31	32
Wisdom classroom	0.63	15	Public opinion guide	0.29	33
Wisdom campus	0.62	16	Civil-military integration	0.18	34
Regional education quality testing	0.61	17	Think tank construction	0.17	35
Intelligence research	0.60	18	-		

Note: the selected indicators are all basic direction items with comprehensive score f > 0.5(that is, more than half of them consider important).

IV. The action path of intelligent technology reform education

By using fuzzy comprehensive evaluation to determine which factor is the intelligent technical change the important path of education, and by using analytic hierarchy process (AHP) to determine the importance of each path, in combination with the domestic existing intelligent technology to reform the education on the basis of practical experience, this study further systematically put forward the "intelligent technology to reform the education action into the hierarchical architecture model".

As shown in figure 1, the action approach of intelligent technology transformation education consists of three layers: Sopport Layer, Dynamic Layer and Objective Layer. Among them, the Sopport Layer establishes the policy environment foundation, talent support system and international development environment for the in-depth integration of intelligent technology and education system. Dynamic Layer describes the actual actions of intelligent technology to promote the reform of education system. The basic power to promote the realization of intelligent education is to build platforms such as infrastructure, enhance the research and development capacity of key technologies, and build demonstration and application bases. Objective Layer refers to the ultimate goal of intelligent technology to promote the reform of education system and realize real intelligent education, including but not limited to liberating the productivity of education system, improving education efficiency, promoting education equity and enriching education forms. Here it should be pointed out that, in terms of goals, and intelligent education is not a single evaluation index on the time dimension and space dimension, as the technology level, social economic environment, the education form change, such as the specific construction form of intelligent education are diverse, and not just the education system under the technical support of intelligent, also can show the intelligence technology, fully evolved in the form of education.

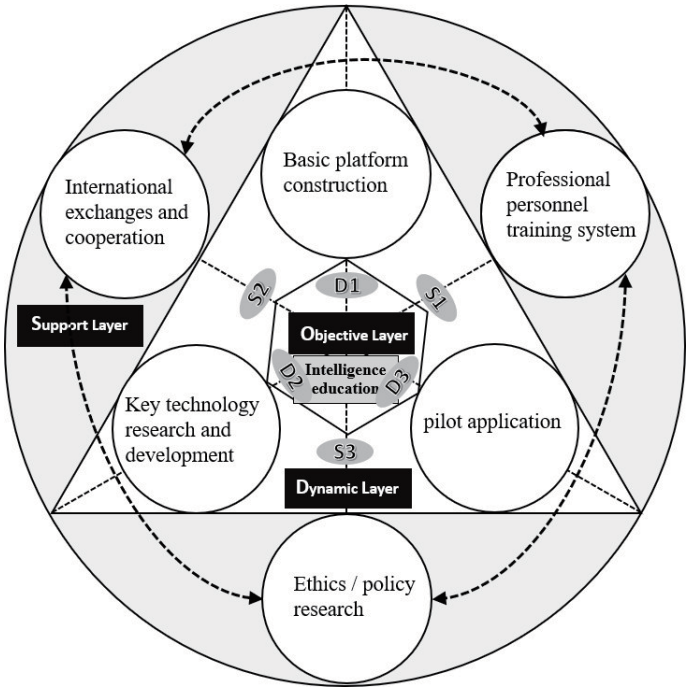


Figure1 action path hierarchy architecture model of intelligent technology transformation education

V.Problems and Challenges

(i) Formulating public policies capable of sustainable development

Intelligent technology sneaks into education development process needs policy support to make full use of various organizations to promote intelligent technology to transform education. By improving the capacity of public policy, planning, formulation, establish comprehensive sustainable development goal framework, create the development of education field the necessary policy support and technical support environment, a variety of factors and the system keep harmonious and consistent pace, common public policy cooperation in international and domestic level, and create a service in the sustainable development of the education path intelligence technology ecosystem.

(ii) Intelligent infrastructure and innovative educational ecosystem make mutual achievements

Intelligent technology is being tested globally in education by providing intelligent solutions for teaching and learning. Education solutions in the "intelligent +" era rely on advanced intelligent infrastructure and innovative education ecosystem, which is a huge challenge for intelligent technology to take root in the field of education. Whether the intelligent infrastructure can meet the needs of education development in the "intelligent +" era depends to some extent on the rationalization construction of the whole education ecosystem and the generation based on sustainable development. On the other hand, the most important component of the innovative education ecosystem in the "intelligent +" era is the intelligent infrastructure that supports the development of intelligent education and the cultivation of future intelligent talents. Therefore, they complement each other and achieve each other.

(iii) Addressing fairness and inclusiveness in the application and promotion of intelligent technologies

The development, implementation and other aspects of intelligent technology need huge financial support, so the difference in economic development level can greatly affect the process of intelligent technology to promote educational reform. We need to pay more attention to the underdeveloped areas and the weak links of financial input, so as to avoid further unbalanced educational development caused by the unbalanced financial input of intelligent technology, which violates the original intention of development. We should pay attention to the construction of technical facilities in areas with different levels of economic development. While the government allocates funds for intelligent education according to needs, the market should be actively mobilized to ensure that each region has the basic conditions for implementing intelligent education.

(iv) Promote the training of "intelligent +" teachers to meet the requirements of The Times

Whether teachers' quality matches the requirements of "intelligence +" era is the key factor of success or failure of intelligent technology reform education. Teachers in the "intelligent +" era need digital teaching skills, the ability to creatively apply intelligent technologies, and the ability to promote the sustainable development of intelligent education. At the same time, when developing relevant products to support teacher teaching, the intelligent education industry needs to fully understand the working mode of teachers, the real demand of teaching scenes, and the

expression mode of products needed by students, etc., so as to reduce the "static friction force" when the intelligent technology cuts into the learning scene and the working scene of teachers.

(v) Build a high-quality and inclusive education big data system to support the development and application of intelligent technology

Education is moving towards data, and big data in education has gradually become the focus of attention in the field of education. The development and formation of high-quality data content and inclusive education big data system is the foundation for education to enter the "intelligence +" era. To improve the ability of national institutions and industrial organizations to collect, organize and systematize educational data is of great and extensive significance for promoting the intellectualization of education in China. On the other hand, the development of intelligent technology provides support for the collection, collation and systematization of a large amount of data generated in education, and provides important opportunities for theoretical research and practical exploration in support of education system management, improvement of education effect, promotion of educational equity and other aspects.

(vi) Rational response to ethical issues arising from the entry of intelligent technology into the field of education

The educational reform in the era of "intelligence +" relies on a large amount of real data in the educational process, and a large number of algorithms are generated based on demands. The development of artificial intelligence will further blur the boundary between human society and physical space and information space, thus generating a series of complex ethical, legal and security issues. Ethical and transparency issues will inevitably arise in the process of data collection, use and dissemination. In practice and research, such as using intelligent technologies to enhance educational opportunities, improve students' learning effects and promote teachers' professional development, ethical research should be carried out simultaneously. Focus on the education the main body of data acquisition and application, particularly personal data collection and application of the ethical issues, to carry out the responsibility, the impact on the sustainable development, data privacy protection, data ownership and so on various aspects of ethical research, around the "intelligent +" in the era of education system change to build the whole perspective, multidimensional ethics research.

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Informal studyonagricultural migrantpopulationin AIenvironment

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Abstract: Agricultural migrant population is a special group in the process of urbanization in China.In order to achieve the urbanization of the migrant agricultural population, the key is to improve their abilities to adapt the life in the city and develop their abilities for jobs. Therefore, it is necessary to create a favorable environment for co-construction, co-governance and sharing. Helping migrant workers overcome bottlenecks such as low education level and lacking of skills training is necessary, at the same time we need to broaden employment channels and increase urban integration. At present, the development and application of AI technology have greatly improved the production and work efficiency. However it also poses a great threat to the employment of agricultural migrant population who are engaged in labor-intensive industries. Meanwhile, it has also created a new informal learning mode for agricultural migrant population. In the AI environment, the convenience usage of mobile devices such as mobile phones has been improved the way to interact with others greatly . Tools such as positioning, search and translation have been implanted into the teaching system. Applications such as automatic matching learning, automatic correction of homework and automatic teaching assessment have been developed one after another. However, there are still some problems in their learning awareness, methods, strategies, abilities and effects. To promote the informal learning ability of the migrant agricultural population and achieve the goal of improving their practical skills is a important part, it is necessary to implement targeted measures to establish the informal learning awareness of the migrant agricultural population, promote connections and improve their learning capabilities. We should carry out targeted training, work together with multiple services, and optimize the external conditions such as learning environment and learning resources.

Key words:Agricultural migrant population,informal learning,AI technology

INTRODUCTION

The report to the 19th national congress clearly pointed out that socialism with Chinese characteristics has entered a new era, and the principal contradiction in Chinese society has turned into the unbalance between the people's ever-growing needs for a better life and inadequate development. With the adjustment of China's economic structure and industrial upgrading, and the accelerating process of urbanization marketization, more and more migrant workers are flooding into cities and gradually becoming the main force of workers, making inestimable contributions to the socialist modernization construction.In the real life, the majority of rural migrant workers as the main group of agricultural migrant population are facing difficulties in the urban integration, knowledge and skills lag, housing and other

problems, their own skills can not support the dream.In the report of the 19th national congress of the communist party of China (CPC), we need to do more to improve the people's well-being and address their difficulties. We need to improve people's well-being through develop their living environment, feeling satisfaction, ensure that all the people have a greater sense of gaining from jointly building and sharing development, and continue to promote all-round human development and common prosperity for all the people.Chai Wansheng, a deputy to the National People's Congress of migrant workers, gave a voice to migrant workers as a deputy to the National People's Congress of China for the first time. He proposed to improve the self-development ability of migrant workers through multiple channels, so as to build a knowledge-based, skilled and innovative labor force for "quality manufacturing in China", and at the same time, it can help them adapt the life the city easily . Therefore, with the shift of economic growth mode in our country,the market demand for labor shows the trend that the mainly number of labor demand gradually turned into the need ofthe labor with higher technology or skills. Exploring ways to promote the competitiveness of the agricultural population resettlement profession, making transfer of agricultural population to adapt to the continuous development of society has become the focus of social organization,the government, enterprises and academia .

CONCEPT DEFINITION

1.Rural migrant population

Migrant agricultural population is a substitute for migrant workers. The China urban development report points out that the migrant agricultural population has two meanings: first, it refers to the population transferred from rural areas to urban areas, such as migrant workers and businessmen, families of migrant workers, land-lost farmers and so on. Second, the population transferred from agriculture to non-agriculture, including those who work or do business in cities, enter urban employment and engage in non-agricultural industries in rural areas. Mingming Yao in his doctoral thesis that transfer of agricultural population, is mainly refers to by taking agriculture as the main object, for some demands, such as improving living environment, increasing household income, take refuge in friends and family, etc. In the process of the second and the third industry transition, agricultural migrant population have multiple occupations or abandon rural working completely. In some ways,On certain conditions including trailing children or need the support of trailing the old man.In this paper, the connotation of agricultural migrant population is determined from the perspective of occupation and region includes the related children and the related old who need the support of their children .In this paper, the connotation of agricultural migrant population is determined from the perspective of occupation and region. Firstly, the occupation is mainly transferred from the agricultural field to the non-agricultural field, such as the people who work in cities and towns or engage in non-agricultural industries in rural areas.Secondly, in geographical perspective , people who have moved from rural areas to urban or urban and rural fringe areas, including those who have worked or engaged in business, followed by migrants and land-lost farmers, etc.Therefore, from the point of view of the population structure, it includes the surplus labor force transferred from rural areas to urban areas, as well as the migrant population.From the perspective of human resources, those who are still in rural areas but have worked and lived in urban areas but have not citizens identity who accounts for most of agricultural migrant population. The other major part of agricultural migrant population was used to live the suburban areas. But their original land was expropriated .So the farmers become urban residents.

2.Informal learning

Informal learning is first proposed by Dewey J., who thinks that experience has continuity and interactivity. Continuity means that each experience of an individual affects his future, while interactivity means that the environment of an individual influences the formation of his experience.Knowles (M.S.K Nowles) will be introduced in adult education and learning, informal learning that adult learning experience in self-awareness, orientation, preparation for learning, motivation oriented features, organized structured course is suitable for learning new knowledge, and based on the experience of the informal learning is more suitable for practice and consolidate have learned content. Different from children's learning, adult learning has the characteristics of non-system and immediacy, and institutionalized school education can hardly meet the learning needs of adults. Research on adult education breaks through the barriers of institutionalized school education, extends its horizon to new learning fields such as life and workplace, and puts forward new concepts such as informal education and informal learning. Institutionalized formal educational institutions are often not supportive of adult learning, and many adult development is often achieved through invisible and even unconscious learning processes. With the decline of traditional discourse of behaviorism and general cognitive learning theory, the focus of adult learning theory research has gradually shifted from school and classroom learning to learners' life and career field.The study of adult learning needs to return to the adult life world and capture and understand the subjective dimension oflearning through adult life experience.

3.The new means ofinformal learning --artificialintelligence education

(1)Rapid development of artificial intelligence

In 2013, the concept of industry 4.0 was launched in Germany. This new concept brought qualitative changes to the science and technology industries of major economic powers in the world, and opened a new situation ofglobal competition in the science and technology industry.

In October 2016, the United States released the report To prepare for the future of artificial intelligence and The national research and development of artificial intelligence strategy planning. The reports Artificial intelligence: The future opportunity and the influence of decision-making launched by Britain government. The three strategy report, inform us the world in the future of artificial intelligence development plan. In December of the same year, the United States released the report artificial intelligence, automation and economy, proposing to formulate relevant policies to develop the creativity ofenterprises and workers.

In July 2017, the United States adopted the document artificial intelligence and national security, proposing to promote changes in military, information and economic fields through artificial intelligence to safeguard national security.

In February 2019, the United States signed the American initiative of artificial intelligence, which proposed a great deal attention should focus on the development of computer science, cultivate the public trust and confidence of artificial intelligence technology, through apprenticeships and other ways to cultivate the researchers in the field of artificial intelligence and the user, courses in science, technology, engineering and other skills, to ensure that all workers in the United States have the ability offreely using artificial intelligence.

In terms of attitude and speed of action, scholars have been deeply engaged in the field of artificial intelligence, but they still believe that their vocational education development cannot meet the needs ofthe future talent market, and the reform is still progressing.

(2)The remolding ofartificial intelligence --online education

The use of artificial intelligence technology has also brought new models to the online education industry. In the traditional education mode, the relationship between teachers and students is one-to-many. The limited energy of teachers determines that their teaching can only be promoted at the average level of students.For students with different learning abilities, such teaching lacks some pertinence. Therefore, personalized education has become one of the trends of future intelligent education.

In the domestic online education market, online education for primary and secondary schools, online vocational education, online education for higher education and other segments have become the main driving force for the growth of online education market.The entry of content producers, technical equipment providers, platform builders and the formation of user habits will further promote the continuous growth of online education.Among them, vocational online education and online language training belong to the rigid demand of users, so users have a strong ability to pay, which will become a prominent field in the development of online education.If artificial intelligence technology can be used to enhance the interactive experience of online education, and personalized content and teaching methods can be integrated into online education classrooms,then the market scale ofonline education is expected to continue to grow rapidly.

Knewton, an online education service company in the United States, provides dynamic adaptive learning technology that creates personalized learning resources for students and continuously understands their learning characteristics. Knewton's core product is an online learning tool ADAPTS which can meet each learner's individual needs.

Knewton works with Pearson and other publishers to digitize a wide range of course materials, including K12, higher education and career development education.Knewton's core technology is adaptive learning, which provides personalized teaching services through data collection, inference, and advice.

①Data collection stage
In the data collection phase, associations between different concepts in the learning content are established, categories, learning objectives and student interactions are integrated, and the data is processed by the model computing engine for use in subsequent phases.

② Inference stage
In the inference stage, the collected data will be analyzed through the psychological test engine, strategy engine and feedback engine. The results of the analysis will be provided to the recommendation stage for personalized learning recommendation.

③Proposal stage
In the proposal stage, teachers and learners are provided with learning suggestions through the recommendation engine and predictive analysis engine, and a unified and summarized learning history is also provided.

Artificial intelligence technology has great development potential in education, which can automatically adjust courses according to each learner's situation. So as to achieve the easiest and most efficient learning. Adaptive Learning has been proposed for many years, and new machine Learning technologies may eventually help to achieve this goal. Adaptive learning is most effective when a large number of learners use the same material for learning, because it allows a large amount of datato becollected.

AI + education deeply excavates user needs, and personalized recommendation can be realized through big data technology, while its feature based on mobile terminal allows users to conduct immersive learning in fragmented time, which makes online education cut into some pain points and blind spots of traditional education. The introduction of the Internet into schools and classrooms is the trend, but these are only hardware devices, it still does not work if the way of thinking is not the Internet thinking. Putting the video of famous teachers' courses in some famous universities on the Internet is conducive to social sharing of high-quality resources and promoting educational equity.

The degree of personalized in online learning way is very high. It is necessary to change the method of traditional class learning and teaching method. First we should change the concept of class. It no longer needs to fix time in class, or even no longer need to constrain administered with the professional knowledge system structure, and it should allow learners to issue as the center. Personal needs is the center. It need to break the original system of subject knowledge, the knowledge structure ofthe construction ofpersonalized, which is conducive to problem solving.

The result of artificial intelligence + education will make all future teaching and learning activities focus on the Internet, where information flows and knowledge takes shape, and offline activities become the supplement and expansion of online activities.Internet tools break everything in the original education system into pieces, and then rebuild it with the Internet as the center to become a new system and new structure.

The study dilemma of the agricultural migrant population

With the continuous deepening of the transmission of lifelong learning concept, people's learning concepts and ways are constantly changing. The characteristics of informal learning can make up for the learning needs of the migrant population in agriculture.The development and application of artificial intelligence have filled the limitation of the agricultural transfer population's learning. And actively promote the construction of a learning society. Then, for the agricultural migrant population, although the external environment is gradually creating good learning opportunities and environment, the comprehensive coverage of informal learning based on artificial intelligence education is still facing many difficulties.

1. Lack oflearning awareness

Learning consciousness plays a subtle role in people's learning, especially for the agricultural migrant population. As adults, they have the ability to choose independently and choose what to learn or not to learn according to their own future planning area.Then, there is the phenomenon of weak learning consciousness in the current agricultural transfer population.This is inseparable from their work and living environment. First, the agricultural migrant population has left school

and has less perception of learning. Secondly, the restriction of learning environment, learning resources and learning opportunities weakens the enthusiasm of the migrant population in agriculture. Thirdly, the indifference of the surrounding population to their own learning dilutes the motivation of more agricultural transfer population than learning.After that, the purpose of study is not clear to dampen the enthusiasm of the agricultural transfer population. Most of the agricultural migrant population study in order to obtain academic qualifications or professional titles. So as to increase their income and improve their living condition. But they ignore that study can also improve their comprehensive quality, which is conducive to the rapid change of work and life. The external restriction and the internal passivity all cause the agriculture transfer population to study the consciousness to be weak.

2.Self-doubt learning ability

Learning ability refers to the ability to learn and use knowledge.It determines the efficiency of learning.Learning abilities generally include attention, observation, memory, imagination and thinking.To improve the learning ability. We should stimulate the interest of cognition in the process of mastering knowledge, form the intrinsic incentive of learning, adopt scientific learning methods, summarize learning experience, find out the rules, improve the learning efficiency, develop good learning habits, and learn to independently use the knowledge to analyze and solve problems. Thorndike, a famous educator, argued that adults can still learn. Then, many agricultural migrants question their ability to learn, believing that learning will be difficult after the optimal age.Even some young agricultural migrant population think that the lack of learning ability is one ofthe main reasons fortheir dropout.

3.Lack of learning strategies

Learning strategy refers to a set of internal operational activities and systems that learners actively monitor and control the learning process in order to achieve a certain learning goal, comprehensively grasp the factors in the learning situation, i.e. their relationship, according to the existing experience, and actively control the learning process.First, there is a lack of time management strategies.The primary task of the migrant population in agriculture is to make money to support their dairy life. So they are faced with the contradiction of work and study, lack of study time, overtime, business trip, entertainment, housework and other influencing factors will lead to relatively insufficient experience.Under the dual pressure of work and study, it is easy to drive the population transferred from agriculture to study passively or perfunctorily. Secondly, lack of learning resource integration strategy.Poor knowledge base, few learning resources acquisition channels and single learning methods are all obstacles to the integration of learning resources in the system of agricultural migrant population,There is no need to say to build up own knowledge system. Third, there is a lack of strategies for getting help from others. As a result, regarding a lot of adult formal higher training cost, a lot of agriculture transfer population are flabbergased before learning. Because they lack the guidance from the teachers ,the help of thers , learning alone always makes them in the confusion without good ways to solve their confusion during studying.

4.Lagging learning effect

Most of the agricultural migrant population has a weak knowledge base, and they are engaged in relatively simple mechanical work after entering the city. So the demand for theoretical knowledge in practical application is low.Theoretical knowledge is the basis of later practical

knowledge, so theoretical knowledge is an indispensable part.Long time away from theoretical knowledge learning will lead to the theory learning part as a difficult point in the learning process, and then it affects the learning effect. Secondly, they can not get the immediately. Therefore, the lack of positive feedback and evaluation will dampen learners' enthusiasm in learning. Thirdly, in recent years, although the promotion of informal learning certification has attracted much attention and support, it still fails to form a systematic and universally recognized certification system.The disapproval oflearning outcomes directly impacts learners' original intention oflearning.

Solutionstrategies

(1)Enhance learning awareness

People receive new knowledge in work, life, social contact and other informal learning time and place account for more than 75% of what they have learned, but less than 20% of their attention and investment in it. Due to the insufficient advocacy of informal learning, many agricultural migrant population lack awareness of informal learning.Therefore, educators should cultivate their awareness of informal learning and let them know that informal learning takes place in various situations in work and life.At the same time, it will guide the occurrence of the learning behavior of the agricultural migrant population, gradually clarify the learning purpose, promote the persistence oflearning behavior,and guide the good learning results.

(2)Build confidence in learning

First, to understand the learning needs of learners and make targeted use of artificial intelligence learning resources.Secondly, learners' interest oriented, expand knowledge, stimulate the desire to learn. By making use of network communication tools, learning groups are formed to carry out online collaborative communication on different learning topics, so that learners feel that they are part of the whole learning and meet the needs of learners' communication. Thirdly,choose reasonable evaluation mechanism to maintain learning motivation.

(3)Teaching learning strategies

Learning strategies can affect learning effect, so it is of great significance to master certain learning strategies.First of all, we should coordinate our study time, focus on learning, reasonably exclude irrelevant matters, and increase our study time.Secondly, the artificial intelligence education system is used to evaluate the current learning level through scientific testing methods, make full use of the big data and computing functions of artificial intelligence, and then formulate learning objectives, refine learning plans and improve testing methods. Second, construct a resource acquisition strategy. Make use of the high-speed and convenient Internet system, enhance the cooperation and communication with others, and try out cooperative exploratio, which can not only integrate your own network, but also help you learn.

(4) Improvethe certification system

Any certification system needs a frame of reference that is socially acceptable.Eligibility is generally based on two main criteria: vocational and educational.First, a set of clear, scientific, fair and authoritative certification standards should be established.Secondly, due to the complexity of certification activities, it is necessary to establish special certification bodies and strengthen cooperation with other departments. Coordinate the certification activities. The method used for recertification is critical.They not only affect the overall quality of the certification process and results (reliability and validity), but also affect the certification

experience of individual learners. Therefore, an evaluation method suitable for purpose should be constructed. At the same time, the quality assurance mechanism supports the basic requirements of certification activities for a long time, and sustainability is necessary to gain trust.Attention should also be paid to the quality assurance ofcertification.

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Research on the Training Mode of Artistic Design Talents in the Age of Artificial Intelligence

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Abstract: Human development has changed greatly because of the coming of artificial intelligence. When it comes to the environment, more and more design works are or will be replaced by artificial intelligence, so new technologies and new platforms which run the renovation of design have appeared one after another. But as for there will be much more possibilities for AI in applying in the area of art designing in the future, how to adjust the education and training of bright people in art designing to face the challenge of AI, is becoming a serious problem for those colleges and universities teachers who are engaged in art design education. This passage starts from the designing thought and designing pattern of working, discusses how to make changes in training bright people in the environment of AI, how to cultivate students' new thoughts better for fostering designers who have strong abilities in going on fabulous initiative designing to satisfy the new need of bright people in art design through comparing the different between AI and designers' designing behaviors and achievements.

Key words: Artificial Intelligence, Art Design, Cultivation Talents

INTRODUCTION

As technologies evolve, artificial intelligence (AI) is more infiltrating into every field of our lives. Human beings are in an irresistible and exciting future. With the future development of artificial intelligence, human beings must learn to interact with artificial intelligence in work, life, and learning. In the process of mutual learning, artificial intelligence and human beings will bring their unique characteristics, including experience, values, and judgment, which can contribute to artificial intelligence. Great qualities intertwine. Artificial intelligence is changing many industries subversively, and many mechanized jobs have been replaced by artificial intelligence, so people have the fear of losing their jobs and their jobs will be taken away by computers. However, artificial intelligence applied to art design (which has been at the leading edge through the adoption of new technologies) may not be such a frightening question as people imagine, "Will artificial intelligence make artists unemployed?" New technologies not only create new opportunities for artists but also stimulate traditional media, which is a catalyst for a paradigm change. Whether we accept it or not, the change will come and all we can do is to accept these new tools and stick to them. The development of technology has stimulated the sustained vitality of art, and new art technology has created new employment opportunities. New AI algorithms will give us new expressions and change our art and culture in an active approach, as what formerly new technique has done in the past else. How to adjust the education and training of artistic design talents in such an era background? As an educator and designer who has been engaged in artistic design talents for many years, what needs to be studied are how to cultivate students' ability to use design thinking, design skills, science and technology, and

innovative design products to meet user needs.

RESEARCH DESIGN & METHODS

1.Art Design in the Age of Artificial Intelligence

The Oxford Dictionary describes AI as "the theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages". Therefore, it can be used as a suggestion. In short, human comprehension is the foundation and eventual aim of artificial intelligence. Viewed this way, the elementary term "intelligence" refers to thinking, while "manual" refers to machines and computing systems. The most basic issues with artificial intelligence are their ability to think like people.

1.1 Artificial Intelligence

John McCarthy, one of the Godfathers of AI research, describes AI as "science and engineering of making intelligent machines, especially intelligent computer programs." (McCarthy, 2007:2). He argued that intelligence is"the computational part of the ability to achieve goals". This circumscription as well as for humans, animals, and machines. He said it is out of the question to define intelligence independently because there are still problems in describing the types of calculation procedures that should be defined as "intelligence". There have also been some intellectual systems that are not fully comprehend (McCarthy, 2007:3).

As a subfield of computing science, Artificial intelligence tries to grasp the substance of intelligence and make a new intelligent machine, which can react as human intelligence. The research in the domain consists of image identification, language identification, robots, NLP systems, and expert systems. Since AI comes into the world, theory and technology have grown sophisticated, and the area of application has been widening. It is conceivable that the technology products brought by artificial intelligence should be the "receptacle" of mankind intellectual in the future. Artificial intelligence can emulate the information process of mankind mentality and think. Artificial intelligence is not human wisdom, but it can ponder over as mankind, also it may be above mankind intellectual.

Artificial intelligence is a wide-ranging science. AI consists of different domains, like computer vision, machine learning and so on. Altogether, the primary aim of artificial intelligence study is to enable machines to compete for complicated works that usually require mankind intellectual. But everybody has various understandings of this kind of "complicated works" on a different day. In December 2017, Artificial Intelligence (AI) was selected as "Ten Popular Languages of Chinese Media in 2017", which has become a hot word at present, and it is also a computer science that may bring tremendous impact on the cultivation of art and design talents in the future.

1.2 Art Design

The art design is an independent art discipline, which mainly includes environmental design direction, visual communication direction, product design direction, etc. The studying contents and consumers of AI are distinguished from the traditional arts, and moreover, art design is

also a strong comprehensive discipline, which relates to a lot of elements, for instance, society, culture, economy, market, science and technology, and the aesthetic standards will be varied with the changes of these elements. The most valuable thing of the art design is persisting in creations and practices, which is the reflection of the designer's all-round qualities actually, as expression, perception, and imagination.

The greatest characteristic of the art design is serviceability. The first motive of the art design is not expression, but a creative change of the way we live, and a possibility providing a new lifestyle for people, whether in the application of information transmission in business activities or the application of daily life behavior. The art design is to enable human beings to obtain a variety of more valuable and quality forms of life, the ultimate manifestation of which is excellent products. To make life more simple, comfortable, natural and efficient is the ultimate goal of the art design.

Another characteristic of the art design is its scientificity and rationality. The means of realizing artistic design is rational, which is different from the realization of works of art. You can create shocking works of art only by the explosion of artistic inspiration, but you can never create a good product only by inspiration. A good product is not a designer's pure self-expression, but a rigorous scientific spirit. It is a rational and balanced purposeful activity. We should perfect our ideas and concepts step by step through scientific investigation and reasonable process. There will be various scientific experiments in the process. Considering all kinds of data, there will be various compromises between the artistic pursuit and the actual needs of life. There is no absolute purity of artistic ideal in artistic design products. Ultimately, it should be people-oriented and conquer people with experience.

2.Problems of Art Design in the Age of Artificial Intelligence

In the era of artificial intelligence, designers will be more creative and take the lead with the help of science and technology. This means that designers will supply sophisticated direction to their artificial intelligence partners, covers targets, restraints and particular problems that need to be solved. In theory, it will allow them more time for more creative work. As the developing of artificial intelligence, AI needs the cooperation and feedback of the creators for growing and learning. Designers will also have a chance to construct algorithms for their creativity tasks, which is an excellent opportunity to alter their professional levels forever. It also makes new demands for the training methods of artistic design talents in the context of artificial intelligence.

2.1 Characteristics of Art Design in the Age of Artificial Intelligence

It has become a trend to replace people with computers to complete repetitive work that requires a lot of manpower. FastCo. points out that most designs are formulaic enough to be used by computers. For example, to create an attractive website, we need to rely mainly on the design principles contained in the website to win, such as golden section rate, Fibonacci spiral, three principles, and sacred geometry, etc. For designers and computers, the application of these principles is no problem. Also, many rote-learning tasks performed by designers, such as processing grids across devices and preset rules, are easy to automate. It's a victory to liberate these tasks from designers. Like the Autodesk Dream Catcher tool, by applying an algorithm to any set of parameters, the application program generates countless iterations of a design, enabling designers to select an optimum one or previous for reorganization. Another example is Grid, a website contributor who uses artificial intelligence to build a website without the input

of designers, and becomes a labor-saving device for designers. If an application like Grid is designed for studio use, the rudiments of Web design can be automated according to consigner parameters and targets. After that, the designer can take charge of trimming and user experience duties.

2.2 Problems of Art Design in the Age of Artificial Intelligence

The research of artificial intelligence (AI) has made amazing progress recently, containing plenty of steps in web search, image distinguishing, session proxy and robot technology. These advances have exacerbated people's concerns about the impact of AI in more ways of society. In the art context, the media hype presents new algorithms of image and video creation as if they were the automation of artistic creation. Maybe artificial intelligence will empower ordinary users while leaving artists out of work. From the 19th century, people began to worry about how technology could replace jobs, but, as the old roles were removed, more roles replaced them. Artificial intelligence algorithms are not independent creators so far, and they incapable appear in the predictable future. AI algorithms are still tools for artists to grope for and open up. New growth in these tools will be eagerly used by many artists, causing dramatic new art forms and styles, and new artificial intelligence will become new implements for artists.

The difference between the perception of design and art is that the perception of design can be an additional thing. The specific "use" of objects mostly follows the needs of people's life. For the design of body use, AI can effectively approach the purpose of "use" through the calculation of large data. In this regard, AI has absolute value advantages. However, this absolute advantage must be based on the clarity of the design's "use" purpose list. The design of AI can only involve some kind of fixed result, and process experience is difficult for AI to implement with calculation. Moreover, the scope of design covers all aspects of the lifeworld. From a macro to a micro level, the design is involved. For the "system" type of object design, it involves group commonality, so AI has natural advantages. On the level of visual communication or some personalized expression, AI has to find the existence of "boundary".

Although AI is not enough to replace design at present, it does not prevent data scientists from trying to use artificial intelligence designers on many creative works. For example, a Japanese creative director of an advertising company competed with an AI in a competition to produce better (real) ads for Clorets. Although human advertisements won popular voting by a small advantage (54%), while the industrial sectors voted on AI advertisements. In Italy, through YouTube, an algorithm has also been used to design 7 million unique labels for Nutella cans. The project was a huge success, driving Italians to produce outnumber 10,000 videos and selling more than 7 million cans within one month.

As Rob Girling, a technical analyst pinpoints that a great majority of modern design tasks are defined by social and creative intelligence, abilities that require creative problem solving, empathy, talks, suasion, and problematic frame. AI can influence the labor force by challenging further non-designers to expand their creative and social intelligence to maintain their employability. Designers may need to do more work to out of the ordinary, and may pursue more particular market segments or specialties with higher skills, or acquire broader skills, thus shifting too many roles.

3.Cultivation of Artistic Design Talents in the Age of Artificial Intelligence

The “emotion” conveyed by design must be the information that can be conveyed between people, and this information must be shaped by people. It is not the person who fears technology or machine supremacy, but the person who can balance the convenience brought by computer artificial intelligence to designers and think actively to train future-oriented artistic designers.

3.1 Creative dimension as the main development goal

Creativity is a concept involving human ability. According to Professor Keith Sawyer, the most famous expert in creativity, creating and learning and American psychologist, it is a creativity that “making us a part of humanity”. Therefore, creativity is a key concept when comparing machinery intelligence with human intelligence and talking about the ability that machinery intelligence has which is equivalent to the human level. As mentioned in the previous chapter, creativity is one of the key advantages of a human brain simulation system. In addition to the large-scale parallelism of the human brain, randomness, affective thinking, aesthetic ability, and artistic taste are also inherent characteristics of human intelligence. Sawyer points out in Explaining Creativity: Human Innovation Science (2014): “Although AI computer programs are world champions in chess and can process huge amounts of data and recognize types that are beyond our vision, they can’t grasp everything yet.”

Ingenuity can often be defined as the capability to put forward fresh, original and worthwhile ideas amazingly or unusually. These worthwhile ideas may have various implications. An idea may be a conception, a theory, or a work of art, such as painting, music, architecture, tools, etc. This is one aspect of human intelligence, it is a level of human thinking (Boden, 2004:1), which is the general characteristics of human intelligence. To some extent, everyone is creative. So Boden said, rather than asking whether this idea is creative, you’d better ask how much creativity it is and in which areas. The source of “creativity and inspiration” is always human beings, and computers only assist people in more complex and extensive data retrieval and deduction.

3.2 Establishment of “Intelligence & Design” Education System

If humans fail to grasp the potential interaction of AI, which will combine the best characteristics of each other, then humans must be second-class citizens in their world. Artificial intelligence processes large amounts of data much faster than humans imagine, and humans bring emotional characteristics, such as emotion, happiness, and judgment. Combining the best of these two attributes can make the future of humans and artificial intelligence more beneficial, although humans need artificial intelligence far more than humans need. Artificial intelligence needs the degree of human beings.

Artistic design in the era of artificial intelligence is based on people’s understanding of themselves and emotional experience. If we do not understand the generation of aesthetic thinking and consciousness, then under different cultural and religious backgrounds, it is impossible to solve the design problem of human lifestyle only by machine algorithm. Science and technology enrich people’s lifestyle and aesthetic pursuit, which cannot be replaced. AI development aims to better serve people themselves. Art and design are based on people’s emotional experiences. Art emphasizes the expression of people’s subjective concepts, the future of artificial intelligence applications, more to think about people’s needs and changes in the needs of different living environments. From the current application scenarios of AI, people will

lose to machines when AI is applied to solve the problems, conditions, and results of determining boundaries. However, when we need to rely on perceptual decision-making to make judgments, it is often unreliable to apply AI to logical reasoning based on large data. As far as the present visible future is concerned, AI can only provide technology. The emergence of excellent works must be the emergence of new technologies or means in that era.

In this context, the value of art design education lies in granting students a unique experience, helping them acquire the abilities of visual reading, shape expression, spatial thinking, imagination and creativity, making the best use of everything, and aesthetic extension. The creative dimension is the priority development goal. The unique value, purpose and priority development goal of school art design education can help students integrate new things into their learning and life horizons, and learn to actively create a future society. These courses should stimulate creative thinking and enable students to acquire the knowledge and skills of visual reading and plastic expression by exploring a theme (or topic) of art design in depth; the ability to integrate art information in new ways, stimulate imagination and inspiration, analyze creativity and promote the practicality and creativity of making the best use of things and full of aesthetic sense. Creative thinking ability generated by ideas; curiosity, intrinsic interest, and perseverance in art design, willingness to take risks; use critical thinking to creatively make decisions on themes, themes, media, and manifestations of meta-cognitive. Also, students should be trained to be good at finding problems in the design, to have a unique way of expressing beauty and emotion in design expression, and to learn to use artificial intelligence to assist design to complete various types of design projects.

RESULTS

Moshe Vardi, professor of computer science at Rice University in the United States, asserts that in the next three decades, artificial intelligence will supplant 50% of current work in the world. The reform and transformation of art design education need to renew the concept, content, and mode of education. Art is a kind of social activity, so at present, we cannot point out with certainty that any software system can be called “artist”. However, art maintains its lifeblood by innovating constantly, while technology is one of the primary impetus behind innovation. The most important part of art points to people’s emotional experience and presents it as a specific visual perception. The most important life direction of design is “use”. Being born for use is also the expression of people’s life experiences. Human experience has become the most important point in defining people and AI in art and design. We should regard AI as a tool that will make our work more efficient and convenient, sets us free by clearing up cumbersome works, and help us producing more highly conceptual and emotional creative works.

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Application of Artificial Intelligence in Education in China1*

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Abstract: based on 656 core journal articles on "application of artificial intelligence in education in China" collected from CNKI, then, SATI, EXCEL and SPSS software were used for cluster analysis and Citespace software was used for keywords and time map analysis, here are six themes: education application based on big data; the innovative application of artificial intelligence in education; Artificial intelligence promotes the educational reform of curriculum system such as information technology; Artificial intelligence promotes the development of education equity and distance education; The influence of artificial intelligence on talent cultivation; Artificial intelligence helps the development of educational informatization. In terms of correlation analysis, this study puts forward three conclusions and Suggestions to provide a summary and reference for the application of artificial intelligence in education.

Key words: Artificial Intelligence, Education

INTRODUCTION

Since 2016, breakthroughs have been made in artificial intelligence research, which has become an inevitable trend in the field of education. Artificial intelligence is helping to improve education, and it is applied in various forms in education. Concepts such as "intelligent education", "intelligent education" and "artificial intelligence education" have emerged. From Alan's Turing test in 1950 and the term "artificial intelligence" formally proposed at the Dartmouth college conference in 1956, artificial intelligence has developed into an interdisciplinary discipline involving computer science, informatics, psychology, philosophy, education and other fields. Artificial intelligence to the daily life, to the national attention the influence of social demand, For example, the United States has released “The National Artificial Intelligence Research and Development Strategic Plan”, “Preparing for the Future of Artificial Intelligence”, and “Artificial Intelligence, Automation, and the Economy”, etc., forming the blueprint for American artificial intelligence research. In 2017, France formulated an artificial intelligence development strategy in public institution innovation, talent cultivation, research institution infrastructure and other aspects, and established the artificial intelligence strategy committee. According to the report "Growing the Artificial Intelligence Industry in the UK"

* 项目基金：“赣鄱 555 英才工程”领军人才培养计划［赣才字[2012]1号]专项资助，江西师范大学领军人才科研专项资助。

in 2017, the Turing artificial intelligence scholarship should be established to develop relevant courses and attract and retain talents in the field of artificial intelligence. Against the background of international attention to artificial intelligence and the development of Chinese science and technology, China also pays attention to the development of artificial intelligence promptly on time. In 2017, it proposed using artificial intelligence to explore education and teaching.
In recent years, the application of artificial intelligence has become a hotspot in society, people can experience it in their daily lives. Because of the importance of education to society, applied education of artificial intelligence will become the research direction that people pay attention to for a long time. Therefore, this study reviews the core journals and literature of Chinese scholars concerned about the application of artificial intelligence and provides a summary and reference for the application education of artificial intelligence.

RESEARCH DESIGN & METHODS

In this study, core journals were searched with "artificial intelligence" and "education" as the main topic. As of May 15, 2019, a total of 722 literature had been collected, including 656 core journal literature, excluding irrelevant literature such as conferences, newspapers, statements, advertisements, and contributions. This study collected the literature first, endnote format derived from CNKI, use SATI, EXCEL and SPSS, Citespace software, clustering analysis, spectrum analysis, the origins of the journal literature statistical analysis in the first place, it is concluded that the CNKI literature sources of journals, know which subject areas more focused on the application of artificial intelligence in education, and then to carry on the clustering analysis was carried out on the keywords, direction of the research of the draw, time-sequence analysis with keywords, to sketch in recent years, the current situation of application research in artificial intelligence in education. Finally come to the conclusion and Suggestions are put forward.

THE DATA PROCESSING

(1) Journal source analysis
The selected documents of this study are distributed in 177 journals, mainly in the journals of education technology, and some of them are in the journals of “People's Education”, “Research in Higher Education of Engineering”, “Theory and Practice of Education”, etc., among which the top ten journals with the number of publications are from, as shown in figure 1, and the number accounts for 42.5%. It can be seen from the figure that "China Educational Technology", " e-Education Research", " Distance Education Journal", " Open Education Research", " Distance Education in China" and " Modern Educational Technology" are periodicals in the direction of educational technology. It indicates that scholars in the field of educational technology pay close attention to the application of artificial intelligence in education. Meanwhile, the number of articles published in other journals shows that Chinese educational scholars pay close attention to this field as well as the process of educational informatization.

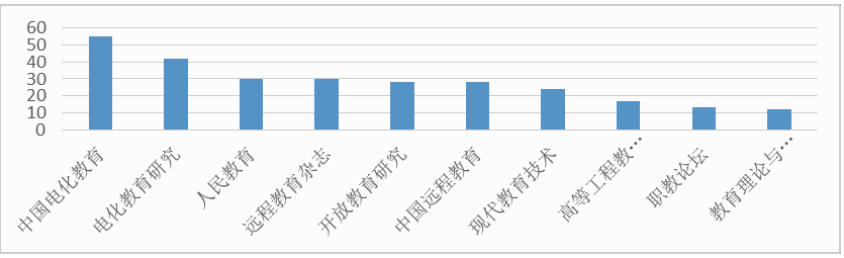


Figure 1 partial journals

(2) Keywords cluster analysis

The required literature was selected and SATI3.2 was used for data processing. To avoid repeating words near-synonyms and synonyms influence on research, for "to" operation, select "keywords", Rows/Cols is set to "30" import "endnote" format, to extract "field", "frequency statistics", then click "matrix generation," former 30 keywords word matrix, the generated word matrix into SPSS and generate similar matrix, then similar matrix into Excel, generate the dissimilarity matrix, and then import the SPSS, to carry on the related operations, generate keywords clustering, clustering tree, content analysis and combined with literature, Table of clustering results of high-frequency keywords is made, as shown in table 1.

Table 1 results of high-frequency keyword clustering

Type 1	Learning analysis, educational big data, machine learning, personalized learning, deep learning, educational applications
Type 2	Learning, students, education, innovation, maker education, robot education, teaching design
Type 3	Information technology, science of learning, and education reform
Type 4	Distance education, educational technology, problem solving
Type 5	Personnel training, vocational education, higher education, primary and secondary schools, robots, schools, artificial intelligence
Type 6	Intelligent education, educational informatization, educational modernization, intelligent education

As can be seen from table 1, the application of artificial intelligence in education in China mainly has 6 types of themes: education application based on big data; the innovative application of artificial intelligence in education; Artificial intelligence promotes the educational reform of the curriculum system such as information technology; Artificial intelligence promotes the development of education equity and distance education; The influence of artificial intelligence on talent cultivation; Artificial intelligence helps the development of educational informatization.

Type 1 is based on the education application of big data, data analysis, education mainly include learning, machine learning, individualized learning, depth, keywords such as application of education. Big data technology is one of the technologies supporting intelligent education and constructing an intelligent teaching environment. It can collect and analyze data in the teaching process, evaluate learning status, predict learning trend and find potential problems in time. Meanwhile, machine learning is the core technology of artificial intelligence. With the application of artificial intelligence in the field of education, exploring personalized learning and attaching importance to machine learning in education have become one of the focuses of research.

Type 2 is the artificial intelligence applied to the education innovation, mainly with learning, students, education, innovation, and customer education, robot education, instructional design, such as keywords, artificial intelligence, the large data, the study and analysis, deep learning, personalized learning for application of the innovation of education has brought vitality, such as artificial intelligence oriented and customer education and elite education mode, will be able to get new experience and more open access to resources, is helpful to the innovation of education.

Type 3 is artificial intelligence to promote information technology education reform of course system, mainly include information technology, to study science, reform of education and

keywords. Artificial intelligence has a deep impact on all aspects of life, education teaching also needs to keep up with the changes of The Times, is the product of the era of information technology curriculum, artificial intelligence is the frontier subject of information science research, since the "computer to grab from baby", in computer science, information technology education evolved into education, under the background of educational informatization 2.0, as a combined with modern technology, thinking, information literacy class, the information technology course need to re-examine its positioning, likewise, in other courses or classroom teaching reform accordingly.

Type 4 is the development of artificial intelligence to promote education fair, remote education, remote education, education technology, main problem solutions such as keywords, according to the artificial intelligence application in the education of perception, knowledge, cognitive and so on three levels, the influence of the artificial intelligence in such aspects as teaching organization, teaching forms of education bring significant change, is helpful to solve the problem of education fairness. The outline of the national program for medium - and long-term education reform and development 2010-2020 clearly points out that people's demand for education is one of the goals of education development. Artificial intelligence can help expand the coverage of high-quality resources, its adaptive technology can bring more students with personalized learning resources, solve the contradiction between supply and demand of education, promote education equity, and meet the educational needs of the people with increasing population.

Type 5 is the effect of artificial intelligence for talents, talents cultivation, main vocational education, higher education, primary and secondary schools, the robot, the school, such as artificial intelligence keywords. The development of artificial intelligence has become one of the national strategies, and the changes in talent demand caused by industrial transformation will also feedback into the education system. Carry out science and technology education and popularize intelligent technology education in primary and secondary schools; To train high quality and high-level technical workers in vocational education; In higher education, interdisciplinary talents who understand professional theories and cutting-edge technologies, can integrate into the social culture and cooperate with machines are cultivated. Adjusting school running, combining with social needs and leading development, research on talent training mode has become one of the important research points.

Type 6 is artificial intelligence power e educational informatization development. There are intelligent education, education information, education modernization, intelligent education, and other keywords. The construction of educational informatization is to realize the modernization of education. In the process of this construction, a large amount of information must be produced, and data and algorithms are the foundation and core of artificial intelligence. Cooperate with artificial intelligence to collect, clean and generate reports, and have big data awareness, computational thinking, and data accumulation, etc.

(3) Keywords time map analysis

Select the required literature, export the "RefWorks" format, and use Citespace.v. 4.0 for data processing. Set the appropriate parameters on the operation page: The Time interval is set as "Time Slicing" from "1992" to "2019", the Time slice "Years per Slicing" is "2" Years, the Node "Node Types" is "keyword", the Node threshold "Top N" and "Top N%" are "20" and "10%" respectively, and "Pathfinder" and "Pruning the merged network" are selected for network tailoring. The keywords time map from 1992 to 2019 is obtained as shown in figure 2.

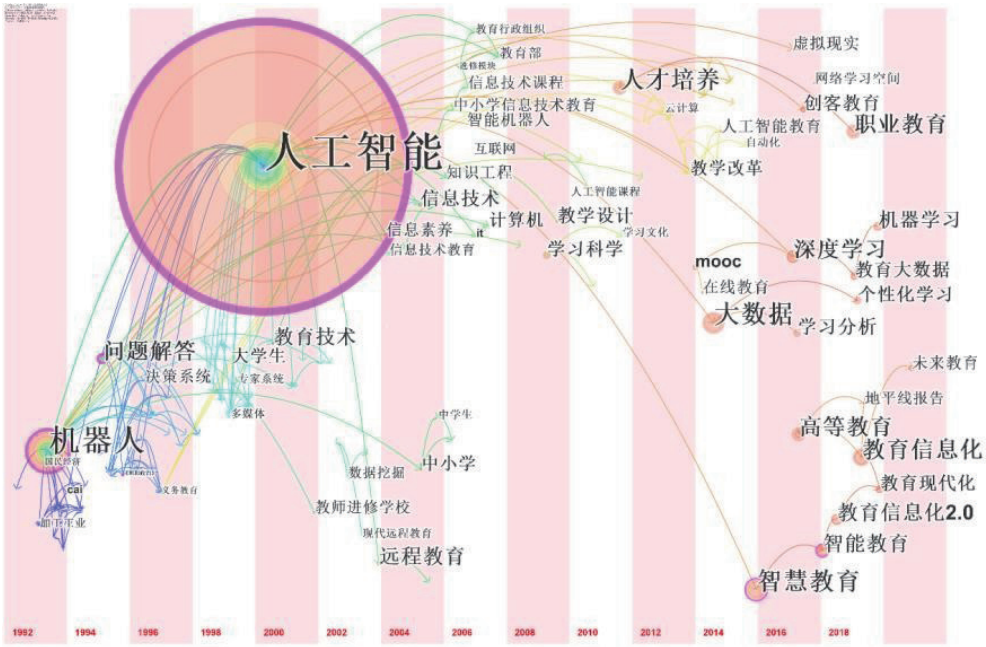


Figure 2 keywords time map from 1992 to 2019

In figure 2, the circle represents the node, whose size is proportional to the occurrence frequency, and the higher the frequency, the greater the centrality. Meanwhile, according to the trend, color and year location of the line between nodes, the research status of 27 years can be divided into seven clusters: the initial development stage of artificial intelligence centered on robotics; research and development stage of multimedia application and expert system in higher education; assist in data mining of primary and secondary education and teacher training; curriculum reform led by information technology curriculum reform supported by educational administration; the teaching reform of maker education and vocational education under the influence of artificial intelligence; MOOC, deep learning and personalized learning supported by big data; research on intelligent education and educational informatization construction with higher education as the main research institution.

First cluster: France a robot in the web site will replace the 3 million jobs, in the 90 s, the "863 plan" to promote the robot research and development in China, first started with all kinds of processing industry, since Deng Xiaoping put forward the importance of computer education, education industry began to attach importance to the study, based on the application of artificial intelligence technology in the education gradually officially launches the research, such as problem-solving, decision-making system, multimedia, type 1 in table 1 in this part of the research content distribution. The second cluster: the first theoretical research mainly starts from the university. Due to the professional characteristics and nature of education technology, it pays more attention to intelligent education. The content of this cluster mainly fits the type 4. The third cluster: mainly is the artificial intelligence to solve education fair, combined with distance education, and type 4, at the same time with close links to the second cluster. Fourth, five clusters: in 2003, the ministry of education issued the curriculum standard of ordinary high school technology to promote the development of Chinese elementary and middle schools information technology education and information technology courses, information technology education of primary and secondary schools, intelligent robot, information literacy, as well as teaching design, reflected in the intelligent education background, with information technology to promote curriculum reform; After 2010, in the fields of maker education and vocational

education, the model of talent training is also changing actively. These two clusters are in line with types 2, 3 and 5 in table 1. The sixth cluster: MOOC, deep learning, personalized learning, and learning analysis supported by big data. Based on big data technologies, the information, and data-driven decisions, provides the service for learning, artificial intelligence, such as MOOC online courses, personalized education, deep learning to provide a more reliable basis, the variety, and type 1 joint. Cluster 7: mainly promote the educational informatization and education modernization of research in colleges and universities, which is in line with category 6. Among them, since 2012, the literature data of smart education research has increased significantly, and smart education research is the focus of theoretical research.

Through the combination of table 1 and figure 2 can be found by cluster analysis of SPSS a map and the kinds of content is almost unanimously. It shows that the SPSS cluster analysis is reasonable and reliable.

RESULTS

By sorting out literature, statistical journals, sorting out literature data, using SPSS cluster analysis and mapping, it is concluded that Chinese artificial intelligence education mainly has 6 research topics. After analyzing the above contents, the following conclusions and Suggestions are drawn.

(1)Strengthen interdisciplinary cooperation and jointly promote theoretical development

Through cluster analysis of SPSS, the application of artificial intelligence in education in China is divided into six kinds of topics. Through the testing of the time map of keywords drawn by Citespace, the results are almost consistent with the clustering results. Research topics are broad and distributed in all stages of education. According to the discoveries of the source journals, which involves many periodicals, discipline, but mainly education technology professional, as a multidisciplinary intersection of artificial intelligence, in the application of education, from the support of multidisciplinary theory, will become a technology for technology, from the technical secondary education principle, as well as the technical problems such as improper use. In future research, multi-disciplinary cooperation should be strengthened to jointly promote the application of artificial intelligence in education and provide scientific theoretical guidance for artificial intelligence to enter the field of education.

(2)The development of artificial intelligence in education is driven by policy

At present, the application of artificial intelligence education in education in China belongs to the attention, but in the exploration, not a mature state. Domestic education despite the setting add artificial intelligence course, with artificial intelligence information technology of auxiliary course content, the curriculum reform, the use of artificial intelligence system, such as policy, but not detailed, comprehensive and is used on a large scale of artificial intelligence teachers team construction, curriculum construction of supporting system important content. To some extent, the application of artificial intelligence in the education system to cultivate talent development, the depth of integration of artificial intelligence and education. The development of Chinese education industry is policy-centered, and the government's attention and policy release are conducive to large-scale and general implementation. Government education departments have paid attention to the impact of artificial intelligence on society, and the education field is in urgent need of active

adaptation and reform. It is of great influence to improve policies and drive the development of artificial intelligence in education.

(3)Accelerating technological development and enhancing information security

In the previous article, part of the research topic is the application of artificial intelligence technology based on big data, which indicates that the development of technology has the status of fundamental construction. At present, the level of artificial intelligence technology can meet the normal teaching needs, personalized teaching, characteristic teaching, unique resource acquisition technology needs to be optimized and developed. Meanwhile, in the process of application, information collection, data cleaning, report generation, and other situations involving the privacy, personality, ability and other issues of students and teachers, so as to enhance information security and reduce and avoid moral and legal problems caused by information problems. Science and technology are a double-edged sword, artificial intelligence can promote the development of education, but it also can cause new educational problems. Accelerating technological development and increasing information security guarantee is to magnify and exert artificial intelligence to help education.

Conclusion

Artificial intelligence is the summary of the current information revolution and an important research hotspot in the field of education. The national, social and school levels only pay more and more attention to this, and artificial intelligence will become an important part of future school and future education. The application of artificial intelligence is not only simple technical support but also deep integration of artificial intelligence and education, beyond the tool itself, to empower education, which is the essence of the application of artificial intelligence in education.

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Clarification of the Problems that International Students in Japan Suffer

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Abstract: Recently, many foreigners, including international students, have come to Japan for some purpose such as working as an employee, studying Japanese, and so on. However, with an increase of foreigners, current problems among them are expected to occur more and more. This time my research focuses on international students because I have some friends who study Japanese as international students. Through conversations with them, I have also realized that problems which they have are not only related to their command of Japanese but also related to other reasons. Considering the situation and what I have realized, the purpose of this study is to clarify what kind of problem makes them struggle with living their life in Japan. To get some data, I interviewed international students studying at Nihon Fukushi University (NFU) to know what they think about their life and I did the same thing to international ones at other university to know the difference of support for them. I also used the governmental data to know the number of international students. As a result, most of foreign students think that Japanese classes they have taken are not practical enough to use in a daily life. Also support for them from school is not enough. Moreover, I found that they do not have somebody to talk with about their problems. Contemplating these results, I would like to correspond a cause for each problem that worsens their situation, and I will pursue what can improve those difficulties, observing the process.

Key word: international students, higher education, learning support

INTRODUCTION

Recently, many foreigners have come to Japan for some purposes such as working as an employee, studying Japanese and so on. Moreover, because of a new policy set up by Ministry of Education, Culture, Sports, Science and Technology-Japan (2008) called “Ryugakusei 30mannin Keikaku” (a plan for 300,000 international students), more and more international students are expected to come to Japan. However, currently there are some problems which make international students struggle, and due to that, their life in Japan seems to be getting very hard. Considering this vicious cycle, I would say that current problems will worsen if we do not try to change it. That is why I decided to focus on international students to clarify what kind of problems international students in Japan have suffered, to find out what can improve them.

METHODS

To make my research concrete, I interviewed international students, studying not only at Nihon Fukushi University but also at different universities, to know clearly about what they feel good and what they struggle in their life. Furthermore, as one of the practitioners, I have conducted a special class once a week with some students to support international students regarding not only

their school life but also their daily life. It is also for knowing what kind of support they need.

RESULTS

After interviews with international students, I arranged results. While doing that, I found that some of results were the same as I expected, however, the other of them were unexpected. According to the results, almost all of them have a hard time for learning Japanese. Also most of them think that they have struggled in their life. On the other hand, some of them have not. There are a few concrete differences between them.

DISCUSSION

To deepen my research more, I reviewed results to know what component distresses them. The main one is that their financial situation. Mentioned previously, since most of them have to earn enough money for their livings, they have to do a part time job, sacrificing their free time. Due to that, they cannot spend time studying Japanese or doing homework. The harder and longer they work, the less time for studying becomes. Another component discomforting them is that they do not know how to study outside school. In other words, instruction from school after classes. Sometimes 90 minutes inside the class are not long enough to understand what teachers teach them, hence they need time to review the contents. Nevertheless, they do not how. Although they have homework, they cannot even do it themselves because of its difficulty. It might be possible for them to learn well outside school if they can take time for that. However, they cannot do it because of working.

CONCLUSION

Considering these elements, I clarified the problems international students suffer. They are strongly related to their financial situation and their way to study. However, since it is difficult for them to change their financial situation quickly, I would say that we need to consider how we will make them effectively understand the contents of classes to help them do their homework easily. Also for making them study in a better way outside school, we need to tell them clearly about how they can achieve their tasks or tools for learning such as applications or Social media.

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The Aspiration and Challenges of ICT Enabled Higher Education in Ethiopia: The Case of Addis Ababa University

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Abstract: Efficient use of information and communication technology (ICT) has been considered as a key factor for economic growth and productivity for it contributes to knowledge accumulation and technology advancement (OECD 2014). It is believed that the utilization of ICT has the potential to expand the opportunities of education access and to improve education quality. However, most of the research are discussed in a relatively developed context where adequate infrastructure including electricity and internet connection are ensured. As a result, although inadequate infrastructure is identified as a major obstacle for ICT application in education in developing countries by existing research, the fundamental influence of how this obstacle influence the way and the efficiency of ICT application, which ultimately limit the contribution of ICT to education change, is undermined. This research explores the specific situation of ICT utilization in higher education of Ethiopia with Addis Ababa University as the case in order to figure out the challenges to achieve ICT enabled higher education for increasing higher education accessibility and quality in the context of a low-income country.

Key words: ICT, Higher education, Ethiopia, Aspiration, Challenge

INTRODUCTION

Efficient use of information and communication technology (ICT) has been considered as a key factor for economic growth and productivity for it contributes to knowledge accumulation and technology advancement (OECD 2014). In order to seize the opportunities of the digital age, ICT initiatives are carried out by international organizations and national governments in both developed countries and developing countries. In developing countries, efficient utilization of ICT in all fields of the society is considered as a significant way for the leap forward of national development. This is especially the case in the higher education sector for it bears the responsibility of knowledge production, talent training, and innovation.

The application of ICT in higher education has been discussed for decades. It is believed that the utilization of ICT has the potential to expand the opportunities of education access and to improve education quality (Khan et al., 2012; Nwosu and Ugbomo 2012). Research suggests that ICT is potentially a powerful tool to expand education access for underserved groups through providing access to distant learning resources, increasing the motivation and engagement of learners, and improving teacher training (Tinio 2003). Regarding the function of improving quality education, ICT application is expected to fulfill the function mainly through compensating the low teacher-student ratio (Ministry of Education 2015) and bringing about

transformative changes on the process of teaching and learning (Watson 2006).

However, most of the research are discussed in a relatively developed context where adequate infrastructure including electricity and internet connection are ensured. As a result, although inadequate infrastructure is identified as a major obstacle for ICT application in education in developing countries by existing research (Mikre 2011; Kozma and Isaacs 2011; Moges 2014; Karunaratne, Peiris and Hansson 2018), the fundamental influence of how this obstacle influence the way and the efficiency of ICT application, which ultimately limit the contribution of ICT to education change, is undermined. Furthermore, although the way how the application of ICT brings about transformative change on teaching-learning process has been discussed more in current literature, the way how ICT utilization compensate the inadequate facilities and teachers is more of an issue in the context of developing countries. The focus of ICT application in education in developing countries should be how to use ICT to compensate their shortage in their education system. This includes the lack of teachers and necessary equipment for teaching (Mikre 2011)

This research explores the specific situation of ICT utilization in the higher education sector in Ethiopia with selecting Addis Ababa University (AAU) as the case in order to figure out the challenges to achieve ICT enabled higher education for increasing higher education accessibility and quality in the context of a low-income country. It aims to investigate how the limitation of infrastructure influences the efficiency of ICT application in higher education. It first reviews the situation of higher education in Ethiopia to figure out the problem and the motivation and expectation for Ethiopia to apply ICT in higher education. Then, a case study on AAU is conducted with attention on ICT utilization for regular education programs and distance education programs. Semi-structured interviews and participant observation are adopted as the methods to conduct the case study.

PROBLEM STATED IN THE CONTEXT OF ETHIOPIA

As one of the low-income countries identified by the World Bank, Ethiopia has paid efforts on poverty elimination and economic growth, aiming to transfer into a middle-income country by 2025 to 2035 (Ministry of Finance and Economic Development 2006). Higher education is believed to be a pivot that contributes to economic growth and poverty elimination through labor force development, knowledge production, and knowledge utilization in local contexts especially in low-income countries in Africa (World Bank 2009). The secular concept of higher education was introduced into Ethiopia in 1950s with the establishment of university college of Addis Ababa (Bishaw and Melesse 2017). Although higher education expanded since 1975, featuring by the establishment of postgraduate programs, research institutes and junior colleges (Bishaw and Melesse, 2017), during the Derg regime, the radical socialist political, social, and educational polices of the regime actually alienated students from universities (Teshome 1979). In early 1990s, higher education institutions in Ethiopia, overloaded and with low research capacity, concentrated in a few regions. The whole education system was featured by the problems of relevance, quality, accessibility and equity and the shortage of facilities, materials and teachers (Ministry of Education 1994).

Many of the problems remain in the sector of higher education with new problems arising, although the government has committed to improve the whole education system during the past decades. Despite the rapid expansion of the number of higher education institutions, facilities,

qualified academic staff, student enrollment and graduation rate, universities in Ethiopia still face the problems of insufficient supplies of teaching and learning materials and equipment, limited access to ICT facilities, equity in terms of opportunities, and unsatisfactory quality of education (Ministry of Education 2018). To align with the national strategy of transferring into a middle-income country by 2025, the higher education gross enrollment rate should reach at least 22% while the current gross enrollment rate is 10.2% by 2015/2017. The supply of qualified teaching staff is far behind the growth of student enrollment rate which hinders both the increase of gross enrollment rate and the quality of education (Ministry of Education 2015).

The potential of ICT utilization as a mean to address the problems of education accessibility and quality is valued by policy makers in Ethiopia. The application of ICT in education is considered as a way to compensate the shortage of resources, as a tool to equip students with skills and technologies that the country will need in the future, and a mean to improve teaching and learning (Ministry of Education 2015). In the Pastoralist Area Education Strategy, distance education is identified as an important component for improving education accessibility especially in pastoralist areas (Ministry of Education 2009). Especially in higher education, the proposed Ethiopia Education Development Roadmap 2018-2030 suggests expanding open, continuing, distance, and online education in order to increase student enrollment rate. Computer literacy to prepare students with skills needed in workforce and ICT enhanced teaching and learning are emphasized to improve the quality of education (Ministry of Education 2018).

However, despite the ambition of the policy makers on applying ICT to improve higher education in Ethiopia, few evidence demonstrates that ICT has efficiently addressed problems arose from the teaching-learning process in the universities of Ethiopia (Alemu 2015). The lack of basic infrastructure, including the supply of power and the connectivity of internet, and well-trained qualified teachers are identified as major obstacle of ICT utilization universities in Ethiopia (Mikre 201; Moges 2014). The following section explores the case of AAU, focusing on ICT utilization for expanding education accessibility in terms of distance education, computer literacy and ICT enhanced teaching and learning process, in order to figure out the reality and challenges. Specific research questions include (1) how is distance education planned and implemented in AAU? (2) how are smart classrooms used in AAU?

RESEARCH DESIGN & METHODS

In this case study, AAU is selected as a critical case (Yin 2017) to explore the reality and challenge of ICT enabled higher education in Ethiopia. Located in the capital city Addis Ababa, as the oldest and most renowned university in Ethiopia, AAU is believed to reflect the features of highest level of infrastructure and resources of Ethiopian universities. Based on the current infrastructure distribution and higher education financing situations, AAU has the previledge to integrate resources. The communication infrastructure in Ethiopia is featured by an imbalance distributing of concentrating mainly around Addis Ababa (Sani, Tasisa, and Panigrahi, 2013). Higher education institutions in Ethiopia rely largely on government funding which allocate resources according to student and staff population, discipline aggregation, etc. (Ministry of Education 2018). As a large university with 47,610 students, 8,709 staff, 14 campuses, 70 undergraduate and 293 graduate programs, AAU also has the advantage on obtaining public financing from the government.

Based on existing research, the hypothesis of this research is that the lack of basic infrastructure,

including the supply of power and the connectivity of internet, and well-trained qualified teachers are major obstacles of ICT utilization in universities in Ethiopia. This research conducts semi-structured interviews and participate observation in the case study to explore what factors hinder ICT utilization in AAU and how these factors affect ICT enabled higher education in AAU.

ICT enabled higher education in AAU involves major actors including the ICT Directorate, the Continuing and Distance Learning Office, and Addis Ababa Institution of Technology (AAiT). Among them, the ICT Directorate plays a significant role in providing necessary infrastructure for ICT enabled higher education in AAU. The Continuing and Distance Learning Office coordinates the distance education programs organized in respective schools or colleges. While AAiT is the unit that requires deeper knowledge on ICT and one of the schools that has large demands for distance education. Situated in AAU, the relationship among the key actors in ICT enabled education is relatively clear. Hence, semi-structured interviews (Ayres 2008) are conducted to understand the whole process of distance education planning and implementation and the utilization of smart classrooms in AAU. Interview questions are open-ended and based on the hypothesis of this research.

Purposeful sampling, in which information-rich cases are selected for generating in-depth data rather than empirical generation (Patton 2002) is used to as the sampling strategy. More specifically, quota sampling which allocates quotas to each category (Morgan 2008) is adopted to select interviewees. Key informants from the ICT Directorate, the Continuing and Distance Learning Office, and Addis Ababa Institution of Technology, as well as their collaborators, are selected as interviewees.

Participant observation with an overt insider position (McCurdy & Uldam 2014) is adopted to explore the way how smart classrooms are planned for utilization and actually used in the practice of teaching and learning in AAU. As a visiting scholar in AAU who uses smart classrooms and a representative of the International Center for Higher Education Innovation under the auspices of United Nations Educational, Scientific and Cultural Organization (UNESCO-ICHEI) to oversee the smart classroom project implemented in AAU, the researcher is both a participant and an overt observer. More specifically, the researcher's position as a visiting scholar who uses smart classrooms helps understand the challenges of smart classroom planning and potential demands for smart classroom implementation. Similarly, the researcher's position as a representative of the UNESCO-ICHEI to oversee the smart classroom project provides the privilege to obtain the access to investigate issues related to smart classroom planning and utilization.

RESULTS

1. Distance Education

According to Webb and Cox (2004), the application of ICT in education is either through synchronous or asynchronous media. The former requires participants to learn simultaneously through different ends or even at different location. While the latter allows participants to learn at different times and locations (Webb and Cox 2004). There are 11 distance education programs at Master level in AAU. Driven by market demands, most of them are business and technology related disciplines. Distance education programs are conducted with the application of

asynchronous media. Although there are more than 25 interactive touch boards in AAU, few of them is actually used for distance education programs. In the current mode, each course consists of self-learning session and a 16-hour face-to-face tutorial session. Instructors mainly allocate course materials through emails or handouts to students for self-learning. Students submit assignments through email or during the face-to-face session.

With the application of merely some types of asynchronous media as a supplement to face-to-face tutorials, the current distance education mode adopted in AAU not only prevents ICT application from truly transforming the teaching-learning process, but also raises concerns about quality education. In the current mode, ICT is used as a supplement channel to face-to-face communication to distribute learning materials to students. It has not reached the real the teaching-learning process. Instead, it substitutes part of the face-to-face communication with a non-interactive way. That requires high level of self-learning ability of students which cannot be ensured. As a result, the current mode of distance education in AAU shares the features with correspondent education. No evidence shows that the quality of distance education could be compared to those of regular education programs.

Administrators and instructors show the aspiration to make full use of technology to transform the existing mode of distance education into an interactive way with synchronous media which allows simultaneous instruction and support for learners and minimize the isolation of learners, in order to truly affect the teaching-learning process. However, this aspiration is hindered by the inadequate infrastructure supply, especially the insufficient supply of internet connection. The national insufficient supply of electricity is compensated by the supply of power generators for academic activities in AAU. Nevertheless, the unsteady internet connection appears to be a major obstacle for the utilization of synchronous media in distance education programs in AAU.

The insufficient supply of internet connection affects the implementation of distance education program in AAU in a more profound way than merely limiting the operation of ICT equipment. The application of new technology requires the transformation of people's mindset which implies a long process. This process is especially difficult in the situation of inadequate infrastructure support for the operation of ICT equipment. The technical support unit attributes the insufficient usage of ICT in distance education program to the lack of skills of instructors and their unwillingness to learn new technologies. Indeed, the lack of well-trained skilled instructors, as identified in existing research, is an obstacle for ICT application in distance education programs in AAU. However, this research furtherly shows that inadequate infrastructure support makes this situation more difficult as it restrains the full expression of the advantages of ICT application to prospective users, especially the instructors who are expected to play a significant role in ICT application. Thus, the potential instructors' willingness to learn new skills for ICT application and mindset transformation are hindered by the insufficient infrastructure support. Meanwhile, computer literacy among students restrained by insufficient infrastructure supply affects the transformation of students' mindset in a similar way as how it affects instructors.

2. Smart Classrooms

Smart classrooms are expected to play a significant role in both distance education and regular education programs in AAU although the specific functions of them varies in different type of programs. In an enhanced mode of distance education programs in expectation, the smart classroom is first expected to diversify the types of asynchronous media used for delivering

courses. In addition to email communication, the smart classroom could provide conditions for producing Massive Open Online Courses (MOOCs) to compensate the current self-learning mode with necessary instruction, thus improving the quality of self-learning. With the application of synchronous media supported by the smart classroom, the face-to-face tutorials in the current mode could be replaced by teleconferencing which facilitates teacher-student communication in a synchronous way.

For regular education programs, smart classrooms are believed to be a tool to compensate the problem of insufficient supply of teachers especially for engineering related subjects. Due to the 70/30 strategy of discipline mix since 2008, 70% of college students are allocated in science and technology related disciplines each year. As a result, the lack of teachers appears as a salient problem especially in science and technology related disciplines. Furthermore, instructors in AAU usually have the obligation to support regional universities where the supply of resources and personnel is limited compared with those in the capital city Addis Ababa. This makes the problem of insufficient supply of teachers more sever. Smart classrooms are expected to compensate the insufficient supply of teachers with MOOCs and synchronous media for simultaneous communication for the teaching-learning process.

In practice, smart classrooms in AAU are only used for courses at Master and Doctorate level as the supply of smart classrooms is not sufficient to cover undergraduate students. For postgraduate students are more likely to be university teachers giving the fact that a large number of university students in Ethiopia are still taught by teachers with a Bachelor degree (Ministry of Education 2015), prioritizing postgraduate students to use smart classrooms helps to equip future teachers with necessary ICT skills for teaching-learning process. This will pave the way for transforming the mindset of future teachers to adopt ICT in education. However, due to the inadequate infrastructure and the lack of skilled instructors currently, technologies have been used fully as the interactive function of touch boards is not used.

Facing the problem of insufficient supply of smart classrooms, AAU is actively cooperating with enterprises to build enterprise-supported academies on campus. Currently, AAiT Cisco Networking Academy and AAiT Huawei Network Academy operates in AAU. These enterprise-supported academies not only ease the insufficient supply of equipment and hardware, but also compensate the situation of lacking teachers, especially well-trained teachers, by providing extra-curriculum trainings to bridge the gap between university knowledge and industry needs.

CONCLUSION

Research on ICT application in higher education originates from the context of relatively developed countries where basic infrastructure is ensured. As a result, existing research focuses more on how to use ICT smartly to enhance teaching and learning, taking workable ICT with sufficient supply of infrastructure for guaranteed, rather than exploring how ICT application could be possible in a less ideal environment. Although current research increasingly pays attention to the situation in developing countries and concerns the limitation of insufficient supply of infrastructure, it fails to address how the insufficient supply of infrastructure affect ICT application beyond the dimension of infrastructure.

In the reality of AAU, the insufficient supply of infrastructure actually influences the efficiency of ICT both at the initial stage and in the teaching and learning process. Poor internet connection

is inadequate to support the full exertion of the functions of ICT equipment. Furthermore, the inadequate infrastructure support restrains the full expression of the advantages of ICT application to prospective users including both instructors and students. As a result, the potential users' willingness to learn new skills for ICT application and mindset transformation are hindered by the insufficient infrastructure support.

The most practical goal for developing ICT enabled higher education in Ethiopia from the level of the education system should be applying ICT to compensate the problem of lacking qualified teachers, rather than the aspiration of adopting ICT as a tool for the leap forward in education. The current problem rising from reality is how to use ICT properly and smartly in order to supplement the current supply of resources in a way that would not lower the quality of education.

However, it does not mean that applying ICT in higher education to bridge the "digital divide" (National Telecommunications and Information Administration 1999) or even to achieve the goal of leaping forward in Ethiopia is impossible. University-industry cooperation for ICT application in higher education appears to be a potentially win-win strategy for ICT enabled higher education. On the one hand, enterprises will benefit from market opportunities stemed from their efforts to bridge the "digital divide" as their upgrading requires the market from developing countries (Chambers 2016). Thus, cooperating with universities to improve the talent ecosystem to bridge the gap between university knowledge in Ethiopia and industry demands (Huawei n.d.) will ultimately cultivate market demands and reputation for enterprises. On the other hand, universities will benefit from the hardware and cutting-edge technologies from enterprises to supply its shortage of infrastructure, equipment, knowledge, and well-trained instructors.

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04

Chapter 4:

Machine Learning

Research on the Application of Blended Learning Oriented by Computational Thinking

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Abstract: The cultivation of computational thinking is the focus of computer education.Studies have shown that learning approaches are able to promote the developments of computational thinking on students, including cooperative learning, project-based learning, online communication, Academic dialogue etc. Therefore, these learning approaches can combine with the traditional teaching in a more effective way. Blended learning may promote the developments of computational thinking on students. The paper takes the junior College students as the experimental objects, and carries a pretest-posttest study through unequal experimental and control groups. It approved that blended learning has a positive impact on the college student's computational thinking, i.e., they have an obvious progress.

Key words: Blended learning; Computational thinking; Computational thinking trend; Skills of computational thinking

INTRODUCTION

First of all, the author took the problems in the teaching practice of computer foundation course for computer majors in colleges, including: the training target of the curriculum is very difficult to implement; the teaching content is not updated in time, and its structure is not reasonable; the quality resources for personalized learning are inadequate; the interaction in classroom teaching is insufficient, leading to the low class participation; the teaching evaluation form is single, difficult to play the role of promoting teaching, etc. Then it constructs a Blended Learning model based on computational thinking. It is composed of five aspects: teaching content, teaching resources, teaching environment, teaching activities and teaching evaluation.

Firstly, it is a general way to develop students' computational thinking in subject teaching. However, it still needs further investigation as in what way we can positively integrate developing computational thinking with subject teaching. So far, a large body of research at home and abroad indicated that cooperative learning, project-based learning, online communication, problem-based learning, design-based learning, academic dialogue are effective teaching and learning modes to foster learners' computational thinking.

Based on existed research, relying on course materials, present study will adopt a combination

of teacher instruction, academic dialogue & presentation and group-based project cooperative learning in teaching. In addition, off-line academic dialogue in real classroom will be conducted together with on-line distant courses. Through all these teaching-learning modes, students are supposed to learn and apply the basics of programming and design of information management system in real practice. Further, with teachers' instruction facilitating learners' understanding of basic principles of the subject, this study attempts to investigate the effectiveness of blended learning approach in developing learners' computational thinking ability.

CONCEPT DEFINITION

1 Computational Thinking

Computational thinking (CT) is being located at the focus of educational innovation, as a set of problem-solving skills that must be acquired by the new generations. Professor Seymour Papert of the MIT first proposed the concept of computational thinking in 1996. Jeannette Wing, went back in 2006, who is calling for teaching Computational Thinking (CT) as a formative skill on par with reading, writing, and arithmetic places computer science in the category of basic knowledge. In 2012, the United States media lab at the Massachusetts institute of technology (MIT) Lifelong Kindergarten Group has developed a three-dimensional framework of computational thinking. It includes three dimensions: computing concept (refers to the concept used by designers during programming), computational practice (refers to the designer in programming in the development of practice), and computational perspectives (refer to the designers to form about the world around them and their own ideas).

2 Blended Learning

Blended Learning is a new way of learning, in Curtis J. Bonk's "THE HANDBOOK OF BLENDED LEARNING", a blending was defined: a Combination of Face-to-face Instruction with Online Learning.

Blended Learning, is that to put together the advantage of traditional classroom teaching and the network teaching. In other words, B-learning merges the advantages of both E-learning and traditional classroom teaching, and it has not only give play to teacher's initiative function but also reflected student's subject status. Blended Learning is the focus of educational technologies at present.

RESEARCH METHODS

What this research adopts are measurements before and after intervention of an experimental group and a compare group, supplemented by a qualitative research of the related literature. To explore how to effectively use Blended Learning to promote students' development of computational thinking ability. A quasi-experimental was conducted with two classes of juniors, course selection for "management information system". And then, with one randomly identified as the experiment group (the number of 53 people), and the control class (the number of 56 people). The only difference is that the Blended Learning method is applied in the experiment class while in the controlled class the traditional teaching method is employed. The whole data was analyzed by independent sample t-test. And the analysis of the students' homework, classroom performance, based on social software virtual learning community of the non-real-time online communication data such as text analysis, which the deficiency of studies

can be avoided. Computational thinking skills scale with a reference on WGCTA (Watson-Glaser Critical Thinking Appraisal) scale. Computational thinking tendency scale reference CCTDI (California Critical Thinking Disposition Inventory) scale. Depending on Learning in experimental classes, the study mainly included: lectures, accounts for about 40% of the total teaching hours; Based on collaborative project of group learning that accounts for about 30%; asynchronous online communication accounting for 15%; academic dialogue and show, accounting for 15%.

EXPERIMENTAL RESULT

1 pre-test results analysis

Experimental class and control class students took computational tendency test and computational thinking skills test, and the results are as follows.

The experiment results show no significant difference between experimental class and control class in terms of computational thinking tendency. Fig.1 shows that scores of two classes are just over 280 points, indicating that students tended to hold a positive but not strong attitude towards the thinking tendency. As seen in Fig. 2, T = 0.944, P = 0.334 > 0.05, no significant difference in calculation thinking are found between the two classes before the experiment.

	Class	N	Mean	Std.Deviation	Std.Error Mean
Tendency to pretest	experiment class	53	282.56	19.346	3.236
	control class	56	288.38	24.351	4.524

Fig. 1. Group Statistics

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	*Sig.*	*t*	*df*	*Sig.* (2-tailed)	Mean Difference	Std.Error Difference	Lower	Upper
Tendency to pretest	Equal variances assumed	1.541	0.219	-0.944	58	0.334	-5.719	5.873	-17.475	6.038
	Equal variances not assumed			-0.966	52.931	0.339	-5.719	5.922	-17.596	6.159

Fig. 2.Independent Sample t-Test

The experiment results show no significant difference in computational thinking skills between experimental class and those of control class. Fig.3 showed that the average of computational thinking skills scores for the experimental class was 48.8 (sd 5.01), and 47.44 (sd 5.91) for comparative class, indicating that both classes are relatively low in computational thinking skills. As seen in Fig.4, T = 0.961, P = 0.340 > 0.05, there was no significant difference between two classes in calculation thinking before the experiment.

	Class	N	Mean	Std.Deviation	Std.Error Mean
Skills to pretest	experiment class	53	48.8065	5.01610	0.90013
	control class	56	47.4483	5.91358	1.09712

Fig. 3. Group Statistics

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Skills to pretest	Equal variances assumed	0.108	0.743	-0.961	58	0.340	1.35818	1.41256	-4.46938	4.18573
	Equal variances not assumed			-0.956	55.086	0.343	1.35818	1.42040	-1.48827	4.20462

Fig. 4.Independent Sample t-Test

2 post-test results analysis

Experimental classes and control classes students took computational tendency test and computational thinking skills test respectively, and the results are as follows.

The experiment results show no significant difference between experimental class and control class in terms of computational thinking tendency. Fig.5 shows that the average for experimental classes in posttest was 312.81(standard deviation by 25.34) and 295.52(sd 25.96) for control classes. The experimental class is higher than that in comparative classes. It can be deduced from the picture that Blended Learning can improve students' learning outcomes, help fostering their cooperation spirit as well as computational tendency and new ideas. As seen in Fig.6, T = 2.610, P = 0.012 < 0.05, according to the statistics and analytical results of post-test, remarkable difference were found between experimental class and control class, suggesting that students in experimental class have a strong tendency for computational thinking.

	Class	N	Mean	Std.Deviation	Std.Error Mean
Tendency to post-test	experiment class	53	312.8065	25.34266	4.55160
	control class	56	295.5172	25.95811	4.82032

Fig. 5. Group Statistics

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Tendency to post-test	Equal variances assumed	0.104	0.748	2.610	58	0.012	17.28921	6.62428	4.02928	30.54914
	Equal variances not assumed			2.608	57.515	0.012	17.28921	6.62967	4.01610	30.56232

Fig. 6.Independent Sample t-Test

The experiment results show a significant difference between students of experimental class and those of control class in computational thinking skills. From Fig.7 shows that the average score of computational thinking skills for experimental class students was 50.96 (sd 4.51), 47.58 (sd 5.46) for comparative class, So the experimental class level is higher. It can be inferred that Blended Learning can facilitate development of students' computational thinking skills. As seen in Fig.8, T = 2.621, P=0.011 <0.05, showing a significant difference between two classes in posttest.

	Class	N	Mean	Std.Deviation	Std.Error Mean
Skills to post-test	experiment class	53	50.9617	4.51283	0.81053
	control class	56	47.5863	5.46101	1.01408

Fig. 7. Group Statistics

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Skills to post-test	Equal variances assumed	0.599	0.442	2.621	58	0.011	3.38154	1.28993	0.79946	5.96361
	Equal variances not assumed			2.605	54.458	0.012	3.38154	1.29820	1.29820	5.98377

Fig. 8.Independent Sample t-Test

3 Text Analysis

Qualitative analysis of the virtual learning community post situation. It points out that students to post content mainly around the classroom teaching and learning mode of heavy difficult problem. Average each thread reply all above five, interaction is very frequent, is to ask questions and interpretation, for example, specification, certificate, etc. Students explore is essentially to calculate with the thinking mode of the academic conversation.

4 Observation Analysis

It points out that blended Learning can obviously promote and improve the cultivation of students' computational thinking ability and overall quality. Experimental classes students more active classroom performance .Experimental classes' students are more proactive in classroom performance. Experimental classes' students work more diversely.

RESEARCH CONCLUSION AND SUGGESTION

1 Conclusion.

Firstly, this thesis draws the conclusion according to the analysis of experimental data. Effective Blended Learning can promote students' development of computational thinking, enhance students' interests in learning, help students build knowledge and improve students' computational thinking skills.

2 Suggestion

In order to promote the development of student computing thinking, you must ensure that Blended Learning effectively. For this purpose I put forward some related suggestions.

First, Blended Learning should encourage and guide students to find problems, solve problems, and can according to the background of the problem, using the logic to analyze the collected data, based on the point of view to explain and judge. Second, we should make a variety of

ways of teaching and learning really need each other and complement each other, that is the integration, rather than piece together. Last but not least , teachers need to have a certain thinking spirit and the calculation of thinking skills. Taking a variety of means to create computational thinking in the process of learning and teaching atmosphere.

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Using Brainwaves to Understand Learner Activities in Different Types of Learning Materials

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Abstract: The major disadvantage of cognitive learning theory as opposed to behavioral learning theory is that human thinking could not be observed. The study on electroencephalogram (EEG), an electrophysiological monitoring test, to record electrical activities of the brain, is expected to complement the cognitive learning theory which could not be observed in the course of learning. The purpose of this study is to investigate how the frontal lobe region of brain, which is related to learning, projects different brainwaves according to different types of learning materials.

Brainwaves using EEG were monitored for 5 minutes when learners were studying different types of learning materials: text, audio, captioned video, and captionless video. Text material showed the highest frequencies in beta waves compared with sound and captioned video clips. Theta and alpha waves for captioned video were higher compared with video only materials. The results of this study provide possibility of using EEG as a research tool for understanding human learning in terms of cognitive approaches.

Key words: brain waves, electroencephalogram (EEG), learning material, text, video, captioned video, sound

INTRODUCTION

Cognitive learning theory was an alternative for behaviorist approach to explain human process in acquiring knowledge. However, the tradeoff was that the human thinking process could not be directly observed. The study on electroencephalogram (EEG), an electrophysiological monitoring test, to record electrical activities of the brain, could be used to complement the cognitive learning theory.

Since the 1950s, research on the human brain has been conducted by biologists and surgeons, and research findings from neuropsychology and physiological psychology have been applied to the education (Bogen, 1969). While different opinions exist, some common findings on brain waves have been revealed. Major brain waves are delta waves, theta waves, alpha waves, beta waves, and gamma waves, in the order of frequency ranges (Das, 2017).

Delta waves (0.5-3 Hz) are generated in deep meditation and dreamless sleep, when there is no external concern. Delta waves are found in infants and children, and decrease when aging. Theta waves (4-8 Hz) are found in sleep and meditation. They are also measured during short term memory tasks and memory retrieval. Alpha waves (9-12 Hz) are dominant when minds are quiet with flowing thoughts. If people get stressed, excessive beta and little alpha waves may occur, which is called "alpha blocking" phenomenon. They are believed to reduce stress and anxiety. Beta waves (13-39 Hz) are related to waking state of consciousness, such as problem solving, judgment, decision making, and etc. They are further divided into 3; Beta1 (13-15 Hz), Beta2 (16-22 Hz), and Beta3 (23-40 Hz). Gamma waves (40-100 Hz) are dominant when information from different brain areas is processed simultaneously. They involve higher cognitive processes and are important in learning, memory, and information processing.

Many on-line and off-line courses use multimedia materials for learning which include texts, graphics, and audio to deliver instructions. Multimedia principle suggests that the contents presentation to learners should be conducted through mix of modality rather than just written texts (Reed, 2006). Dual Coding Theory (Paivio, 1969), Multimedia Theory (Mayer, 2001), and Multimodal Theory (Engelkamp, 1998) are some theories that support multimedia learning. Information presented in a visual or audio-visual format enhances comprehension and retention (Baggett, 1984; Kozma, 1991). However, whatever format a medium might be, it is prone to passive learning, where learners are mere receptors of information delivered to them (Florida State University, 2011). Without proper learning strategies, multimedia materials might even be less supportive than text materials.

The purpose of this study was to investigate how the frontal lobe region of brain, which is related to learning, projects different brainwaves according to different types of learning materials, such as text, sound, captioned video, and captionless video clips.

RESEARCH DESIGN & METHODS

The students participating in this study were 20 middle school students; 9 male and 11 female students. All of these students were healthy students who have correctly understood the purpose of the study and actively participated in the study. All students participating in the study were right-handed, and the level of academic achievements in class was above average.

1) Measurement of EEG

Researchers used BTS-2000 (Laxtha Inc, Korea) which is a hair-band type two-channel EEG device to measure real-time EEG activities of the subjects. The analysis software was TeleScan ver.3 (Laxtha Inc., Korea). The power spectrum was transformed into the frequency domain and used for quantitative analysis in order to facilitate the analysis of the time series signal which changes with time. Electrodes were measured by monopolar derivation on two forehead surfaces. The electrodes were positioned at the Fp1 and Fp2 area of the prefrontal lobe suggested by the 10/20 international electrode system.

Learning materials were presented to subjects with different contents on the theme of the Fourth Industrial Revolution to avoid learning effects by repetition. The materials were checked by 3 teachers to insure equivalent difficulty level and overall similarities.

2) Experimental procedure

The experimental procedure was as follows: 1. A brief explanation of the experiment and installation of the experiment device (20 minutes) 2. Subjects rest in stable state (5 minutes). 3. Presentation of each learning material, and what subjects understood (5-minutes). 4. Thoughts about learning materials (5 minutes) <Table I>.

<Table 1> Procedure of Experiment

Presented learning materials	Type of learning materials	Time	Measurement condition
1. Experimental preparation	Explanation of experiment and installation of experiment device	20 minutes	
2. Stable state	Eyes closed in stable state	1 minutes	Stable state with eyes closed
Relaxation and learning (5 minutes)			
3. Awakened state	Sitting still with eyes opened	1 minute	Stable state with eyes opened
Rest and review of learning contents (5 minutes)			
4. Text material		2 minutes	Presented in printed paper
Rest and review of learning contents (5 minutes)			
5. Audio material		2 minutes	Listening only with eyes closed
Rest and review of learning contents (5 minutes)			
6. Captioned video clip		2 minutes	Watch
Rest and review of learning contents (5 minutes)			
7. Captionless video clip		2 minutes	Watch
Checking learning contents and thoughts about each of the learning material presented (5 minutes)			

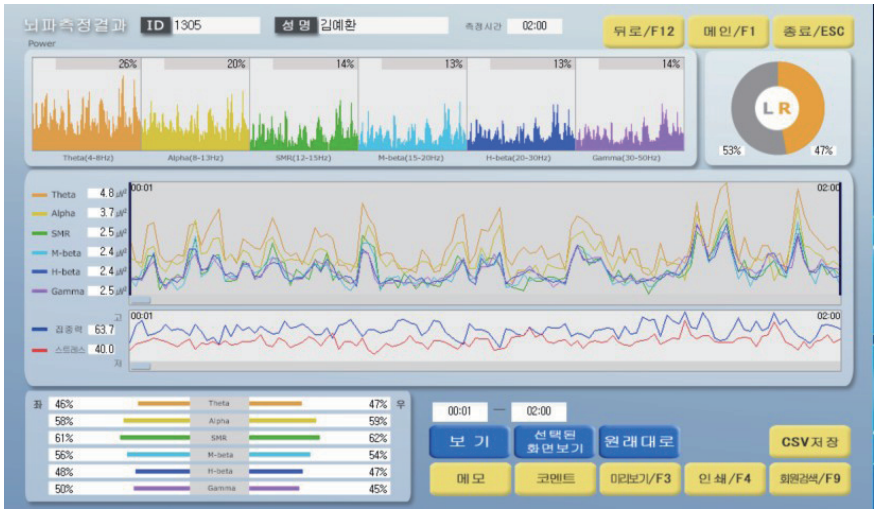


Figure 1. Screen capture of EEG measurement.

2) Data analysis

Paired t-tests were performed to compare mean scores of two different materials with SPSS 24.0.

RESULTS

To study if there is a difference in the learner's brainwave activities depending on the learning materials, the researchers ran a paired t-test for each learner's brainwave activity, including text, sound, captioned video clip, captionless video clip.

As results, means of beta1 waves (t=2.3368, p<.05) and beta2 waves (t=2.2460, p=.0368 <.05) were significantly higher when compared with text and sound material. Means of theta (t=2.6514, p<.05), alpha (t=3.1436, p<.05), and beta1 waves (t=2.7597, p=.0125 <.05) for text were higher when compared with captioned video. The means of theta (t=2.3061, p=.0325 <.05) and alpha waves (t=-2.0939, p=.0499 <.05) for captioned video were higher compared with those of video only.

Table 2. t-test results of the comparison of brain wave means.

Materials	Brain waves	Mean	SD	t	p
Text	Beta1 μV^2	3.2850	1.4550	2.3368	0.0306
Sound only		2.3450	1.0689		
Text	Beta2 μV^2	3.1350	1.1600	2.2460	0.0368
Sound		2.3700	1.0322		
Text	Theta μV^2	5.8850	1.7590	2.6514	0.0158
Captioned video		4.9100	1.4739		
Text	Alpha μV^2	4.5183	1.3809	3.1436	0.0053
Captioned video		3.9712	2.1166		
Text	Beta1 μV^2	3.2850	1.4550	2.7597	0.0125
Captioned video		2.3450	1.0689		
Text	Alpha μV^2	4.6150	1.3417	-2.0940	0.0499
Captionless video		3.3550	1.6155		
Sound only	Alpha μV^2	3.5900	1.2264	-2.0939	0.0499
Captionless video		3.3550	1.6155		
Captioned video	Theta μV^2	43.5450	12.0225	2.3061	0.0325
Captionless video		49.8600	13.5616		

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05

Chapter 5:

AI in Humanistic

Research on Individualized Teaching Based on the Integration of Artificial Intelligence and Multiple Intelligences*

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Abstract: In recent years, the artificial intelligence technology has been developing iteratively, and has been deeply integrated with the field of education, resulting in intelligent applications such as intelligent tutor, intelligent assistant, intelligent evaluation, intelligent educational cloud, etc. At present, Chinese scholars have discussed quite a lot on artificial intelligence technology and Theory of multiple intelligences in the field of personalized teaching, both of which are lack of comprehensive research. This paper attempts to explore the realistic basis and significance through deep integration of artificial intelligence technology and Theory of multiple intelligences in personalized teaching, providing suggestions for those using personalized teaching to promote students' development.

Key words: artificial intelligence; multiple intelligences; personalized teaching; deep integration

1.Introduction

In recent years, the continuous maturity of artificial intelligence (AI) technology at home and abroad has exerted far-reaching and extensive influence on various fields of human society. AI technology has been increasingly applied in amounts of fields such as intelligent robots, intelligent homes, intelligent health care, intelligent cars, intelligent environmental protection, and a variety of smart applications, we are gradually moving from the information age to the intelligent era [1] . AI-related technologies are influencing all aspects of teaching and learning in the field of education. On July 8,2017, the State Council issued the development plan for the new generation of artificial intelligence. In order to speed up the innovative application of artificial

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intelligence, the State Council proposed the plan of "Intelligent Education" , which uses intelligent technology to accelerate the reform of personnel training models and teaching methods , to establish a learner-centered education environment and to provide personalized education services accurately [2] . With the deep application and integration of artificial intelligence technology in the field of education,itprovidesstrongtechnicalsupportfor personalizedteaching.

Theory of multiple intelligences (also known as MI theory) is an important educational theory proposed by American scholar Howard Gardner in 1983, which has had a significant impact on education in the United States and many other countries and regions around the world[3] . Theory of multiple intelligences, as one of the foundations of personalized teaching theory, is not only the theoretical support for personalizedteaching, butalsoplays aprofound guidingrole initspractice.

Individualized teaching is a kind of teaching activity that teachers take individualized teaching a method to meet students' individualized learning needs and develop students' personality [4] . The individualized teaching, which pays attention to the realization of both teachers' individualized teaching and students' individualized learning, aims to respect students' individuality and unique values [5] . It is of great value to enhance the effectiveness of teaching activities, to promote the development of students' study , and to cultivate their personality. In the case of artificial intelligence as a technical support andTheory of multiple intelligences as a theoretical support, how to excavate and apply artificial intelligence technology combined with Theory of multiple intelligences to serve personalized teachingt is an important subjectfor contemporary educators.

2. the Impact ofArtificial Intelligence andTheory of multipleIntelligences on PersonalizedTeaching

Education is one of the internal driving forces of social development, and cultivating students' innovation and practical ability has always been the focus of national quality education, and its cultivation goal is divided into three aspects: Cultural Foundation, Independent Development and social participation [6] . Training students to learn to study and promoting their self-development is the key to the implementation of core literacy. In today's era of rapid development of artificial intelligence, the information-based education has developed to a new stage with effective support for teaching and learning .Providing personalized learning service fmeet the needs of students in a new learning style to support their independent developmentseems moreandmore important [7] .

Theory of Multiple Intelligences, with its diverse and personalized teaching philosophy, provides a new way to the educational community and plays a very important role in the era of artificial intelligence. The deep integration and application of artificial intelligence and Theory of multiple intelligences will broaden the vision andlevelof contemporary individualizedteaching.

2.1. TheTechnical Support of IndividualizedTeaching:AITechnology

At present, artificial intelligence technology has been widely concerned and used in many fields, which include the field of education in many countries of around the world. The intelligent tutor, the intelligent assistant and the intelligent evaluation have been applied to the personalized teaching field, which not only greatly helps the teachers to improve their work efficiency, but is also beneficial to the students' personalizedlearning.

2.1.1. IntelligentTutor

As an important application of artificial intelligence in the field of education and teaching, the intelligent tutor makes a special learning plan for students according to their interests, habits and needs[8]. Sleeman and Brown first proposed the concept of IntelligentTutoring Systems in 1982, and considered that IntelligentTutoring Systems are computer Systems that use computers to imitate the experience and methods of teaching experts to assist teaching[9]. The main purpose of an intelligent tutor is to simulate the experience and methods of teaching by computer, to teach students one-to-one and to transfer knowledge to learners with different needs and characteristics [10] . By means of natural language processing and speech recognition technology, the intelligent tutor endows the computer with "intelligence" , which can replace the existing teachers to provide auxiliary learning materials for students and carryoutindividualizedteaching according tothecharacteristicsoflearners [11] . The reason why the intelligent tutor can reach the intelligent level of personification abilityismainlybecause of thefollowingaspects:

(1)record the learning process and results from learners, automatically analyze thecharacteristicsoflearners andformulate personalizedlearning program [12] ;

(2)provide learners with immediate, effective, comprehensive and targeted error diagnosis,and takecorrective measures [13] ;

(3)simulate human's similar reasoning and automatically generate the solution of theproblem [14] .

2.1.2. IntelligentAssistant

The continuous development and mature application of artificial intelligence technology has brought more and more artificial intelligence tools to the field of education, and has become a good teaching assistant for teachers. Educational robot is a kind of artificial intelligence assistant which is widely used and recognized in the field of Education. And the most famous educational robots are the "future teacher" robotandtherobotteacher "Saya" [15] .

The "future teacher" robot, developed by the Beijing Normal University and Netease Education, can not only help teachers with classroom-assisted or repetitive tasks, such as: reading the text, roll call, invigilation, examination papers, etc. , but also help teachers collect information, assist teachers to prepare lessons, scientific researchactivities,etc. [16] .Theteacher "Saya" developedbyProfessorKobayashiof Tokyo University of Science and technology is used as a teacher to complete the teaching of a course independently according to different teaching situations in order to achieve good teaching results. Educational robot can free teachers from trivial burden,improve teachers'working efficiency.

2.1.3. IntelligentAssessment

As the last part of the learning process, intelligence assessment is to evaluate and diagnose students' intelligence based on their learning goals and contents. Intelligence Assessment emphasizes measuring learners' development level and status in an automated way, tracking learners' learning performance in reality, and providing appropriatefeedback andevaluation oftheirlearning performance [17] .

With the development of artificial intelligence technology, the intelligent test platform emerges continuously. There are several intelligent test and evaluation platforms at home and abroad for personalized teaching: (1) My English Lab, (2) E2coach, (3) Avida Net, (4) Haiyuntian education test and evaluation, (5) Chinese character writing quality assessment system, (6)

intelligent speech assessment system [18].

My English Lab is an intelligent evaluation platform for students' academic achievement by means of test paper, which can provide corresponding test questions and learning materials according to the results of students' answers; E2coach is an intelligent evaluation platform for college students to evaluate their learning motivation, learning advantages and learning disadvantages by means of online behavior data and Questionnaires, which can provide diagnostic reports, learning advice and personalized learning content; The Chinese character writing quality evaluation system is an intelligent evaluation platform, which collects the writing trace point set and the Chinese character writing trace image recognition, and evaluates the brush layout, the part layout and the whole character shape to the primary and middle school students and the calligraphy ability appraisal organization, whichcan providedetailed evaluationresultsand writtencomments. [19]

2.2. Theoretical Support forIndividualizedTeaching:Theory of Multiple Intelligences

The essence ofTheory of multipleintelligences isshown inthe following aspects:
(1) diversity of intelligence: everyone is born with eight to nine intelligences; (2) individual differences of intelligence: The structure of intelligence is different for everyone[20] . The Theory of multiple intelligences proposed the idea that human intelligence is diverse Namely, human intelligence includes linguistic intelligence, musical intelligence, logical and mathematical intelligence, visual and spatial intelligence, body movement intelligence, self-knowledge intelligence, interpersonal intelligence and natural observation Intelligence [21] . Theory of multiple intelligences believes that human development is the result of multiple intelligences, and that different people have different combinations of intelligences, so it advocates a positiveview ofstudentsandadoptsdifferent teachingmethodsfor differentstudents.
The different combination of intelligence shows individual intelligence difference, that is, each learner has his own unique intelligence Schema [22] . The Theory of multiple intelligences clearly and scientifically illustrates the necessity of individualized teaching. Every learner has his own strong points and weak points, which requires that we should respect the individual differences and provide an open and diversified learning environment and teaching space by using different technical strategies, methods and approaches f[23] . Personalized teaching based on Theory of multiple intelligences is to recognize and develop all kinds of intelligence combination, respect learners'intelligence difference, and help learners find their own intelligenceadvantage tobuildself-confidence.

2.2.1. EqualStatus between teachers andstudents with emphasis on individualizedteaching

Under the guidance of Multiple Intelligences, individualized teaching emphasizes the equal status of teachers and students, which enables both teachers and students would trust and respect with each other[24] . It is easier to develop create students' personality in an easy environment based on mutul understanding. In fact, equal status between teachers and students is also a kind of positive and equal view of students. The problem is not whether they are smart any more, but what they are and howtheytobesmart. [25] .

2.2.2. Enhance the Principal Position of Students inIndividualizedTeaching

Individualized Teaching under multiple intelligences requires finding out each student's

intellectual advantages and choosing different teaching methods according to students' differences in temperament, personality and cognitive style. To stimulate potential intelligence, teachers would do by creating a variety of situations conducive to the discovery and providing students with a variety of learning options, so that studentscan develop theirstrengthsand circumventtheir weaknesses [26] .

2.2.3. Encouragingthe Cultivation of CreativeTalents inIndividualizedTeaching

Under the guidance of multiple intelligences, individualized teaching pays more attention to the multiple development of students' intelligences. The task of teaching is not only to develop students' verbal intelligence and Mathematical Logic Intelligence, but also to develop students' musical rhythm intelligence, interpersonal intelligence and oZ G GRence advantage, strengths, and stimulate their intelligence potential.

2.2.4. DiversifiedEvaluation Forms, Channelsand Situations onIndividualized Teaching

Under the guidance of multiple intelligences, individualized teaching advocates evaluation through various channels, forms and learning situations. This assessment is based on students' ability to solve practical problems and to create preliminary products both on spiritual and material. It goes beyond the traditional evaluation orientation which focused on standard intelligence tests and students' academic achievement assessment [27] . There are three criteria for this evaluation: (1) display intelligence through related activities under a development vision; (2) use different evaluating methods rather than an score from a single paper test; (3) promote a more naturaland scenario-sensitiveassessment[28] .

3. Deep Integration ofArtificial intelligence andTheory of Multiple Intelligences

3.1. the Realistic BasisTOIntegrate artificial intelligence technologyand multiple intelligences

With the development of artificial intelligence, artificial intelligence technology has been concerned by many educators, and has been gradually applied in education and teaching research and practice. The application of intelligent tutor, intelligent assistant, intelligent evaluation and intelligent education cloud not only brings students a brand-new learning experience, overturns the traditional classroom teaching, but also brings great influence to teachers themselves. It effectively supports the individuation teaching. Theory of multiple intelligences in China has been widely accepted and recognized by the educational field, and is closely related to the liberal education advocated by CHhinese government. The Theory of multiple intelligences is a modern educational theory because of meeting the needs of the development of the society, which focuses on the development of potential and the development of personality,and onthecultivation ofinnovativespiritandpracticalability[29]. At present, many countries and regions in the world have begun to apply artificial intelligence technology to the field of education, and achieved some achievements. Professor Spector from the University of North Texas introduced the construction of an intelligent learning environment to measure students' development of critical thinking by providing an opportunity for innovative practice in multidimensional scientific assessment in STEM education [30] . China can learn from the practical experience of the integration of artificial intelligence technology and multiple intelligences in other countries, and at the same time find a way to meet the needs of individualizedteachinginChina

3.2. the Deep Integration ofAI technologyinto the Field of Personalized Teachingmeets the Need of the Reform of Information Education

With the rapid development of information technology, educational informatizationhas entered a new stage-wisdom education [31] .The idea of intelligent education supported by artificial intelligence has been gradually extended to the fields of education: intelligent teaching, intelligent learning, intelligent classroom, intelligent campus, intelligent learning environment, educational robot, etc.[32] . At present, although many teaching devices such as computers, whiteboards, projectors and mobile devices have been put into classrooms, and the teaching forms have changed a lot, while iIt does not achieve the deep integration of information technology and personalized teaching. The aim of this deep integration is to let students master the learning content better, at the same time, to expand the students' individual learning field, to push the students exploring the advantage field, and to promote the students' independent development. The artificial intelligence technology developed byXunMenginrecentyearscan pro motethesolutionofthisproblem.

In the process of the integration of artificial intelligence technology into the field of education, in addition to intelligent tutors, intelligent assistants, intelligent assessment, we can also use the intelligent education cloud service to the field of personalized teaching, which is based on the integration of education big data, machine learning, learning analysis and other advanced technologies, providing learners with personalized learning services to support their autonomous development[33] .Take Xunfei education cloud as an example, Xunfei education cloud applies a large number of high-quality resources, covering teaching, learning, examination, evaluation, management of the whole education scene. Educational cloud applications generate process and outcome data that are routinely accumulated on cloud platforms, make data assets, and provide the foundation for educational big data. The education cloud platform can also provide customized development and system integration services according to the school's personalized teaching scenario, maximizethevalue ofintelligent technology,andpromotepersonalizedteaching.

3.3. the Effective Use of MITheory inIndividualizedTeaching isthe Need to TeachStudents inAccordance with theirAptitude

Since Confucius put forward the idea --teaching students in accordance with their aptitude , it has been the goal and pursuit for educators to teach students in accordance with their aptitude. According to the Theory of multiple intelligences, each person has his or her own set of superior and inferior intelligences, which are mutually reinforcing and interrelated, and different people have different combinations of intelligences. The structure of intelligence develops and changes with age and environment, so proper individualized teaching can result in the development of some kinds of intelligence. At present, applied research in China on Theory of multiple intelligences mainly focuses on the reform of students' intelligence evaluation, the reform of curriculum teaching, the reform of teacher training, the reform of school management and the influence and enlightenment of subject teaching,etc.

In a word, the current research of artificial intelligence technology and Theory of multiple intelligences in the field of personalized teaching in China is characterized by many independent research, rich achievements but insufficient comprehensive research. If the artificial intelligence technology and the Theory of multiple intelligences are deeply integrated, and work together in the field of personalized teaching,itwillbuilda newera of information-based education.

4. Teaching Benefitsof Deep Integration ofArtificial IntelligenceTechnology and Multiple Intelligences

The combination ofAI booster technology with Theory of multiple intelligences that values individual student differences will provide an efficient service for personalizedteaching inChina.

4.1. Enhancingthe LearningExperience andFacilitating Students' Effective Learning

The use of intelligent technologies can create meaningful and diverse learning environments to meet students' diverse learning needs and enhance students' learning experiences, for example, by creating learning situations through games with the help of intelligent technology, students' learning experience and participation can be improved, and the learning effect can be improved[34]. The use of intelligent technology can break through the limitations of traditional teaching methods in cultivating students' thinking ability and creativity, for example, through the use of virtual technology, in a well-made environment or in a scene constructed by the students themselves let the student obtain the learning opportunity which does not have in the real world. The use of smart technologies can break through the physical space constraints of learning and enable meaningful learning anywhere, for example, through useing mobile devices and smart telephone educators enable students to focus more effectively on learning goals and effectively experience scientific inquiry project learninginSTEMactivities.

4.2. Providing IntelligentPlatforms andTools to FacilitateTeachers' Effective Teaching

In addition to providing teachers with more abundant teaching resources, intelligent technology also has special significance for personalized learning [35] . Making full use of Educational data mining technology to track and dynamically capture the learning behavior of each student in reality, and analyzing the differences in learners' behaviors and the causes of these differences can effectively support personalized teaching [36] . University of North Texas Professor Spector introduces an intelligent tutor system based on intelligent techniques such as complex pattern matching algorithms and data analysis, which can develop children's exploratory ability and critical reasoning habits by automatically generating meaningful interactions [37] . Through the use of intelligent technology, teachers can free themselves from mechanical jobs, such as homework marking and simple tests, so thattheycan devotemoreenergy todesign andinteractiveteaching activities .

4.3. ProvidingAccurateTeaching Support to HelpStudents Develop in a PersonalizedWay

The rise of new information technologies, especially big data based learning analytics, make it is possible that classifying and analyzing the data such as knowledge structure classification, difficult subjects, students' learning behavior, learning preferences and styles, learning motivation and attitude, so as to provide a basis for accurate teaching[38]. Precision teaching can improve the teaching quality and the learning effiency of the students, and can let teachers have more time to do more meaningful and efficient work. With the beginning of the era of artificial intelligence, Chinese scholars are paying more and more attention to Theory of multiple intelligences, hoping to make use of the increasingly abundant intelligent teaching methods to carry on the individual teaching to different students, and to help studentstodevelop theirabilitiesindividually.

5.Conclusion

The development of intelligent technology has promoted the ecological construction of intelligent education system and brought new development opportunities for educational reform . As the integration of AI and education continues to deepen, we will also face a series of challenges, including: Ethical challenges such as student data security and privacy protection; problems on helping students learn effectively by identifying appropriate educational content, designing appropriate educational objectives, and establishing scientific and reasonable standards for the application of technology. Multi-intelligence as the theoretical support of individualized teaching, its function is consistent with artificial intelligence technology. On the basis of the deep integration of artificial intelligence technology and Theory of multiple intelligences, personalized teaching will promote the developmentof students.

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Analyzing Lessons on Intercultural Understanding and Instruction

~ Case Study on Grade 4 Integrated Study about Cambodia ~

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Abstract: The purpose of this research is to clarify the relationship between student's intercultural understanding and teachers' teaching behavior. This case is the integrated study class of a private elementary school in Osaka. The authors analyzed "The Cambodia Book" created by student to gain insight how students got intercultural understanding. In addition, the authors observed class activities and recorded dialogue in the lessons to analyze relationship between student's intercultural understanding and teachers' teaching behavior. As a result, the relationship could be organized in the following three categories: [knowing Cambodia culture], [understanding the cultural background], and [creating students' thoughts]. Furthermore, the authors conclude that the case was considered the importance of "understanding the cultural background" in intercultural understanding education.

Key words: Intercultural understanding education, Participation observation, Introducing multiple perspectives, Understanding cultural background, Global competence

INTRODUCTION

Ministry of Education, Culture, Sports, Science and Technology (MEXT) stated that the basic idea of the new course of study is "to further ensure the development of the qualities and ability for student to open up the future society" because of the rapidly changing society, such as globalization and computerization. Nowadays, people have to live together with people of diverse cultures without crossing borders.

There are a variety of intercultural understanding education in Japan. Sato (2007) pointed out two issues concerning a multicultural perspective. Firstly, learners need to appreciate other's cultures by introducing multiple perspectives. Secondly, learners need to develop global competence. Therefore, in this research, the authors analyze lessons, focusing on the issues of intercultural understanding education.

PURPOSE OF RESEARGH

The purpose of this research is to clarify the relationship between student's intercultural understanding and teachers' teaching behaviors from the perspective of developing global

competence.

RESEARCH DESIGN & METHODS

The case is the integrated study class at a private elementary school in Osaka Prefecture. They study Cambodia. Sixty students were involved for one-year long from April 2018 to March 2019.

Student made "The Cambodia Book" in the integrated study. The authors analyzed this book as text data to gain insight how students got intercultural understanding. The authors coded the text data and generated categories based on SATO (2008). In addition, the authors analyzed relationship between student's intercultural understanding and teachers' teaching behaviors. The authors participated observation and recorded dialogue in class. Recorded data was transcribed and analyzed.

RESULTS

We extracted three categories of student's intercultural understanding. The relationship between student's intercultural understanding and teaching behavior was organized into these three categories.

1.[Knowing Cambodia culture] and teacher' teaching behavior

The teacher planned lessons in order to increase student's cultural knowledge of Cambodia. For example, " Using episodes and videos of traveling to Cambodia", " Using ICT equipment" and "group discussion". One group chose the topic about water festival. Students wrote "National events", "Thanks for nature", "Water god, Naga", "Outdoor life", and "Boat race". In this way, the students had various information about Cambodia festival.

2.[Understanding the cultural background] and teachers' teaching behavior

The teacher asked students, "What is the meaning of culture for Cambodian people?", "Why do you think there is such a culture?" The teacher asked the students to think about Cambodians' cultural background. The student wrote the following cultural background in The Cambodia Book. "The use of dollars in Cambodia is related to the civil war." "The reason Cambodia people eat insects is that they need to survive during civil war time."

3. [Creating students' thoughts] and teachers' teaching behavior

The teacher said repeatedly, "Be sure to write your thoughts in The Cambodia Book". The student wrote the following thoughts in The Cambodian Book. "In the water festival, people express the gratitude for the water that supports life. "I think it is an important festival for Cambodian." "People who lived on the water developed their lives in inconvenient places without giving up. I thought that was great."

The authors considered the importance of "understanding the cultural background" in intercultural understanding education. Through understanding the cultural background, the students were able to develop a perspective on Cambodian history and natural environment. In

addition, the students were able to understand the Cambodian's way of thinking and to have a sense of respect for the Cambodian culture. Such intercultural understanding of the students is also linked to Sato's point of view as "introduction of multiple perspectives" and "nurturing of global competence." The authors conclude that the case is considered the importance of" understanding the cultural background" in intercultural understanding education.

FUTURE OUTLOOK

Further research could be conducted about the following two areas. First, it is necessary to look at each child's learning. Next, it is necessary to investigate more about the global competence required in the global society.

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Research on the humanistic value of artificial intelligence education

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Abstract: With the gradual advancement of educational informatization, deep learning and neural network technology are attracting more and more people's attention. The era of artificial intelligence has come and led the development of educational informatization to intelligence in education. However, while bringing convenience to education, some problems brought by artificial intelligence also appear, posing challenges to the natural environment and human development. Based on the current situation of the application and development of artificial intelligence in education, this paper combines artificial intelligence with humanity from the essence of human nature, and makes rational reflection on the current phenomenon of destroying nature, educational ecology and killing humanity in the promotion of artificial intelligence education. And it sets up reasonable humanistic values in the era of artificial intelligence, and standardizes the application and development of artificial intelligence in education from the natural level, the social level and the human level.

Key words: Artificial Intelligence, Education, Humanity Value

INTRODUCTION

In the current era, the development of artificial intelligence is bringing about a broad and far-reaching social transformation. It is an important driving force for leading a new round of scientific and technological revolution and industrial transformation. It has had a tremendous impact in all walks of life, and the integration of artificial intelligence in education. The application is widely concerned by educators and carries the high hopes of a “revolutionary impact” on education. In July 2017, the State Council issued the “New Generation Artificial Intelligence Development Plan”, which clarified the strategic goal of the three-step strategy and put forward the requirements of intelligent education [1]. In 2018, the Ministry of Education issued the “Education Informatization 2.0 Action Plan”. It is proposed to carry out the construction of a learner-centered intelligent teaching support environment and promote the

application of artificial intelligence in teaching, management, etc. In the 2018 release of the "Artificial Innovation Initiative for Higher Education Institutions", the Ministry of Education promoted In the reform of the school's artificial intelligence education system, the Ministry of Education proposed to set up artificial intelligence-related courses in primary and secondary schools in March 2019, "The Essentials of Education Informationization and Network Security in 2019", and gradually promote programming education. The application of artificial intelligence in education is in full swing. However, the profound changes brought about by artificial intelligence will also produce a series of problems in the persistent collision with education: artificial intelligence is a kind of technology, and the problem of alienation is inevitable. There are various phenomena that exaggerate the role of technology and neglect human development. In the era of artificial intelligence, the essence of education is still to educate people and promote the development of human beings. It is necessary to correctly guide the development direction of artificial intelligence in education, to handle the relationship between technology and people, and to return to the essence of education.

CONNOTATION ANALYSIS OF ARTIFICIAL INTELLIGENCE EDUCATION

The meaning of artificial intelligence

Artificial intelligence, English for Artificial Intelligence, abbreviated as AI, was first introduced in 1956 by John McCarthy at the Dartmouth Symposium and defined as making the machine behave like a human being. The intelligent behavior that came out gave birth to the artificial intelligence revolution that was later known. And it has been widely used in many fields such as computer science, information science, psychology, philosophy, and physiology. Since then, artificial intelligence has experienced three waves: the first wave developed computational intelligence, but quickly entered the trough because of the uncertainty of visual and natural language symbols and limited computing power; in the 1980s, expert systems and artificial nerves New progress has been made in the network, artificial intelligence has ushered in the second wave, and perceived intelligence has been developed. In the 1910s, the development and development of deep learning, big data, and neural networks set off the third wave of artificial intelligence, and artificial intelligence rose to recognition. Know the intelligence stage. After more than 60 years of evolution, especially driven by new theories and new technologies such as mobile Internet, big data, supercomputing, sensor network, brain science, and strong demand for economic and social development, artificial intelligence has accelerated development, showing deep learning, New features such as cross-border integration, human-machine synergy, group openness, and autonomous control [1].

In the definition of artificial intelligence, Professor Winston of the Massachusetts Institute of Technology believes that "artificial intelligence is to study how to make computers do intelligent work that only people can do in the past" [2]. Jia Jiyou believes that artificial intelligence is a human education realized on artificial machines represented by computers, or education on machines [3]. Zhang Kunying et al. pointed out that from the perspective of the function of artificial intelligence, artificial intelligence is the sum of functions related to human intelligence realized by intelligent machines, including judgment, reasoning, learning and problem solving[4]. Drawing on the relevant research results of artificial intelligence, this paper believes that artificial intelligence is a new technology that enables the machine to simulate, extend and expand human intelligence and intelligent behavior.

Artificial intelligence education

With the continuous advancement of educational informationization, the research of artificial intelligence is also developing in depth. The application in the field of education has gradually gained people's attention. Artificial intelligence education refers to the application of artificial intelligence technology in education. Zhang Kunying and others believe that only when artificial Intelligent assistance in educational applications, constructing educational scenarios, reorganizing elements of education, or reconstructing educational processes is an educational application of artificial intelligence [4]. Many domestic experts and scholars have carried out in-depth research on the application of artificial intelligence education and teaching from different angles, generally including intelligent tutor system, educational robot, intelligent assessment, intelligent agent system, intelligent education decision-making and other applications. Educational scenarios such as personalized learning, test evaluation, education management and decision-making are applied.

HUMANISTIC VALUE IN ARTIFICIAL INTELLIGENCE EDUCATION

Artificial intelligence education is a way that emerges and applies in the process of educational information development. It is a way to realize education informationization while exploring and advancing. The ultimate goal is to realize education modernization and promote people's all-round development. "Human" is a unique creation group on the earth. It has infinite wisdom and ability. Marx believes that man is a thoughtful individual. Under the impetus of thought, people will have endogenous motivation--human needs. People's demand for nature, society, and people themselves promotes the continuous progress and development of human society, and whether nature, society, and people themselves can satisfy people's needs has created value questioning. The all-round development of human beings is not only a result, but also a process, the ultimate result achieved in the process of continuously satisfying the needs of nature, society and people's own needs. Thus, the human value can be realized.

To study the humanistic value of artificial intelligence education, it is necessary to determine the subject and object of value. The subject and the object are a pair of corresponding categories, each of which exists as the premise of the existence of the other party, and can only obtain its own prescriptiveness in the relationship with the other party [5]. The subject is the practitioner, the object is the object of the subject practice, and the subject exists relative to the object. It is precisely because the object is the object that the subject becomes the subject. At the same time, the subject is also subject to the object, and the interaction between the subject and the object is a two-way objectification process [6]. In education, both the subject and the object point to the "self-contained person". In different educational situations, both the educator and the educated person exist as subjects or objects, and play a role in certain educational activities. To grasp the relationship between the subject and the object, we must change the value orientation of the human nature. The humanistic value of artificial intelligence education is in the process of educational informationization. The main body integrates artificial intelligence and education to promote the transformation of people's teaching and learning, change the value form of learners, and realize the satisfaction of nature, society and people's own needs.

THE REALIZATION PRINCIPLE OF HUMANISTIC VALUE OF ARTIFICIAL INTELLIGENCE EDUCATION

The realization of the humanistic value of artificial intelligence education should follow the

unity of the combination of humanity and nature. The principle of humanity is the humanistic principle, which refers to the implementation of educational practice activities according to the essential characteristics of human beings and their laws. The compound nature is the ecological principle. It means that the main body should implement educational practice activities in accordance with the natural structure and laws of nature, so that people and nature can live in harmony and promote the coordinated and sustainable development of people and nature.

The key to adhering to the principle of humanism lies in people-oriented, correctly understanding and grasping the essential characteristics and internal laws of human beings. In the educational activities, the use of technology must conform to the laws of human beings, rather than putting the cart before the horse and technology first. Artificial intelligence technology should serve people and should help teachers and students achieve better teaching results in educational activities. However, in the process of education informatization, there has been a technology-to-human substitution and negation, human control and indifference, that is, technology alienation, which deviates from human development. For example, modern teaching machines replace teachers, students learn the knowledge of books, but human emotions have not been developed; due to the emergence of advanced technology, teachers must force themselves to learn the operation of technology, adapt to the laws of technology, thereby increasing pressure on themselves, the original intention of teachers It is the control technology but is controlled by the technology in the application process. All kinds of technological alienation have deviated from the essence of human beings, and technology has not played its true role in education.

The key to adhering to the ecological principle lies in changing the concept of existence and the way of practice. The human being and the natural world are one. The human being is the natural being. The natural world must be understood and transformed according to the natural structure and laws of nature. Just as nature is the natural world of human beings, the object-oriented relationship between man and nature makes people and nature merge into one, becoming a naturalized or naturalized person [7]. The pursuit of ecological technology in educational activities should follow the natural and natural laws, “focus on minimizing resource consumption and maximizing output through research and development of ecological technologies, production of ecological products, and provision of ecological services” [8], the raw materials produced by technology should be recycled, environmentally friendly and non-polluting; provide a harmonious environment in the application process of technology, distribute equitably, pay attention to the role and status of human beings, and promote the comprehensive development of people themselves.

The integration of human principles and ecological principles is an inevitable requirement of the development of contemporary society. The unity of humanity and unity is the fundamental path to realize the humanistic value of artificial intelligence education. Sticking to the humanistic orientation of ecological principles is the basic requirement and objective necessity of historical materialism. Man and nature are the unifying relationship. People are constantly changing the process of the relationship between man and nature through practice. In practice, technology is continuously applied to people and the natural environment. Only at the same time respect human development and respect the laws of nature. By coupling humanized technology with ecological technology, we can truly achieve the relationship between human nature and the harmonious coexistence between man and nature.

HUMANISTIC VALUE REALIZATION STRATEGY OF ARTIFICIAL INTELLIGENCE EDUCATION

Natural level

In the era of artificial intelligence education, we adhere to the ecological principle and deal with the relationship between artificial intelligence and nature used by human beings, including the way and concept of treating nature. The arrival of the era of artificial intelligence means the advancement of science and technology, but the impact on the environment is self-evident, deeply affected by the ability to transform natural forces, such as the requirements for the manufacturing process of mechanical devices, the requirements for energy consumption, and the operation of its ecology. The requirements of natural influences are inherently limited by nature. Accelerated the consumption of natural resources. The low productivity makes our utilization of nature extremely low, and the side effect of the fast-developing technology level is to accelerate the efficiency of natural consumption. General Secretary Xi Jinping once said in a speech at the Nazarbayev University in Kazakhstan: "We need green mountains and green mountains, but also Jinshan Yinshan. Ning wants green mountains and green mountains, not Jinshan Yinshan, and green mountains and green mountains are Jinshan silver. Mountain." Visually reveals the relationship between environmental protection and economic development. Environmental resources are the most rare resources in the 21st century. The development of artificial intelligence technology cannot be at the expense of the environment. In the process of building and applying artificial intelligence technology, we should focus on the use of ecological materials, develop ecological technologies, and enable resources to circulate. Use, avoid resource consumption, avoid material waste, make rational use of resources, discharge pollutants as little as possible and recycle resources, promote harmonious coexistence between man and nature, and embody the principle of ecologicalization.

Social level

Similar to other information technology in education and teaching applications, in the wave of artificial intelligence development, there have been two voices in society: too optimistic and too pessimistic. The optimists believe that the rise of artificial intelligence will enable all sectors of society to develop rapidly, produce better economic benefits, effectively promote the progress of science and technology and social development, analyze learners in education, and realize personalized teaching, answering, evaluating and managing. To achieve better teaching results. The pessimists believe that once artificial intelligence is out of human control, human long-term biological evolution will not be able to compete with it, and eventually there will be a situation in which machines replace humans. The cover of "The New Yorker" is a comic book that is madly automated: the robots in the streets of the future world are endless, and human beings can only serve as a robot that desires to have compassionate procedures, and society will become a society of robots. Both of these viewpoints are biased. Artificial intelligence is also a double-edged sword. While promoting social progress, we must also pay attention to avoiding the problems caused by it. The current artificial intelligence is weak artificial intelligence, and it takes a long time for development and progress to achieve breakthroughs in multi-domain and multi-task. Artificial intelligence does replace mechanical jobs, but looking back at the historical development process, it is not difficult to find that, in general, as old industries are replaced, emerging industries will also rise. For example, the appearance of a car replaced the carriage, and the coachman lost his job. But at the same time, the emergence of cars has also led to the

development of other industries such as automobile manufacturing, auto repair, etc., which in turn provides many jobs. Therefore, in this trend of artificial intelligence development, as human beings, we can only strive to strive for and improve ourselves, and establish a firm foothold in the AI society to avoid being annihilated by this wave.

People themselves

Education should be the education of the development of people, paying attention to the external knowledge growth and inner emotional growth of people. No matter how advanced the artificial intelligence technology is, how powerful the functional utility is, it is always used as a tool in education to help education and teaching, and promote the all-round development of students. Therefore, for teachers, artificial intelligence can not replace its identity role, teachers have the characteristics that artificial intelligence can not replace, rich in feelings and wisdom, know how to integrate excellent quality into education in subtle ways, can grow into talents in students. Guidance is given in the road, and artificial intelligence is only part of the labor of the teacher, as a technical tool to help teach. But at the same time, for the teaching and learning activities of teachers and students, we should not rely too much on artificial intelligence, causing alienation of human thinking and weakening individuality. Teachers use artificial intelligence technology, and the focus should be on how to use technology to better serve students, rather than simply learning how to use technology, contrary to the original intention of technology use, resulting in the situation of putting the cart before the horse. Students use artificial intelligence technology to create a personalized learning path based on their functions, rather than as a shortcut to learning. When encountering problems, they should not first think independently, but first solve problems through artificial intelligence, and form artificial labor in the long run. The dependence of intelligence negates the subjective initiative of people and hinders the free and all-round development of people.

CONCLUSION

The development and application of artificial intelligence education is an unstoppable trend of the times. As a new technology, artificial intelligence will bring new challenges while bringing convenience. We should comprehensively and rationally view the development of artificial intelligence education. We should make rational use of artificial intelligencev, handle the relationship between artificial intelligence and education, realize the needs of nature, society and people, pay attention to prevent its negative effects, and integrate artificial intelligence education into an orderly development track, so as to provide many advantages for human development. condition.

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The Structure and Function of Educational Informationization Humanization Value System

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Abstract: Education informatization is the necessary way to realize education modernization, and its ultimate goal is to realize the all-round development of human being. In the era of education informationization 2.0, from the philosophical level, we systematically reflected and explored the humanistic value of education informatization, and proposed a three-dimensional-four-level structural model, which owns four functions of incentive, orientation, evaluation and rectification. All of both forming the humanistic value system of education informatization, and promoting the informatization of education to point to the individualized development and all-round development of human being.

Key words: educational informationization; humanistic value; information technology; humanistic thinking; all-round development

Introduction

Education Information System Engineering Since the beginning of the construction of the Information Highway program in the United States in the 1990s, it emphasizes the application of information technology in education as an important approach to education reform in the 21st century(Yang,2005). Since the end of the 1990s, China has implemented a series of major engineering and policy measures. The Ministry of Education and various levels of education administration departments, schools of all levels, and educational informationization enterprises have actively practiced various forms of educational informationization practices. It has made remarkable achievements in the construction and application of curriculum and teaching

resources, the construction and development of teaching staff, the innovation of teaching and learning models, and the in-depth application of information and communication technology, which has laid a solid foundation for the development of education informationization in China(Chinese Ministry of Education,2012). In the 21st century, a series of important articles such as National Medium- and Long-Term Education Reform and Development Plan (2010-2020) and Education Informationization Decade Development Plan (2011-2020) have been fully specified: "Information The revolutionary influence of technology on the development of education must follow the path of "informatization of education to promote education modernization", solve the problems that restrict the development of education in China, promote innovation and reform of education, and accelerate the pace of transformation from a large educational country to an educational power. On April 13, 2018, the Ministry of Education issued the "Education Informatization 2.0 Action Plan", which reflects the essential characteristics of education based on "cultivating people-oriented", "pursuing people's adaptation to the times" and "requiring comprehensive development". The historical process of transforming and deepening the informatization from the construction of the informationization environment to the promotion of human development(Wang,2018). "China Education Modernization 2035" puts forward the eight basic concepts of promoting education modernization, including "more emphasis on morality first, more emphasis on all-round development, more emphasis on everyone, and more emphasis on lifelong learning"(CPC Central Committee,2019). Education informatization is the only way to realize the modernization of education, and its ultimate goal is to realize the all-round development of people.

The official entry of education informatization into the 2.0 era means that the initial achievements of the education informatization work are fully recognized, and it has high hopes for serving and supporting the process of education modernization in China. However, the application of new technologies such as artificial intelligence, 5G, big data, and Internet of Things in education should be developed. At present, there is still no systematic humanistic guidance and philosophical guidance; this leads to the problem of technological alienation in the process of educational informationization. Such as "ignoring the development of human beings", "ignoring the humanistic value of technology", "lacking or exaggerating the role of technology", "seeing things without seeing people" and other ideas and behaviors, the development of educational informatization has not returned to the essence of human development. Therefore, it is of great significance to reflect and explore the humanistic value of educational informatization from the philosophical level and to reveal its structure and function to lead the process of educational informatization and promote the informatization of education in China to point to the individualized development and all-round development of human beings.

Humanistic Value System of Education Informationization

Humanistic Value of Education Informationization

We should study and grasp the humanistic value of educational informatization from the "human needs", "the essence of human beings" and "the development of human beings". As a kind of technological innovation, educational informatization is a revolutionary practical activity. It fundamentally meets the needs of human survival and development, liberation and freedom, and always satisfies people's survival and development, liberation and freedom. As the destination of educational informationization(Chen,2018). With the application of emerging technologies such as artificial intelligence, the education system is constantly evolving and changing, and the

degree and mode of human survival and development, liberation and freedom are more diverse, rich and individualized. The process of educational informationization itself is constantly changing. Change and development, constantly meet the increasingly rich needs of people.

Marxism believes that technology is the objectification of human essential power and should point to the all-round development of human beings. How does education informatization meet the needs of people's survival and development, liberation and freedom? To further examine the humanistic value of educational informatization, we must start with the "effect relationship" and start with the environment in which people depend for survival. Therefore, we will examine the intrinsic relationship and effect relationship between teaching informatization and human survival and development, liberation and freedom (four levels) from the relationship between man and nature, man and society, and man and man (three dimensions).

The humanistic value of educational informatization means that in the process of educational modernization, the subject integrates information technology and education deeply, promotes the reform of teaching and learning, changes the value form of learners, and satisfies the survival and development, liberation and freedom of learners. The effect relationship required. Therefore, the humanistic value of educational informatization is mainly reflected in the four dimensions of survival, development, emancipation and free value in the three dimensions of nature, society and people.

Three-dimensionality - four levels **of the humanized value of educational informationization**

The survival value of educational informationization

The survival value of education informatization refers to the environmental conditions and satisfaction levels of the learners' physical and mental health development in the process of education informationization, in which physical and mental health includes physical, social and emotional health. From the perspective of natural dimension, it is expressed as the degree of satisfaction of the informationized ecological environment to the learner's learning and life and other physical and mental health; from the perspective of social dimension, it is expressed as the degree of satisfaction of the informationized social environment to the learner's emotional and social and other physical and mental health; From the perspective of people's own dimensions, it is manifested by the degree to which the informationized humanistic environment satisfies the learner's physical and mental health and other physical and mental health.

The development value of educational informationization

The development value of education informatization refers to the environmental conditions and the degree of satisfaction that learners need to grow into talents in the process of education informatization. From the perspective of natural dimension, it shows the degree of satisfaction of the informationized ecological environment to the growth of learners; from the perspective of social dimension, it shows the degree of satisfaction of the informationized social environment to the growth of learners; from the perspective of human self, The degree of satisfaction of the learner's self-development for the informationized human environment.

The liberation value of educational informationization

The liberation value of education informatization refers to the environmental conditions and the

degree of satisfaction that learners need to break through and develop themselves in the process of education informationization. From the perspective of natural dimension, it shows the degree of satisfaction of the informational ecological environment re-creation on the learner's self-breakthrough and development; from the social dimension, it shows the degree of satisfaction of the information society social system reform on the learner's self-breakthrough and development; In terms of its own dimensions, it is manifested by the satisfaction of the informationization human environment optimization to learners' self-breakthrough and development.

Free value of educational informationization

The free value of educational informatization refers to the environmental conditions and the degree of satisfaction required for the individualized development and comprehensive development of individual learners in the process of educational informatization. From the perspective of natural dimension, it shows the degree of satisfaction of the informationized ecological environment to the individualized development and comprehensive development of learners; from the perspective of social dimension, it shows the degree of satisfaction of the informationized social environment to the individualized development and comprehensive development of learners; From the perspective of people's own self, it is manifested by the degree to which the informationized humanistic environment satisfies the learner's self-personalized development and overall development.

Table 1 Three-dimensionality - four levels of educational informatization human value

Level / Dimension	Survival value	Development value	Emancipatory value	Free value
natural	The degree of satisfaction of the informationized ecological environment on learners' learning and living and other physical and mental health.	The degree to which the informationized ecological environment satisfies the growth of learners.	Reconstruction of informational ecological environment satisfies the learner's self-breakthrough and development.	The degree of satisfaction of the informationized ecological environment on the individualized development and comprehensive development of learners.
society	The degree to which the informationized social environment satisfies the learner's emotions and social and other physical and mental health.	The degree to which the informationized social environment satisfies the growth of learners.	The degree of satisfaction of learner self-breakthrough and development in the transformation of information society system.	The degree of satisfaction of the informationized social environment on the individualized development and comprehensive development of learners.
Rén 2/5000 people	The degree to which the informationized human environment satisfies the learner's physical and mental health and other physical and mental health.	The degree of satisfaction of the informationized human environment to the learner's self-development.	The degree of satisfaction of the learner's self-breakthrough and development is optimized by the informationized human environment.	The degree of satisfaction of the informationized humanistic environment on the individualized development and comprehensive development of learners.

Educational Information Humanization Value System Structure

Starting from the three dimensions of man and nature, man and society, and man and man, the humanistic value system of education informatization is constructed on the four levels of human existence value, development value, liberation value and free value. The overall development of people (Figure 1).

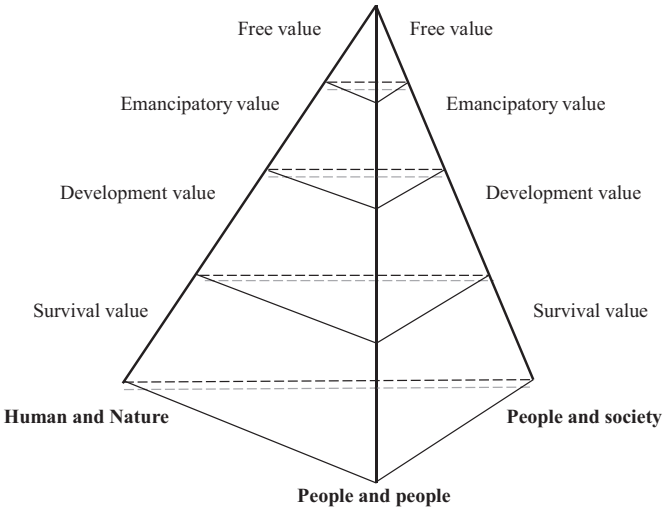


Figure 1 Three-dimensional four-level humanistic value system structure of education informationization

It can be seen from Figure 1 that the humanistic value of educational informatization is to change the value form of "human and nature", "people and society" and "human and human" in three dimensions, pursuing survival and development, liberation and freedom. That is to say, in the process of education informationization, the most basic, first of all, to meet the survival value in three dimensions. Do a good job in hardware environment construction, software platform construction and protection of potential resources for education informationization. For example, the construction of the "three links and two platforms" in the era of education informationization 1.0 to the "three full two high and one big" construction in the 2.0 era is to satisfy the basic survival value. The second stage is to meet the development value of three dimensions. In the process of continuous growth and development, learners need the degree and achievements of educational informatization to continuously meet their educational needs. They must constantly overcome the mistakes in the process of educational informatization and make coping and changing in order to adhere to the correct development direction. For example, to cultivate a new historical stage in which students' core literacy in the 21st century is dominant. With the good foundation laid down in the survival stage, the construction of “three links and two platforms” will be transformed into “three perfects, two highs and one big” construction, and further promote Education enables informationization of education to support the overall development of students. The third stage is to satisfy the liberation value in three dimensions. Education informatization will encounter bottlenecks when it reaches a certain stage. At this time, there is a prominent contradiction between the increasing educational needs of learners and the degree of satisfaction that educational informatization can provide. The development of information technology has reached maturity. It is urgent to change the education system and update the educational concept, so that emerging information technology can better integrate education and teaching, fully liberate the educational productivity of information technology, and gradually meet the individualized development of learners. The fourth stage is to satisfy the free value in three dimensions. The development of educational informatization has reached its

peak, education system reform and educational concept innovation have been completed, and everyone can achieve free and comprehensive development. Human beings no longer harm the interests of nature and society in order to obtain education in line with their own development. Human development will fully conform to the laws of human development.

It is worth noting that the four stages are not linear developments in the strict sense. From the perspective of historical process, the development of educational informatization will generally advance along the process of continuously satisfying the "survival", "development", "liberation" and "freedom"; but in special times, there will be a long time " The parallel advancement period of "survival" and "development", or the parallel development period of "development" and "liberation", or the parallel promotion period of "liberation" and "freedom". Between different regions, due to the difference in economic development level and people's ideas, there will also be multiple phenomena at the same time. The development of educational informatization should be especially vigilant against the phenomenon of uneven development in different regions. If this "digital divide" is not handled properly, there will be a "Matthew effect", which will make the development of a good region better and better. Slower areas progress more slowly. Of course, in the process of promoting education informatization, we must not be too hasty, pursue one-sided development in a “leap-forward” manner, and blindly pursue “liberation” or “freedom” in the absence of “survival”. The correct way should be to develop in an "inverted pyramid". The opening of each new stage can only happen when the previous stage has accumulated enough base. Of course, it is also possible to advance the base period of the next stage while advancing the maturity of each stage.

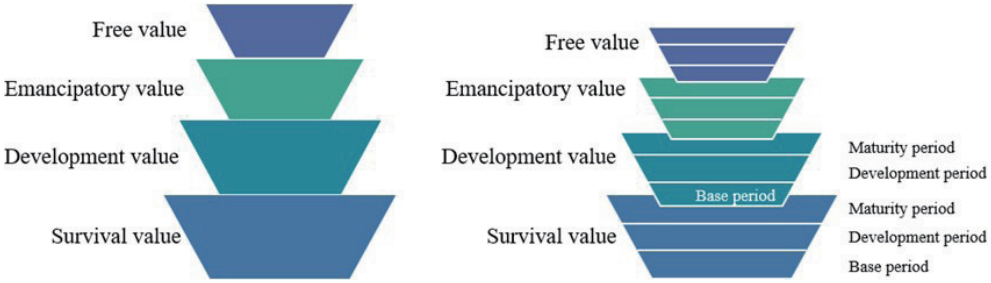


Figure 2 Different stages of development and promotion

The Function and Characteristics of Educational Information Humanization Value System
The Four Functions of Educational Information Humanization Value System
From the role played by the educational informatization humanistic value system in the development of educational informatization, it mainly reflects its four functions, namely, guiding function, incentive function, evaluation function and corrective function (Figure 3).

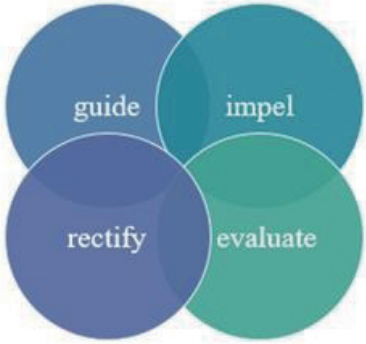


Figure 3 Four functions of the educational informational humanistic value system

First, the educational informatization humanistic value system has a guiding function. The guiding function of the educational informatization humanistic value system is to establish the development direction and ultimate goal of educational informatization, that is, to cultivate people's freedom and all-round development with the support of information technology. The development of educational informatization requires a scientific and clear humanistic value orientation to prevent the harm of technological alienation and ensure that the educational informatization process is on the right path. The educational informatization humanistic value system reveals the meaning of each “square” (Table 1) in the four stages of survival, development, liberation and freedom in the three dimensions of nature, society and people, and reveals each “square”. The task that is intended to be completed. This will help guide the market to develop low-tech, applicability technology applications; help guide educational concepts and guiding policies to foster the development of a new generation of students' thinking and enhance their core competencies; Mechanisms to better cultivate innovative talents; help guide the rational use of information technology (such as resource building and sharing, targeted assistance, etc.) to narrow the digital divide and better address the issue of educational equity.

Second, the educational informatization humanistic value system has an incentive function. The incentive function of the educational informatization humanistic value system is the guarantee to stimulate the better and faster development of educational informatization. The development of technology has brought huge development dividends to all walks of life in various societies. However, because education itself is more conservative than innovative, the application of technology in education has always been “lag”. The establishment of educational informatization humanistic value system clearly demonstrates the value of survival, development, liberation and freedom of education informatization for nature, society and human development on the theoretical level, whether it is educators or business-related practitioners. We will use this as a reference to develop educational application platforms or tools that are more conducive to the survival and development, liberation and freedom of learners; national policies and local promotion agencies, etc., will also develop incentive mechanisms that better meet the needs of students for future social development. To guide the development of more comprehensive development of people. These policies, mechanisms, products and tools will form an incentive mechanism that will positively inspire all parties to apply appropriate technologies and develop education. The incentive function of the educational informatization humanistic value system will make education "go fast" and "efficient".

Third, the educational informatization humanistic value system has an evaluation function. The evaluation function of educational informatization humanistic value is the value evaluation of the development process and effectiveness of the entire educational informatization. Education informatization is a systematic project. The promotion of system engineering must have a sound evaluation mechanism to judge whether the progress of the project and the results of the phase meet the established goals. The humanistic value of educational informatization ultimately points to the all-round development of human beings. In the "journey" of realizing the all-round development of human beings, we must first ensure the physical and mental health of people, then cultivate the comprehensive ability of human beings, strive to satisfy the individualized development of human beings, and ultimately point to The overall development of people. There are clear stages of training in the four levels of openness, development, liberation and freedom in the three dimensions of nature, society and people. By establishing a personal growth portfolio, we will improve the student evaluation mechanism based on big data (multiple evaluations). At the same time, the professional growth of teachers also establishes corresponding electronic

files, and the use of data science makes the evaluation of the educational informationization process more scientific and reasonable.

Fourth, the educational informatization humanistic value system has the function of correcting deviations (allowing mistakes, timely adjustments, more self-adjustment, and not relying solely on external forces). The corrective function of the educational informatization humanistic value system is to cooperate with the evaluation function to ensure timely detection and correction of misconduct in the process of educational informatization. Marx's materialist dialectics points out that the development of any thing is not a smooth and smooth "cloud", but a spiral rise and advance. The development of educational informatization will also encounter bottlenecks, even a brief "disorientation." At this time, the results of the education informatization humanistic value system will be corrected and the performance will be corrected. The forward-looking implementation plan, the corresponding policy guarantee mechanism, and the scientific and rational promotion of the program will reduce the degree of alienation and expand the benefit area to ensure the education informationization. Travel forward along a predetermined "track".

The four major functions have the characteristics of "three completes"

In short, the guiding function of educational informatization humanistic value system indicates the development direction and purpose of educational informatization, the incentive function provides the development motivation of educational informatization, the evaluation function points out the development level of educational informatization, and the corrective function corrects the development of educational informatization The wrong route.

The four functions of the educational informatization humanistic value system are parallel and interacting, and are implicit in the entire process of educational informatization. They have the three characteristics of “all processes, all-round and all-factors”. First, the four functions of the educational informatization humanistic value system have the characteristics of the whole process. At the beginning and end of the process of educational informationization, the whole process of motivation, orientation, evaluation and correction must play a role. Second, the four functions of the educational informatization humanistic value system have all-round features. Incentives, orientations, evaluations, and corrections are not specific to a particular dimension or a particular dimension, but rather to a full effect. Third, the four functions of the educational informatization humanistic value system have the characteristics of all elements. The four functions of the educational informatization humanistic value system interact, support each other, and work together to form a joint force system to ensure the smooth advancement of educational informationization.

Conclusion

The Four Functions of Educational Information Humanization Value System

In general, the humanistic value of educational informatization refers to the effect of education informatization on the individualized development and integrity of people, and the effect of the needs of human survival and development, liberation and freedom. The educational informatization humanistic value system inspires, guides, evaluates and corrects the survival and development of human beings, the educational needs of liberation and freedom in the three dimensions of man and nature, man and society and man and man. The application

and implementation of the educational informatization humanistic value system requires the coordination of government agencies, school enterprises, family society and other forces, closely surrounding the humanistic value of educational informatization, promoting the process of education informatization in China, and cultivating students' comprehensiveness and freedom. development of. Starting from Marxism, this paper reflects on and studies the essence of the humanized value of educational informatization, and constructs the humanized value system of educational informatization. At the theoretical level, it has a guiding role in innovative educational thoughts, ideas, methods and means; in practice, it will In the process of China's current education informatization construction, the real implementation of "people-oriented", correcting the phenomenon of "disappearing people and seeing people" and other technology alienation, the development and application of humanized, ecological and other educational products, has practical significance for promoting the all-round development of people.

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The Essence of Human Learning and Its Enlightenment to Artificial Intelligence
—— Artificial Intelligence Design and Educational Application Based on the Results and Essence of Human Learning

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Abstract: The key to the leap-forward development of AI is to imitate and replicate human learning mechanism. To develop AI, it is necessary to study human learning mechanism. Human learning is the acquisition of knowledge from the result of learning. There are two views of knowledge about what knowledge is. From the point of view of human existence and development, the knowledge acquired by human beings can be divided into two categories, one is rich in principle knowledge, the other is rich in situational knowledge. These two kinds of knowledge have their own characteristics. The result of human learning is to acquire these two kinds of knowledge. The essence of learning is to obtain a reasonable explanation under these two kinds of knowledge. Once explanations are obtained, learning takes place. Human beings'learning of two kinds of knowledge and its essence under this framework have significance for reference and Enlightenment in the development of artificial intelligence, especially in how to make artificial intelligence have learning ability. For the application of artificial intelligence in education, the direction of research and application is pointed out.

Key words: The essence of learning, Rich situational knowledge, Rich principle knowledge, Characteristics, Artificial intelligence design, Application in learning field

Artificial intelligence is a hotspot at present. What is artificial intelligence? Simply speaking, it is to make artificial machines have human intelligence. The ideal realm is to have thinking, thinking and even feeling like human beings. In order to realize all this, the basic condition is that artificial intelligence must be able to learn and be like human beings. Knowledge is acquired through learning. Only by relying on knowledge can we think, make decisions, have our own thoughts and emotions, and eventually become "adults".

In order to achieve leapfrog development of AI, the key is to imitate and copy the human learning mechanism and transfer the basic mechanism of human learning in AI design. So what is the essence of human learning?

1. Two Kinds of Knowledge Acquired by Human Beings

If we want to see the essence of learning, we should analyze it from the results of learning. The result of human learning is knowledge and thinking, of which knowledge is the most direct result. It exists in human mind and can be extracted and applied at any time. Thinking is the ability developed on the basis of knowledge acquisition, and its foundation is knowledge. So

what is knowledge?
(1) Two Views of Knowledge

One view of knowledge holds that knowledge is the reflection of the objective world in the human brain, that knowledge is objective, that it is not transferred by human will, that it is the reflection of the object in the subject, whether you recognize her or not, whether you like her or not, she is there. Another view of knowledge holds that knowledge is not all objective. The perceptual subject of knowledge is human and human is the subject of knowledge. If the knowledge of the object is reflected by the subject, it will inevitably be affected by the subject, and it will be subjected to the "secondary processing" of the subject's prior knowledge and emotion, thus bringing the color of the subject, that is, knowledge has subjective components. It is the subjective knowledge of personal understanding and emotion

So, which of these two views of knowledge is right? It is not advisable to arbitrarily say which view of knowledge is right or wrong, which will lead to the old road of absolutism. Karl Popper said that a true scientific theory should be falsifiable. The correctness of knowledge exists in a certain horizon, and the right knowledge in a certain horizon may be wrong in another horizon. Because of the existence of horizon, discussing which view of knowledge is right or wrong has no practical significance, but from the perspective of learning, discussing which view of knowledge can explain human learning more reasonably, so as to provide a framework and basis for us to discuss the essence of learning, which has practical significance.

The difference between man and animals is that man can learn, have knowledge and think. It is precisely because human beings have acquired the knowledge that can transform the nature that they can become the hegemony of the earth. For nature, man is the subject and nature is the object. It is because human beings have learned the ability of adapting and transforming the object in their understanding of the object of nature that these abilities have gradually accumulated into the most important part of human knowledge base. This part of knowledge mainly reflects the basic laws of nature. These laws are unique. People are active. For a specific person, he or she can reflect the nature correctly or wrongly. But for the human group, it is necessary to pursue the correct reflection. Only in the case of human beings, can the correct reflection be achieved. Constantly studying and researching the laws of nature can make human's understanding of nature approximate to the unique knowledge reflecting nature. With the gradual acquisition of this unique knowledge, the means and tools of adapting and transforming nature become more and more advanced. That is to say, for the object of nature, knowledge is objective and unique to human beings.

Human beings live in an environment composed of human beings and nature. Knowledge will be generated in the interaction between human beings and nature. Similarly, knowledge will also be generated in the interaction between human beings. This part of knowledge is more derived from human beings themselves, with strong situational and personal emotional colors. It is the symbol of different interaction situations between human beings. Named expression, knowledge reflects a specific and vivid human activity situation, which is mainly composed of people in places and places and their immediate activities, reflects human's own ideological activities, with a strong subjective tendency to act as human beings, and is situational, diachronic and relatively stable knowledge.

(2) Two types of knowledge acquired by human beings

In the interaction between man and nature, and between man and man, two kinds of knowledge are actually formed, one is rich in situational knowledge, one is rich in principle knowledge, which is also called situational knowledge and rational knowledge.

(i) Enriching situational knowledge

(a) Definition of Situational Knowledge

The so-called rich situational knowledge refers to the knowledge with significant situational characteristics formed in human interaction. To a certain extent, situational knowledge is an abstract representation of the real-time situation of human interaction. For example, a 2-year-old child, whose family often takes him downstairs to play with a variety of contents, such as sliding, playing marbles, playing games with children, playing sand, etc. Over time, it has formed in the child's mind. A concept of "play", as long as the child is told to take him to play, his mind emerges of a situation: downstairs, there are specific items to play, happy, this situation is his concept of play, the formation of knowledge about play, this knowledge shows a situation, is rich in situational knowledge.

(b) The Characteristics of Rich Situational Knowledge

Situational. Situational knowledge is the most important feature of rich situational knowledge, which represents a specific situation or a specific kind of situation, and is the abstract essential representation of the concrete situation. Situational knowledge is associated with a certain situation or a certain kind of situation, and it is a symbolic expression of the essential elements of the situation. For example, for a child, based on his experience, the basic elements of forming the concept of play are downstairs, having specific play items, and being happy. As for who takes him and what projects he plays, it is not the essential element of his concept.
Human participation. Different from the rich principle knowledge, the situation is made up of people in places and places. People are the most important part of the situation. The knowledge in the situation is generated by three kinds of interaction, including the interaction between people and places, the interaction between people and themselves and the interaction between people. Man is a specific person, with different maturity, different growth environment and different experience. Therefore, the knowledge produced mainly by human interaction has human subjectivity, and rich situational knowledge is knowledge with personal understanding.
Diachronic. Everyone has his own past. History is the existence of the past. Situational knowledge generated in real-time situations is not only the immediate result, but also the diachronic result, with the accumulation of past experience. For example, the first time a child goes downstairs may be playing on a slide and has a pleasant experience. The concept of play formed by him. It's downstairs, playing on the slide and having fun. Later, the number of downstairs trips increased. Not only did he play on the slide, but also sand and marbles. The situation he formed about playing was changed to downstairs, with specific items and pleasure. When he got older, he went to the playground, and the situation he played turned into a playground. There are specific play items, happy, after school, the play situation may evolve into a non-learning, specific play items, happy. It is precisely because of its diachronic nature that it promotes the generation, evolution and enrichment of situational knowledge. For a certain rich situational knowledge, it can be traced back. For example, the current understanding is that there is no need to learn, there are specific play items, happy. If the knowledge owner wishes, he

can go back to downstairs, there are specific play items, happy.

The situational nature of situational knowledge has created the image of such knowledge, which can express the rich and colorful world, the participation and diachronic nature of people, which makes the human thoughts expressed meticulously, and creates the rich and colorful, vivid, pluralistic and regional culture of human beings.

(ii) Rich knowledge of principles

Principle-rich knowledge refers to the knowledge about the environment that people need to acquire in order to transform the environment in the natural environment. Most of these knowledge appear in the form of principles and laws, which are the reflection of the subject to the object. If we grasp these knowledge correctly, we will acquire the ability to adapt to the nature and transform the living environment. Principle-rich knowledge has the following characteristics.

Objectivity. Rich principle knowledge is the reflection of nature. As matter, matter has uniqueness, so rich principle knowledge has objectivity and material has uniqueness. This reflection is projected into people's mind and becomes knowledge. Rich principle knowledge is limited to current conditions and may have errors in expressing things, but it does not exist. Keep approaching this uniqueness.

De-subjectivity. Principle-rich knowledge excludes subjectivity, but it is inevitably affected by subjectivity, because principle-rich knowledge is the reflection of human subject on object as matter, subject to the level and attitude of cognitive subject. Principle-rich knowledge has more or less subjective components, including the depth of knowledge and attitude tendency. Therefore, when human beings accumulate rich knowledge of principles, they must maintain value neutrality, and constantly explore, in-depth study, so that knowledge becomes more and more true, that is, to constantly remove subjectivity.

Current nature. Rich principle knowledge pays attention to the principle of reflecting matter. With the improvement of cognitive technology, the same principle reflecting the same objective object will be updated with the development of time. Once the knowledge is updated, it means that human beings have made a step towards the principle of uniqueness and are closer to the original appearance of things. The old knowledge will be replaced, and the old knowledge will become meaningless. Therefore, the principle-rich knowledge is current and diachronic.

2. Two Kinds of Knowledge Learning Styles

Learning rich in situational knowledge and rich in principle knowledge should be carried out according to their respective characteristics so as to achieve efficient learning with half the effort.

(1) Learning rich in situational knowledge

Rich situational knowledge is a kind of knowledge that reflects the specific human situation participated or even dominated by people. The elements are places and people in the situation. The mechanism of knowledge generation is the interaction between people and situations,

between people and themselves, between people and others, while people have history, and the composition of situational knowledge by people's past knowledge. It is the knowledge that has a diachronic effect. Based on this, the following methods are used to acquire this kind of knowledge.

Experience. Man is the main body of situational knowledge creation, the creator of knowledge, and he has feelings for what he already exists.

Situational knowledge, the most ideal learning method is to experience, experience the place where knowledge occurs and the interactive process in the place, so that the acquired knowledge is the most direct, also full of experience and vivid.

Substitution. For the past situation, it is impossible to experience it personally. To acquire this kind of knowledge, situational reproduction is a good choice. The method of reproduction should first realize situational simulation, such as role-playing, multimedia situational simulation, etc. The learner can not be a spectator of the situation, and should choose a certain angle to substitute it into the specific situation. In order to achieve situational knowledge learning.

Critical thinking. Situational knowledge is a kind of knowledge with personal understanding. Humanities knowledge belongs to situational knowledge. Critical thinking is an advanced way of learning for this kind of knowledge. The learners can make critical thinking on this kind of situational knowledge from their own point of view and with critical thinking so as to realize critical thinking. It is necessary to understand the situation and meaning of knowledge. At the same time, it is necessary to think from a high level, add personal rational thinking, and acquire situational knowledge with their own views. This is a higher level of learning, and also the source of new ideas.

(2) Learning with rich knowledge of principles

Rich principle knowledge is the knowledge reflecting the objective world. There exists only "truth". With the deepening of human understanding, it will never achieve the only "truth". Rich principle knowledge excludes individuality. According to the characteristics of rich principle knowledge, its learning methods mainly adopt the following methods.

Accept. Acceptance learning is the main way for human beings to learn knowledge. Knowledge is a huge amount of knowledge. People's life is limited. It is unnecessary for specific individuals to "discover" what has been discovered. The effective way is to accept. Acceptance learning is the main way to acquire rich and principled knowledge. When people accept it, they should strive for it. Excluding the influence of one-sided, fixed thinking and prior knowledge, we can learn "right" knowledge.

Discovery. Discovery includes two situations, one is to discover new knowledge, the other is to discover objective knowledge, which is the way for human beings to acquire new knowledge. Through constant exploration, discovery of new knowledge, the process of exploration is the process of learning, which is the highest level of human learning, and the work done by scientists belongs to this category. The other is to discover the unknown. This knowledge exists and has been discovered by human beings, but for an individual, he does not know or does not know enough. The process of discovery is the process of gaining new knowledge or renewing understanding of old knowledge. The former increases the content of human knowledge base,

which is to generate knowledge increment learning, while the latter does not increase the content of knowledge base, which is to absorb the stock of learning.

3.The Nature of Human Learning

What is the essence of human learning? Have you learned (understood)? The first problem is solved very well, that is, learning the two kinds of knowledge mentioned above means acquisition if you can remember them. The second problem is whether you have learned them or not, that is, the problem of understanding. Generally speaking, it means that you don't understand them.

(1) A learning society rich in situational knowledge. Learning with situational knowledge is the situation in which knowledge is acquired and the understanding of the situation, such as "one room, two people, three meals and four seasons". For this knowledge situation, the pupils who lack the living situation understand the number of houses and characters, which is the result of the lack of situational knowledge in life experience and the individual's understanding of the situation. An explanation of characters can be explained. For him personally, it means understanding. For a person with rich experience in life, what he thinks of is the experience of life represented by these four words, the experience of bitterness, bitterness and bitterness. His understanding certainly goes beyond the literal meaning. He can explain these four words with the experience of life situation and can explain them. That means he understands. For situational knowledge, if individuals interpret it individually, they can not form group knowledge and culture can not be talked about. That is to say, rich situational knowledge must pursue a consistent interpretation within a group. Strictly speaking, only when individuals obtain this consistent interpretation, can they truly learn.

(2) A learning society rich in principle knowledge. How to learn to be rich in principle knowledge? Benjamin Bloom believes that the level of learning is to remember, understand, analyze, synthesize and evaluate (innovation). So, which level is learning? Rich principle knowledge is knowledge about the objective world, which is necessary knowledge and reflects the law of the objective world. The expression of knowledge is "what" knowledge. Memory alone can not be regarded as learning. The symbol of learning is to understand the "what" of the expression of knowledge and to use this knowledge to explain the objective world, or to say. Knowledge itself is an explanation, learning is to get an explanation.

The essence of context-rich knowledge and principle-rich knowledge learning is to get an explanation. The former is to get an explanation of consistency or tendency in a group, while the latter is to get an explanation of objective world law. The explanation is relative but tends to uniqueness. The knowledge acquired can explain a situation or something, which means that the specific knowledge has been learned.

4. The Enlightenment of the Essence of Human Learning to Artificial Intelligence Design

Artificial intelligence imitates human intelligence. Advanced intelligence is mainly embodied in the imitation of learning. To acquire learning ability with artificial intelligence, we need to follow the mechanism of human learning when designing. Like human beings, we can acquire two kinds of knowledge through learning, rich in situational knowledge and rich in principle knowledge. In view of the acquisition of these two kinds of knowledge, the corresponding

intelligent system should be designed.

From the essence of learning, the essence of human learning is to obtain a subjective or objective explanation, and the essence of AI learning should be consistent. Whether new acquired knowledge of AI can be explained and explained in its own intelligent system or not, it is believed that AI has the ability of learning and the mechanism of obtaining explanation. It should be consistent with human beings.

5. The Enlightenment of the Essence of Human Learning on the Application of AI in Education

The application of AI in education is a hot topic. In order to exert its real significance in education, AI should be considered from the results of human learning, that is, assisting human to learn rich situational knowledge and rich principle knowledge.

For rich situational knowledge, through the help of artificial intelligence, reappear the situation of situational knowledge, help students to understand the situation through situational reappearance; through the service of artificial intelligence, help learners experience the situation of knowledge; through the assistance of artificial intelligence, promote learners to think critically.

To enrich the principle knowledge, through intelligent knowledge supply and learning tool supply, help learners to accept the principle knowledge more efficiently. By providing intelligent exploration environment and tools, learners can explore the objective world and discover new and unknown knowledge.

Study on AI-Driven Personalized Teaching Mode under the Background of the New College Entrance Examination Reform

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Abstract: The New College Entrance Examination Reform is a new educational revolution, designed to increase students' selectivity and promote their comprehensive and individual development. How to provide students with personalized learning assistance in a fair and effective manner has become the core issue of the New College Entrance Examination Reform. This paper analyses the challenges faced by the personalized learning mode after the New College Entrance Examination Reform, and constructs the overall framework of the personalized learning mode from five aspects of learning strategy construction, support system construction, evaluation system construction, digital learning capacity training, and teaching management transformation, as well as explores the application of the AI-driven personalized learning mode in education, so as to provide effective guarantee for students' personalized learning.

Key words: New College Entrance Examination Reform, Personalized, Learning mode, AI-driven.

INTRODUCTION

In 2014, the State Council promulgated the Implementation Opinions on Deepening Reforms to the Student Examination and Admission System. The Opinions posed specific requirements for the fairness of the college entrance examination and personnel training, which were extensively concerned by the public. In the Opinions, “Initiating the comprehensive pilot reform of college entrance examination, reforming the examination subjects and the enrollment mechanism”, as one of the five core actions, has led to some profound changes in the entire teaching mode for senior high school students. At present, Shanghai and Zhejiang have taken the lead in initiating the comprehensive pilot reform of college entrance examination. In accordance with the principles of overall planning, priority to pilot reform, step-by-step implementation and orderly promotion, other provinces have introduced the plan for the New College Entrance Examination Reform after the pilot programs in Shanghai and Zhejiang. About 249,900 senior high schools in China will carry out the New College Entrance Examination Reform in the next three years, involving more than 24 million senior high school students, which will lead to the chain reaction for all students in primary and secondary schools.

The Ministry of Education promulgated the Education Informatization 2.0 Action Plan in April 2018, which is a pioneering project of Education Informatization 2.0. The terms in relation to "intelligence" were mentioned 36 times in the Plan, while it is required to improve the current education ecosystem and build an intelligent education system from a deeper level on the basis of such new technologies as big data and AI.

CHARACTERISTICS OF PERSONALIZED TEACHING

Personalized learning, as the fundamental feature of quality education, is also a new learning trend to promote students' personalized development after the New College Entrance Examination Reform. The traditional teaching mode retains the characteristics of unified standards and progress in the era of industrialization and adopts the large-scale collective teaching mode as the flow line in factories, while personalized learning pays more attention to the individual differences among the students. The implementation of the differentiated and personalized teaching mode on students helps to better develop and exert their learning potential. As a manifestation of the in-depth integration of information technology and teaching, personalized learning has the following features:

- Differentiation of learning objectives: According to students' learning progress, learning methods and other conditions, teachers will provide assistance for students to formulate the contents and objectives of personalized learning based on the six key qualities, so as to stimulate their interest in learning in a target-based way.

- Customization of learning content: On the premise that there is no serious deviation from the learning objectives, the learning contents that meet students' needs can be customized according to the actual situation, interests and subject tendencies of the students.

- Autonomy of learning methods: In the process of learning, teachers are responsible for guiding and assisting students in decision-making. According to students' interest and methods of personalized learning, teachers take into account the learning factors in multiple dimensions, while students can choose their own learning paths.

- Ubiquitous learning environment: Students can take advantage of information means and tools for learning at any time and anywhere.

- Visualization of learning outcome: The presentation of outcomes is the best way to embody the feature of personalization. Teachers can break the tradition of the score-oriented evaluation for learning outcomes, set up personal files to record the growth of students, visualize their diverse learning outcomes and provide more opportunities for them to display their outcomes.

- Diversification of learning evaluation: Taking full account of students' personality differences, teachers can establish a learning evaluation index system, combine subjective qualitative evaluation with AI-based objective quantitative evaluation and focus on students' vertical growth by means of various evaluation methods, such as outcome evaluation, process evaluation and so forth.

- Internalization of learning motivation: Teachers can deeply tap students' learning

motivation behind their interests in learning, enable them to carry out personalized evaluation, give feedback and gain incentive, and internalize their learning motivations, so as to give play to their learning autonomy and initiative.

CHALLENGES IN PERSONALIZD LEARNING

1.Multiplied demand for schools and teachers in personalized learning

At the teacher level, teachers have gradually changed from traditional teaching means, methods and forms to intelligent and digital teaching modes in the new era so as to adapt to and meet the requirements of personalized learning. Moreover, teachers should take the initiative to adapt to the personalized teaching mode and constantly improve their information literacy in the process of professional development, thereby satisfying the needs of personalized teaching.

At the school level, as a personalized learning space, schools are required to present the student-centered design concept in a variety of learning environments, including traditional classroom and intelligent classroom, and provide a personalized learning environment for students, which will enable students to learn in their fragmented time whenever and wherever possible.

2. Lack of guidance for overall personalized framework in China

At present, there has not yet been a standard for the framework of personalized learning in primary and secondary schools in China, and the concept of personalized learning is understood in various ways. Most scholars agree that personalized learning is a teaching method that provides students with appropriate learning materials and activities in accordance with their style, interest and needs in learning, but there is a problem that the position and role of students themselves in personalized learning are neglected. However, there is a lack of effective guidance of top-level documents in various regions and schools, and the relevant departments and schools in regions mostly guide the reform of the education and teaching mode of personalized learning as required by the quality education, the six key competencies of students' development and the core qualities of various disciplines. In case that it is impossible for them to quantify the training objectives of students, there is no way to carry out the personalized teaching on students, and thus they can only explore and implement personalized learning in a small scale, making it less likely to be promoted in a larger scale.

3. Imbalance of personalized learning due to uneven educational resources

Personalized learning depends on the professional qualities of teachers and the education concepts of schools. In the process of learning, a large amount of data concerning students' learning is collected, and teachers' teaching data needs to be supported by a large number of information-based devices, while the educational resources among different regions are unevenly distributed in terms of student-teacher ratio, teachers' educational background and professional skills and positions, and the hardware facilities and so forth. In this context, on the one hand, the use of artificial intelligence can reduce the threshold of the use of information technology, and the accessibility of technology enables information technology to be better publicized, which will be conducive to reducing the uneven distribution of educational resources in urban and rural areas. On the other hand, the degree of individualized learning will still be constrained by the difficulty of balancing the distribution of educational resources.

4. Contradiction between personalized learning and information development

In recent years, information technology has been developing at an unprecedented speed, while the Internet, cloud computing, big data and artificial intelligence are transforming the living space of human beings. Personalized learning can not be separated from the support of information tools, but new problems are also arising from the use of information tools.

4.1. Balance between students' learning and myopia prevention

In the information age, the ubiquitous personalized learning mode and the acquisition of learning resources of senior middle school students can not be separated from the support of information tools. According to the latest data from the survey of the National Expert Group on Myopia Prevention, 80% of senior middle school students are nearsighted. Therefore, how to balance students' learning and myopia prevention has become a practical problem that must be faced by the rapid development of education informatization.

4.2. Informatization and privacy protection of middle school students

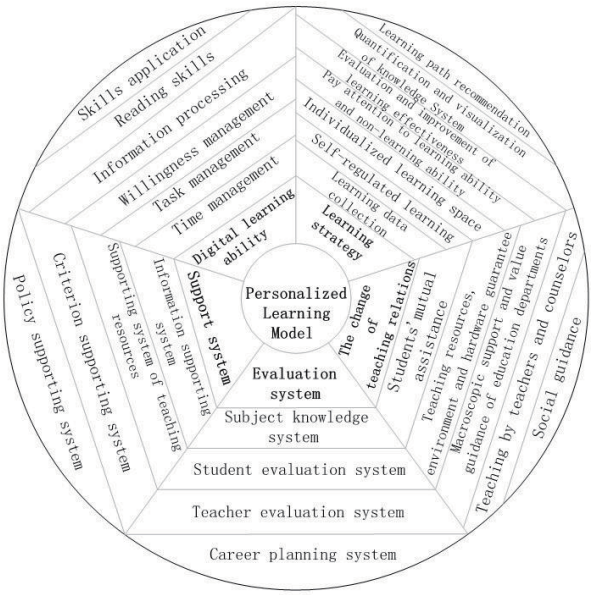
In the process of personalization, the system will collect students' personal information in a dynamic way, including their daily learning data, face recognition, social behavior, examination information, mental health, physical health and so forth. The data, on the one hand, can be used as effective support for the intelligent recommendations for the contents and paths of students' learning and their learning evaluation. On the other hand, the data is students' privacy information, which makes the permission of data acquisition, the scope of information disclosure, the encryption and privacy protection of data information of vital importance.

5. Contradiction between personalized education and exam-oriented education

Personalized learning runs counter to the view of score-oriented evaluation, but lays stress on the promotion of students' personalized development, while the value orientation of educational administration authorities and the teaching concepts of schools and teachers directly affect the outcome of students' personalized learning. However, it is impossible to solve the problem of examination-oriented education in a short time, since the College Entrance Examination is an arms race which never ends. It may be a false proposition that personalized learning lightens the burden of students, but it may aggravate their burden.

AI-DRIVEN PERSONALIZED TEACHING

1. Structure of personalized learning system



Personalized learning strategy mainly refers to the practice that teachers develop appropriate learning paths in view of each student's learning needs in the development course of the personalized learning mode and quantify and visualize the knowledge system, so that students are able to absorb the knowledge more efficiently. After completing a series of learning tasks, students can evaluate their own learning effects and draw up corresponding plans for improvement. At the same time, attention should be paid to students' learning capacity and non-learning capacity. In the personalized learning space, students can collect relevant learning materials and learn on their own.

Students' digital learning capacity refers to the capacity of autonomous learning by means of digital tools, including skills application, reading skills, information processing, willingness management, task management and time management.

The transformation of teaching relationship refers to the corresponding transformation of learning relationship that may occur in the personalized learning mode, which requires teachers and schools to provide more comprehensive support and students to learn on their own in a more efficient way so as to better achieve students' learning objectives. That is to say, schools should provide the guarantee of teaching resources, teaching environment facilities, teaching hardware and other conditions. Education departments should provide macro-policy support to guide students in their values. Teachers and instructors should impart knowledge, answer the questions from students, give guidance in the learning plan, as well as lead students in their growth and development with the aid of social resources and social environment.

Support systems are mainly composed of the information support system, the support system of teaching resources, the support system of relevant criteria, and the support system of policies and regulations.

The evaluation system involves a series of evaluation methods and measures for all the objects concerned in the personalized learning mode for the purpose of providing more assistance for students' learning and development, including the subject knowledge evaluation system, student evaluation system, teacher evaluation system and career planning system.

2. Improvement of Students' learning level

2.1. Construction of subject knowledge graph

A variety of advanced machine learning techniques and domain feature engineering are used to analyze and train the authentic academic big data and massive test question resources. With the help of AI-based automatic labeling system for knowledge space, the knowledge graphs for the subjects after the New College Entrance Examination Reform are constructed, and the weights of various knowledge points are allocated pursuant to the scores, frequency of such points and the importance of the examination syllabus, which will provide support for the analysis of the learning status graph of students themselves and the overall learning status graph of the class and the school.

2.2. Analysis of personalized learning status graph

The premise of effective teaching is precise measurement and diagnosis of students' mastery of knowledge points. Exercise and examination questions tend to blend various interrelated knowledge points together. Self-adaptive calibration of test question parameters based on machine learning is the key and fundamental technique to support personalized teaching and tutoring.

The system visualizes students' knowledge graphs, which will be conducive to discovering the blind knowledge points of students, identifying their potential problems in the process of learning. Through the analysis and visual display of the personalized learning status graph, students' mastery of knowledge can be structured, and their mastery and application of knowledge points can be precisely understood. Furthermore, students should be required to focus on the important knowledge points to be tested in the learning process, so that students will be able to improve themselves and increase their scores, and then their learning efficiency will be enhanced in an effective manner.

2.3. Recommendation of personalized learning paths

The system collects and analyses students' daily data, including examination data, exercise data and homework data. Moreover, based on the analysis and diagnosis of knowledge point graphs, the weak links of students can be identified through the system. In view of some knowledge point that students fail to grasp, the system will construct the knowledge graph of the point and its corresponding knowledge points. In this way, targeted resources can be pushed to help students to improve themselves in learning, so as to further optimize the learning process.

Relying on AI's self-adaptive learning function, personalized resources that conform to students' learning capacity can be automatically pushed to corresponding students according to the varying degrees of their grasp of knowledge points, ultimately carrying out decision intervention. That is to say, the analysis model will give scientific intervention to students' choice of learning paths, so as to prevent them from taking a zigzag course and complete the learning plan more efficiently.

2.4. AI-aided career planning for students

2.4.1. Establishment of personal portrait and intelligent recommendation of courses for students

Through the collection of students' basic data, the system conducts an overall analysis of the comprehensive procedural data, such as the data concerning mental health, physical health (physical examination, physical fitness monitoring and physical education test), moral education, art, social interaction, practice, competition and so on. While evaluating students' comprehensive quality, the system will establish the personal portraits for students, and analyze the personality traits, vocational interests and professional tendencies of the candidates in an all-round way with the help of the intervention of AI technology, which will enable students to have a much clearer understanding of their own status. Moreover, through this system, it is possible to analyze the students' strong and weak points in courses, and offer them corresponding guidance at the time when students choose the subjects for learning, intelligently recommend corresponding courses, and develop a personalized curriculum system, so that students will be able to give better play to their own strengths and strengths in career planning.

2.4.2. AI-aided college application

This system collects the data on admission scores of the target colleges in various provinces, the number of students to be enrolled, and the rankings of students by score, as well as the lowest scores for submission of students' files to colleges concerned, and the minimum number of students enrolled over the years. A database for college application is established according to the admission scores and rankings and a prediction model is constructed by means of the AI algorithm. Putting students' scores into the prediction model, the system will recommend the colleges for qualified students to apply for based on the probability predicted. In the meantime, the analysis of big data on the Internet will help students to avoid the popular universities which candidates are more concerned about in a reasonable manner, give relevant early warning, and then enable them to adjust their applications for colleges.

2.4.3. AI-aided major selection

In addition to colleges, selection of majors is also of great significance to students in their career development. Whether in accordance with the current direction of the College Entrance Examination Reform or from the perspective of future development, the selection of major is not inferior to that of college. Combined with the subject evaluation organized by the China Academic Degrees & Graduate Education Development Center (CDGDC), the system gives full play to the advantages of artificial intelligence technology, and screens out the college groups that conform to students' intentions in accordance with the varied probability of admission, under the circumstances that the personal traits and major tendencies of students are taken into full account, so that students can fill in precise applications for colleges and then make correct choices.

3. Development of teachers' professional level

3.1. Establishment of a comprehensive teaching evaluation system for teachers

It is a complex systematic project to define the specific objectives for education evaluation and establish effective evaluation indexes. Different from the traditional subjective evaluation based on student evaluation, expert evaluation, leadership evaluation, peer evaluation and teacher self-evaluation, AI has incomparable advantages in the construction of specific evaluation and quantification of evaluation indexes.

With regard to the teaching behavior factor indexes that affect teachers' efficiency, such as teaching skills, specialized knowledge in certain subjects, teaching design skills, teaching materials and management skills, the system carries out quantitative analysis of the teaching behavior of teachers and discovers the key teaching behavior factors affecting the teaching effect, relying on the motion capture technology, facial expression recognition technology and semantic analysis technology. At the same time, the implicit experience of teachers is revealed explicitly, and the subjective qualitative evaluation by mankind is combined with the objective quantitative evaluation by AI so as to obtain more objective, authentic and effective results of evaluation.

3.2. Intelligent feedback to improve teachers' professional level

In teaching, teachers give cyclic feedback and intervention to students' learning status. Traditional teaching feedback is based on homework and examination, which is difficult to achieve timely and accurate results, but it is exactly what is AI is adept in. Through the collection of accompanying classroom data, this system analyses the personalized learning status graphs of students and the learning status graphs of the class groups, and then analyzes students' mastery of various knowledge points in accordance with the class as a unit, as well as visualizes teachers' teaching outcomes, so as to teach students in accordance with their aptitude. At the same time, teachers should be reminded to pay attention to the weak knowledge points in teaching and be aided to adjust the direction of teaching.

In addition, teachers' data in classroom teaching are collected in class to capture their classroom behavior, recognize their facial micro-expressions and language style. Coupled with the semantic logic analysis of teachers carried out by automatic calibration and the comprehensive evaluation system for teachers, an analysis model is established to automatically analyze the teaching mode and behavior of teachers, so as to make dynamic evaluation of the teaching ability of teachers with class hour as a unit, give feedback on the advantages and disadvantages of teachers in the course of teaching, and thus help teachers understand their own status in teaching, improve teaching methods and enhance teaching efficiency.

4. Teaching management

4.1. Intelligent management of mobile class and teaching schedule

Under the New College Entrance Examination Reform, students can choose the subjects for learning on their own, which will make the students' subjects for learning, timetables, test subjects, the difficulty in learning the same course and the teaching plan for teachers in the same course vary from each other. The differentiated learning and curriculum system can be realized based on the teaching mode of mobile classes. The flexible curriculum and the varied classroom have posed higher requirements for the self-discipline capacity of students, and the management capacity and teaching management of teachers.

According to the hardware conditions such as the number of school teachers and classrooms, the soft conditions such as the conditions and ideas of class scheduling and the smallest unit layered by subject in the form of course stratification, student classification and class grouping, the weights of the mobile class rules are set up pursuant to the actual situation of schools, and

the schedules of mobile classes are automatically made by means of AI algorithm. Moreover, reasonable strategies are selected and information tools provide effective assistance, so as to achieve the optimal schedule for the school. And the optimal solution is figured out under the limited teaching resources, which will reduce the difficulty and cost of management and solve the problems in the allocation of teaching resources in schools on the basis of meeting the personalized needs of students.

4.2. Establishment of tutorial system and counselor system

The administrative class implemented after the reform differs greatly from the traditional class, while the original head teacher is difficult to adapt to the management mode of course-based mobile classes. Therefore, head teachers should be divided into counselors and tutors pursuant to their primary functions. Full-time counselors are responsible for the management of students in their daily life, so that the instructors can effectively complete their teaching tasks, which will be conducive to the career development of a number of management-oriented teachers.

At the same time, it is necessary to establish a school tutor bank, which can automatically match the tutor for students through intelligent algorithm in accordance with students' character and academic achievements of students, and teachers' teaching mode and language style and other comprehensive factors, and pay attention to students' non-intellectual development. In the process of individual guidance and cooperative learning, teachers and students discuss the implementation of learning objectives, and track the progress of students in learning, college their procedural data, and train them to formulate the plans and strategies to enhance their learning, which will strengthen students' awareness of inquiry and innovation from the professional level, and effectively promote their personalized development.

RESULTS

Personalized education and teaching is supported by artificial intelligence technology. At present, the application mainly focuses on three aspects: recommendation of students' personalized learning paths, teachers' automatic teaching evaluation, and intelligent school management. To some extent, this technically solves the problem of insufficient individual training, which has provided many possibilities for students to develop independently. But even with the promotion of the New College Entrance Examination Reform, personalized education is still in the exploration stage. It also needs the education management department to carry out value guidance and overall framework support from the policy level, and reduce the threshold for technology. In this way, AI technology can better serve personalized education and teaching.

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Research on the Practical Path of "How to be a Future Teacher" in the Era of Artificial Intelligence

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Abstract: Artificial intelligence and education are moving towards deep integration. In the future education, the development of artificial intelligence is bound to change the professional development of teachers. It is a necessary skill for teachers in the new era to learn how to co-exist and complement each other with intelligent technology. This research has explained the development course and the main characteristic of artificial intelligence, clarified the challenge and the opportunity which the artificial intelligence brings to teachers, proposed under the artificial intelligence age the future teacher development practice path: relocates the teacher role, to be the leader of personalized learning, the interlocutor of teaching activities and the innovator of knowledge, to keep the charm of teachers' personality, to make good use of information technology, to iterate their own knowledge system and to learn for life.

Key words: Artificial intelligence; Future teachers; Challenges; Human-computer collaboration; Path research

Introduction

For today's increasingly mature digital environment, what worries us most is the famous educator John Dewey* who said, "If we educate today's students the way we used to, we will deprive them of their future. " This is why it is necessary for us to discuss how to be a teacher in the age of artificial intelligence. In recent years, artificial intelligence is more and more widely used in traditional industries. Keynes believes that machines will lead to "Technological unemployment. " . Jobs that are repetitive, tedious, and labor-intensive could all be replaced by

* 基金项目：“赣鄱 555 英才工程”领军人才培养计划［赣才字[2012]1号]专项资助，江西师范大学领军人才科研专项资助
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robots. This arouses people's heated discussion and reflection: "Can artificial intelligence replace human teachers" , "What kind of teachers will be replaced" and "How to be future teachers" . In the era of "artificial intelligence + education" , artificial intelligence technology will be an integral part of the future work of teachers. Teachers should redefine their roles and know how to do what machines can not do in order to achieve human-computer cooperation, efficient teaching purposes. Therefore, this paper attempts to provide a practical path for teachers and provide direction for future education to achieve human-computer cooperation.

Chapter One Artificial Intelligence Perspective

1.1 Concept of Artificial Intelligence

The term "Artificial Intelligence" was first coined by Dartmouth College Assistant Professor John McCarthy at the Dartmouth Workshop in 1956 Artificial intelligence (AI) is defined as "a machine that has the ability to simulate learning or intelligent features that can be accurately described. "(Mccarthy, Minsky&Rochester, et al, 2006). Joseph McCarthy, Allen Newell, Herbert Simon and Marvin Minsky, who attended the meeting, were later hailed as the founders of AI.

Artificial intelligence corresponds to natural intelligence. "artificial intelligence is the study of how to make computers do intelligent work that only humans could do, " says Winston, a professor at the Massachusetts Institute of Technology (Feng, 2010). AI aims to make machines that mimic human intelligence.

Jiyou Jia (2018). a professor at Peking University, points out that artificial intelligence is the natural intelligence that people use to simulate humans and other creatures, including perception, memory and thinking, capacity and language. In other words, artificial intelligence is the human education realized on the man-made machine represented by computer. The difference is that human education need to spend a lot of time, human and material resources, the outcome is colorful. While artificial intelligence can make plenty of machines possess the same intelligence in an instant, and it's not hard to educate them to be productive.

Artificial intelligence is divided into Strong AI and Weak AI. Strong AI refers to the self-conscious artificial intelligence that reaches or exceeds the level of human beings and can adapt to the challenges of the external environment. Weak artificial intelligence refers to a variety of techniques that simulate human or animal intelligence to solve various problems, including problem solving, logical reasoning and theorem proving, machine learning etc. Up to now, the artificial intelligence system is still the intelligence of realizing specific or special skill, which belongs to weak artificial intelligence (Hong, 2018).

1.2 Development of Artificial Intelligence

The birth of the computer in 1956 marked the arrival of artificial intelligence. The development of artificial intelligence has now produced three schools, a total of three waves.

1.2.1 First Wave: The Turing Test (Logicism)

First wave (1956-1976). The turing test launched the first wave of artificial intelligence. In

1950, AI Pioneer Ellen, Turing published "computing machinery and intelligence" and came up with the famous "Turing Test" : testing in a human-machine split, if more than 30% of the participants were unsure whether they were human or machine, then the machine has passed the test and was considered to have artificial intelligence (Wang, 2016). In the research methods of artificial intelligence, logicism, also known as symbolism, is prevailing. Its core is symbolic reasoning and machine reasoning, that is, to study intelligence and research reasoning by symbolic expression. Mathematical logic uses computers to formalize the world. But in the early days of the computer, limited computing speed severely limited the development of artificial intelligence.

1.2.2 Second Wave: Modeling the Structure and Function of the Human Nervous System (Connectionism)

Second wave (1976-2006). In the 1980s, artificial intelligence emerged again. The research paradigm during this period was connectionism, also known as bionics. The traditional semiotic school developed slowly, and the connectionist school tried to make machines intelligent by simulating the structure and function of the human nervous system. Based on the new method of probability and statistics model, obvious progress has been made in speech recognition and machine translation, and artificial neural network is emerging in the field of pattern recognition. The artificial intelligence in this period is limited by the data and test environment, so it does not have the universal or practical value. To some extent, artificial intelligence is at a low ebb.

1.2.3 Third Wave: Deep Learning (Behaviorism)

Third wave (2006-present). "Deep learning" based on an artificial neural network, have been formally proposed by Professor Hinton in the journal Science , thus revealing the third wave of AI development (Yu, 2018). The wave is based on deep learning of big data, combining some techniques, neural networks and statistical methods, and achieving great success in areas such as face recognition, speech recognition, machine translation and intelligent question-answering. It is entering a new period of accelerated development, in which the three key elements of AI are data, algorithms and computing power (Gao, 2019). Its research paradigm is behaviorism, also known as evolutionism or cybernetics. Inspired by the principles of biological evolution and cybernetics, it aims at developing mobile robots, trying to make corresponding intelligent behavior to the perception result by interacting with the environment, and improving the intelligence of robots by simulating the mechanism of biological evolution. In this period , AI is getting maturity, the application value is also growing.

Chapter Two Challenges and Opportunities

2.1 Application of Artificial Intelligence

Cloud computing and big data make AI possible. Alphago, the first artificial intelligence robot who have beat the world champion, has super computing power and big data, based on the principles of deep learning and reinforcement learning. IBM's "Deep Blue" beat chess champion Garry Kasparov, followed by a cognitive system called "Watson, " which is not only knowledgeable, but able to understand and analyze complex human languages, including adage and slang , and answer kinds of questions quickly with high confidence (Yu, 2018). The CHATBOT, based on IBM's Watson technology, was offered a five-month teaching assistant,

but no students found out it was a robot. Nowadays, AI technology has been widely used in furniture, retail, road network, medical, education, freight, security and other fields. Virtual reality (VR) technology has been able to easily simulate the link of people's automation.
The achievements of AI in the field of education are numerous. Education is pointing to "accurate education" , through "accurate positioning" , provide "accurate services"for the growth of students . VR technology makes virtual teaching scene, virtual experiment and VR training teaching possible. The great achievements of AI need not be mentioned overmuch, but the most pressing question remains: What is the greatest challenge for teachers? How should teachers redefine their roles? How to meet the challenge?

2.2 Challenges in the role of Teachers

In the future, AI will solve most of the problems that can be solved by hard knowledge, which will challenge the role of teachers. When AI enters the classroom, VR technology gives teachers the pleasure of virtual teaching and students fall in love with the immersive classroom experience. The fear of AI superseding teachers came into being, different experts and scholars have expounded it one after another.

Qian Yingyi, a professor at Tsinghua University, believes that AI in the future will first take the place of the advantages of training students under our educational system, namely the accumulation of existing knowledge (Chen, 2018). A 2013 Oxford University study found that teachers are among the least likely to be replaced by computers in the future (0.4 percent of teachers will be replaced by AI) (Frey, C. B., & Michael A. O. , 2013).

We all consider that AI will not supersede human teachers , but teachers who are not good at using AI will inevitably be replaced by those who are. In fact, we can go back to the essence and basic purpose of education to explore its causes. On the one hand, from the essence of education, the famous German philosopher Karl Jaspers once described education as: with a tree shaking another tree, a cloud pushing another cloud, a mind to wake another mind. On the other hand, from the perspective of the fundamental purpose of education, the task of teachers is not only to teach, but to educate people with their hearts . It is necessary to teach students to be human beings, to mold students' quality and to cultivate students' core quality through the input of real emotion and thought. Education is essentially a mental project, and its educators -- teachers -- are human beings full of emotion and wisdom, imagination and creativity, which can not be matched by AI (Zhang, 2017).

The biggest challenge of AI to our teachers lies in: AI provides us with a large area of comfort and convenience, but when we rely too much on the huge data system, can we jump out of the "two circles" in a timely manner? Whether can we still be diligent in thinking, willing to learn , good at reflection and not let our unique wisdom degenerate?

2.3 Opportunities for Teacher Development

Since AI can't replace teachers, anything can be an opportunity for teachers. Supported by cloud computing, big data and VR technology, interactive cognitive tools such as Moocs, Micro Classes, Rollover Classes and Virtual Teaching undoubtedly facilitate teachers' teaching and students' learning. The optimization and centralized use of educational resources, the fragmentation of teaching content and the reconstruction of multimedia can produce new

focuses and new knowledge points in a timely and flexible manner, which can train the students to acquire knowledge anytime, anywhere, to make decision on specific problems and to solve problems creatively (Li, 2016).

The opportunity that AI brings to a teacher comes out one after another. Teachers should be " knew what they wanted" in order to "win every battle" . It is undeniable that the future AI will be better at standardized material push and evaluation. AI can replace teachers to do a lot of standardized work, but AI has defects: AI can't solve creative, thoughtful, emotional, or reasoning problems. As 74th world science fiction convention Hao Jingfang, a well-known sci-fi author, put it: "AI is not a panacea. Right now, there are 'three little dark clouds' over AI: the synthetic cognitive abilities that humans need, the ability to understand others and the ability to make decisions on their own that machines can't do (2018).

Challenges and opportunities go hand in hand. What AI should do for teachers is an opportunity, what it should not do is a challenge; what intelligent machines can not do is an advantage as well as an opportunity for human teachers. Teachers can capitalize on their own advantages and seize the opportunity to make up for the shortcomings of AI. So, as educators, we should be more concerned with ‘How’ than with ‘Whether’, in the age of AI, How do we teach?

Chapter Three How Can We Be Teachers in the Age of Artificial Intelligence?

Faced with the impact of AI, teachers should first have the sense of crisis and reform, redefine their role and think about how to improve the irreplaceable role of teachers through the development of human unique capabilities. Only by working in these directions can we turn the challenges posed by AI into opportunities for innovative education for the future.

3.1 Redefine the Role of Teachers

The traditional role of teachers belongs to prescriptive role, which is shaped by social development, historical tradition and other factors. But in the age of AI, the role of teachers needs to be rethought and redefined. Professor Yu puts forward 12 possible roles for AI teachers in the future: an assistant who can auto-test and auto-grade homework, an analyst who can auto-diagnose and feedback learning disabilities, and an intelligent tutor who can solve students' individualized problems, etc (Yu, 2019). It can be seen that AI is a teacher's right hand, can help teachers reduce a lot of cognitive and operational load. Professor Zhong Zhixian (2007). synthesizes many experts' views on the transformation or orientation of teachers' roles ,then puts forward eight major directions of teacher role transformation: tutor, facilitator, information consultant, team collaborator, curriculum developer, academic consultant, researcher and learner. Absolutely teachers in the AI era still need to work in this direction. Focuses on the pros and cons of AI, we put forward a new type of change of teacher's role in AI era from the perspective of classroom teaching.

3.1.1 The Change from Knowledge Instillator to the Leader of Personalized Learning

In the traditional classroom, teachers played the role of knowledge instigator, paid attention to the teaching materials and their own knowledge "instil" to the students. As to whether the students were interested, whether to understand was less concerned , which directly led to the students to teachers, teaching materials were enshrined in God, thus losing the initiative to learn

(Zheng & Li, 2017) . As for the phenomenon of "full-class teaching" which still exists today, the author believes that, on the one hand, it is caused by the fact that most teachers are stuck in the form of curriculum objectives and fail to understand and implement the curriculum objectives; on the other hand, it is the "binding" of education for examination. Plus, with the limitation of classroom time, it is difficult to realize individuation in large class teaching.

In the age of AI, teachers should be the leaders of students' individualized learning. AI provides intelligent learning environment for teachers and students, such as intelligent classroom, intelligent laboratory, intelligent library, etc. Professor Huang Ronghuai of the Beijing Normal University and others proposed that the intelligent learning environment is an interactive tool that can perceive learning situations, identify student characteristics, provide appropriate learning resources and facilitate learning, and automatically record learning processes and evaluate learning outcomes to promote an effective learning environment for students, which lays the foundation for personalized learning and even wisdom learning, makes personalized learning possible (Huang, Yang & Hu , 2012). On this basis, in the face of different levels of students, teachers need to have sharp eyes to insight into the hearts of students, and then bent over to guide, according to their aptitude, to put teach into practice. For example, building a personalized activity platform, guide students to find problems, group discussions, self-training, mutual evaluation, etc. Assign personalized assignments based on the science of learning (regular exercise assignments based on individual sport interests, because from the science of learning sight, exercise is also learning)

3.1.2 The Change from the Controller to the Interlocutor

In the traditional teaching process, teachers dominated the whole process of teaching. Some studies have shown that, especially in high school and college classrooms, the phenomenon of classroom silence were serious. On the one hand, it had something to do with students' characters, on the other hand, it had something to do with teachers' power of speech. This was reflected in the ordinary classroom and so-called "excellent open class"-everything in the control of the teacher. Students lost their right to speak for themselves. In this process, teachers essentially ignored their "teaching education" in the "education" of the basic duties.

In the era of AI, teachers should change their role to the interlocutor of teaching activities. Machines can solve many of the problems that humans struggle to solve. AI technology can be used for emotion recognition, emotion calculation, natural language processing and analysis based on students' individual information data. AI will liberate teachers from intellectual labor, so teachers will have time to care more about students' hearts, spirits and well-being, which is the premise of humanistic teaching and enables students to express their hearts freely without being tied down to put more focus on students first.

However, based on the difference between AI and human beings, machines, to some extent, also have great limitations : firstly, they don't have psychological properties; for example, Some well-known enterprises choose to have lots of machines working due to the fact that machines don't sulk when they make a mistake (Zhao, 2017) . Secondly, machines are lack of initiative. We can program machines to talk to people and teach machines to do things, but machines don't know what they can do, what they're going to do and how to improve themselves.

Therefore, in the age of AI, the importance of education has become more and more prominent.

In the process of teaching, teachers should have more respect for students, be student-oriented, pay more attention to students' nature, have a heart-to-heart dialogue with students, adhere to the "slow" principle at the right time, and bend down to listen to the inner voice of students to realize the soul and soul of the exchange, guide students to question and reflect in the dialogue actively, then become equal partners of them.

3.1.3The Change from Knowledge Holdouts to Knowledge Innovators

In the traditional education process, teachers were the defenders of knowledge, reading by the book, no innovation. Most of them, frankly speaking, were using an outdated, non digital language, trying to teach a generation of people who are almost entirely digital. This was a kind of sadness. For learners who were aggressive, self-managing and receptive, they may be able to accept such a conventional approach. But for learners who were less motivated and receptive, this must be the beginning of a vicious circle.

In the era of AI, AI has given birth to ubiquitous learning and expanded teaching resources. Not only do teachers have access to a deep pool of teaching resources, but students have access to a vast pool of learning resources. Relying only on the "mechanical knowledge" on books can not meet the needs of students, because students can rely on AI for autonomous learning. Under such circumstances, it is necessary for teachers to innovate the teaching contents (Dong & Li, 2018). If students rely solely on AI for learning, it is obviously not advisable for students. For that there is no substitute for the dominant role of teachers in the teaching process and AI can only play a supplementary role. Therefore, in the AI era, knowledge innovation is imperative for better human-computer collaboration.

Knowledge Innovation is a dynamic process including knowledge creation, transfer, sharing and application. Knowledge Innovation needs the participation of tacit knowledge. Compared with explicit knowledge, tacit Knowledge is the knowledge that can be understood but not expressed, which is frequently used but difficult to be transmitted directly through language symbols. Explicit knowledge can be transmitted by systematic language, which has the characteristics of storage medium, easy transmission and sharing(Mao, 2011). More importantly, tacit knowledge can not be encoded, which is the sore point of intelligent machines.

Ikujiro Nonaka and Hiro-taka Takeuchi of the management have proposed the classic SECI model for knowledge innovation, which describes the dynamic cycle of knowledge generation, dissemination and creation in an organization. It points out that the essence of knowledge innovation is the mutual transformation and fusion of explicit knowledge and tacit knowledge among different knowledge subjects. New Knowledge is created and expanded by switching between four modes in order to achieve knowledge innovation: tacit Knowledge→tacit knowledge , tacit knowledge → explicit knowledge , explicit knowledge → explicit knowledge , explicit knowledge → tacit knowledge. As shown in figure 1(He, 2018).

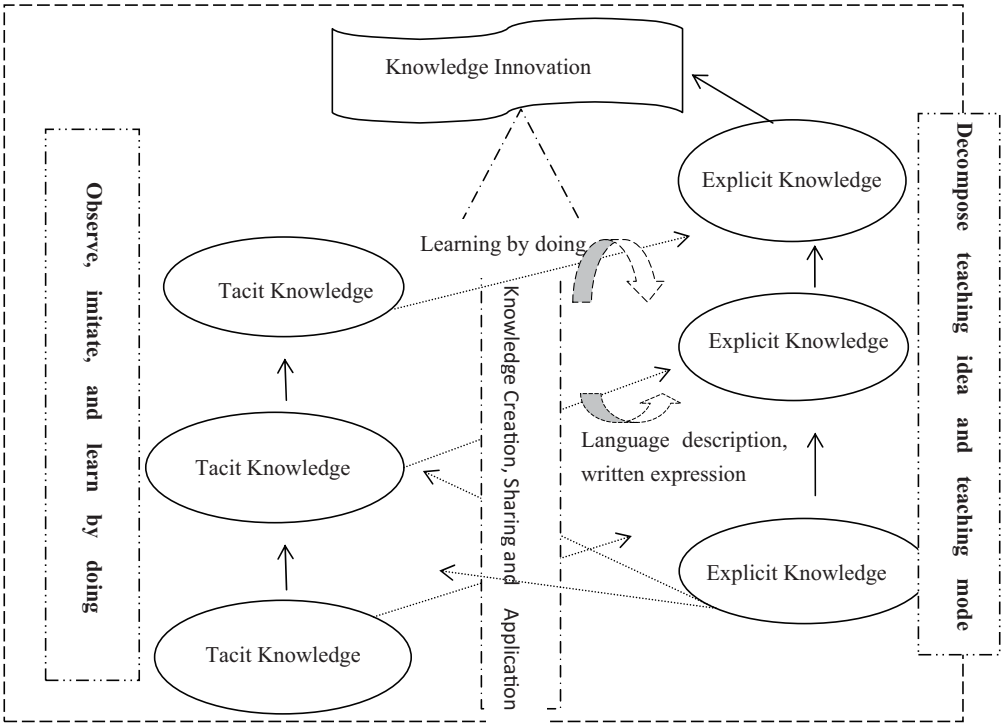


Figure 1 Process Map of Knowledge Innovation

3.2 Respond to Change with "No Change"

3.2.1 "Change" and "No Change" of Teachers in the Age of AI

In the age of AI, some technical applications have changed from complex to simple, many normative programs can be developed, and smart applications have been upgraded. In the era of AI, the roles of teachers are gradually diversified, the needs of students are becoming more and more individualized, and the teaching and office environment is becoming more and more intelligent. Plus, a series of changes are taking place in teaching and learning, from the generation and flow of knowledge, the form and interaction of learning, and the form and construction of learning resources, the organization and implementation of teaching content, the expansion and upgrading of teaching methods to the evaluation and management of teaching performance, etc (Bao, 2017).

Facing the changes of AI, the teacher can not forget the original intention, by invariable response ten thousand changes. This original intention is to "educate people" , teach people to become a whole person . According to Li Zhengtao, a East China Normal University professor and "Yangtze Scholar" , in the age of AI, there are "three invariants" for teachers: Firstly, the invariable is "teacher's love" , which includes loving teaching, loving students and loving learning. Secondly, the constant is the "teacher's imagination" , which includes the imagination of the growth of human life and the imagination of teaching. No amount of data or advice from AI is a substitute for a teacher's imagination. Thirdly, the same is the "courage of teachers" , in the face of teaching regret, teaching setbacks and teaching failure, the courage is adherence □ persistence, firmness and fortitude , the courage is to tell the truth, listen to the truth (Qingdao

Daily, 2019).

We've added two "invariants" -- Empathy and lifelong learning . The five invariants mentioned are where AI is out of reach.

3.2.2 Maintain the Charm of the Teacher's Personality

Teachers' empathy is the source of keeping the charm of teachers' personality. AI who based "thinking" is one-way, linear, lack of self-representation ability can not understand the child's mind, can not express emotion and identity to the child, which is precisely the key to the child.whereas the teachers 'thinking is reversible, with the internal factors such as teachers' professional ethics, literacy and empathy, which are not possessed by the machines. Therefore, teachers should grasp this fundamental difference, around these invariable things to cope with the ever-changing educational form, to maintain the charm of teachers' personality.

The key capabilities of lifelong learning include thinking, self-management, information literacy, problem solving, teamwork, communication and learning to change (Zhong, 2015). AI machines may have only the information literacy and problem-solving skills. Therefore, teachers should focus on their own unique ability, promote the constant "depth" to cope with the ever-changing educational patterns, and maintain the charm of teachers' personality.

The author suggests that teachers can show their personality charm through the "three changes" in the teaching process: Firstly, the emphasis on teaching should be given equal importance to both teaching and education. Secondly, the emphasis on the analysis of teaching materials should be shifted to the analysis of teaching materials and learning conditions. Thirdly, the emphasis on collective analysis turns to both collective analysis and personality analysis. These will also be directly related to whether the teacher can realize the role of personalized learning leader. Empathy and lifelong learning must be maintained throughout the transition.

3.3 Make the Most of Technology and Keep Life-long learning

In the era of AI, education informatization will change from 1.0 to 2.0. The Action Plan of Educational Informatization 2.0 issued by the Ministry of Education Puts a high demand on teachers: improve the information literacy of teachers and students in an all-round way, and promote the development from technology application to ability and quality, so that they can have good information thinking and meet the requirements of the development of the information society, the ability to apply information technology to solve problems in teaching, learning and life has become an essential basic quality (EB/OL, 2019). Life-long learning and information literacy are inseparable, information literacy is the basis and core of life-long learning.

In recent years, with AI coming of age, smart phones, computer multimedia and mobile Internet have provided great convenience for life-long learning. To achieve lifelong learning, teachers must see themselves as learners first, information technology (IT) as an intelligent partner, with technology learning , technology and curriculum integration. As one scholar put it: "The best way to stay employed by new technology is to use it to grow, advance, and improve (Zhao, 2018). " Digital natives ponder and process information in a very different way than we do. Kids today can discover and learn more from a mobile APP than from any textbook (John&Jason,

2019). Therefore, especially for the "digital immigrant" generation of educators, it is important to fully recognize the role of technology in curriculum integration, to achieve the transformation from ‘Learn from IT ’to ‘Learn with IT ’and to improve their high-level capabilities.

Technological learning requires learners and technology to exert their own unique advantages, emphasizing that learning is an active process of construction (Zhong & Qiu, 2015). The learner must use technology as a means or an instrument of learning, not as an end in itself. There are six major categories of IT as a learning tool, the implications and examples of which are shown in Table 1(Zhong, 2007). The key for teachers to effectively implement IT as a learning tool is to consciously combine meaningful learning characteristics and use IT to promote meaningful learning. For example, teachers can use IT tools for students to create lively and interesting real learning situations, using computer software to teach students drawing, programming, design,etc. In short, by making good use of IT, it create more opportunity to education. This is the premise of training lifelong learning for teachers.

Table 1 Types, Functions and Examples of Technologies as Learning Tools

Types	Functions	Examples
Information tools	Access to resources, explore knowledge, support learning through construction	Search engines,search strategies, etc.
Situation tools	Create situation,support learning by doing	PBL, CBL, micro world,etc
Communication tools	Support for collaborative learning	Synchronous and asynchronous communication tools
Cognitive tools	Support higher-order learning, development of higher-order thinking,	Databases, semantic networks, etc.
Evaluation tools	Record learning process, display learning works, promote reflection	EPSS and electronic learning files (ELP) ,etc.

Teachers in the AI era should have ‘information quotient’ ,which mainly refers to teacher's ‘information competence’. It involves how to search, distinguish, judge, refine, integrate, use and generate all kinds of information. Only teachers with this kind of information competence can avoid losing themselves in the face of the information tide and not be dominated by information. We may say, "the information quotient" is the foundation, the lifelong learning teacher needs this kind of "information r quotient" .The core of lifelong learning is learning to learn.However, intelligent machines can either build their own knowledge systems, learn by themselves or reflect on themselves. Therefore, IT is impossible to surpass human teachers in life-long learning, teachers need to take IT as a tool for their own development, take life-long learning as a way of life, and constantly improve themselves.

Artificial intelligence is a sharp double-edged sword. Is it a challenge or an opportunity? It's up to the educators. Facing the challenge brought by AI, teachers should adapt to the development of the times, insist on student-oriented, redefine their roles(SWOT Analysis can be used to analyze their own strengths, weaknesses, opportunities and threats in the AI era and make timely adjustments), complement each other with AI's advantages, cooperate with each other, respond to the ever-changing of education with "constant" feelings, and keep the charm of teachers' personality. Make good use of IT, arm ourselves with knowledge innovation, persist in lifelong learning, iterate our own knowledge system and carry out the task of "learning to be" . This is not only a strong call under the era of AI, but the inevitable requirements of the future teachers.

At present, the concrete measures to realize the transformation of teachers' role is important but difficult, which needs all teachers' joint efforts.

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06

Chapter 6:

Ethics in AI

Data Security And Governance Paths On "AI + Education": From the Perspective of The Responsibility Ethics *

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Abstract: Nowadays, artificial intelligence is integrated with education increasingly. Fromthe perspective of technology-enabled educational innovation, "AI + education" plays animportant role in promoting educational innovation. However, In the application of artificialintelligence in education, educational data are constantly increasing and varying, whichwill involve with data leakage, algorithm discrimination and other issues inevitably, infringing the legitimate rights and interests of teachers and students. Therefore, this studycombs the researches about educational data security in the era of artificial intelligence.From the perspective of "the responsibility ethics", the data ownership of "AI + Education" is clarified, and the responsibility for the safety of educational data is determined. This paper puts forward cultivating teachers' application ability about artificial intelligence, and comeup with that the responsibility ethics should be included in the goals of talent cultivation forstudents, in order to makes a preliminary assumption to guarantee the security of educationaldatain the era ofartificial intelligence.

Key words: the responsibility ethics, "AI + Education", The educational data, The responsibilities for security, Governance paths

1. Introduction

In 1950, Alan Turing, the father of computers, proposed the Turing test. He believed that if a machine could carry on a conversation with humans without being recognized as a machine, it would be intelligence. Four years later, computer expert John McCarthy put forward the concept of Artificial Intelligence at a conference, which became the official birth of artificial intelligence. Artificial intelligence has gone through a spiral development process, during which it experienced two low points, and then ushered in a new level after the low points. After

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launching a series of artificial intelligence upgraded continuously, such as industrial robot, chat robot, expert system, Deep Blue, Watson, AlphaGo and AlphaGoZero, artificial intelligence has come across aglobal boom of development.

The earliest policy related to artificial intelligence in China was Manufacturing Industry Policy in China 2025 in 2015, in which the word intelligence appeared as frequently as 74 times, which shows that China attaches great importance to intelligent manufacturing and strongly promotes it. Then there were The Robot Industry Development Planning(2016-2020), The Action Planning About Internet + Artificial Intelligence for Three Years, The Development Planning about A New Generation of Artificial Intelligence, and other policy which were introduced in a row.It has provided a powerful political support for the development of artificial intelligence in China and makes the application of artificial intelligence to the various fields ofsociety.

While artificial intelligence is widely used, it highlights many ethical issues gradually, such as the ethics issues of media technology and non-journalists in the field of news(Yang, 2018), the issues about data security and governance in education, and so on. With the exception of European countries, only less than 30% of countries have introduced data protection regulations or policies Currently (United Nations, 2016). Under the circumstances, it is a magnificent issue to how to ensure the safety of educational data for the society with great concern, which is a hot potato needed to be handled. This paper attempts to combs the researches about educational data security at home and abroad, and adopts the perspective of the responsibility ethics in a creative way. Then, analyzes the ownership and security of educational data on AI+education from the perspective of the responsibility ethics, and proposes the governance path to realizeit.

2. The Status Of Research On Data Security of "AI+Education"

Artificial intelligence has changed the traditional teaching mode and provides a precise plan for teaching and learning, which is a new direction of the development of educational informatization. Once applying artificial intelligence in classroom teaching, people begin to realize the importance of information security and data privacy. Artificial intelligence(AI) mainly includes expert systems, robotics, machine learning, natural language understanding, artificial neural network and distributed artificial intelligence, which have been widely applied in education and been active field of study (Wang & Li, 2008). Importing the advanced technology will involve a large amount of personal privacy from sensitive data inevitably, such as teachers' or students' age, social manner, classroom behavior and cognitive level and other data. At present, It is not clear that who is the person should be responsible for the security of these data, and there is not standardized that what is the security responsibility. On how to ensure data security, countries and academia have not reached a consensus.

Educational data security on "AI + education" is inseparable with network security and information security strongly. Obviously, education data security is based on network security and information security. They are all the security forms closely related to personal privacy in the informational age, and which are also the security types that is the most difficult to handle for states and individuals. In 2015, China promulgated The Emergency Plan For Public Emergencies In The Education System, adding the network and information security into the emergency plan, which is the starting point for China to pay attention to the security of educational data. In 2018, the United States and the European Union respectively promulgated The Right To Family Education And Privacy Act and The Ethical Guidelines For Trusted Artificial Intelligence (draft).

The Act emphasizes that students have the right to protect the privacy of their own educational data. Schools must obtain written permission from parents or students to release the students' education records(US Department of Education, 2018). The Ethics Guidelines points out that artificial intelligence must be legitimate, ethical and robust, while ethical points out respect for privacy, protection of data integrity and making clear data access rights(European Commission, 2018). In May 2019, UNESCO held The First Conference About Artificial Intelligence And Education in Beijing and reached the Beijing Consensus, which clearly pointed out the desire to develop an ethical framework for the application of artificial intelligence in education and emphasized that machine learning may pose a threat to the privacy and safety of students or teachers, Hoping that teachers' and learners' personal data can be guaranteed in a transparent way through the framework(Zhang, Huang, Li & Yi, 2019). Although these policies all have raised the importance of ensuring the safety of educational data, they do not give specific, operational and systematic guarantee measures for "AI + Education".

Scholars at home and abroad have carried out exploratory research on ensuring the safety of educational data, mainly proposing to restrict and standardize the behavior of data users with ethics. Firstly, information ethics is used to make people follow the ethics, morality and regulations of information consciously(Zhong, 2013). Secondly, it is possible to solve the problem of data security in education through ethical choice and reconstruction(Tang, 2018). Thirdly, Conduct researches on the safety, ethics and specifications of intelligent machines(Liu, Du, Jiang & Huang, 2018). Fourth, construct the behavioral framework of the ethical norms of the development of artificial intelligence technology with the concept of Responsible Innovation as the core(Zang, 2019). Fifth, security technology hierarchy system of education information is constructed according to the privacy security of educational data(Liu, Jiang, Cao & Yang, 2019). In conclusion, It can be seen that scholars at home and abroad all propose measures to ensure data security in the form of ethics, without in-depth understanding of specific ethical forms. This study creatively uses the responsibility ethics to conduct exploratory analysis on data security of "AI +Education".

3. The Responsibility Ethics And Educational Data Security

3.1 The Connotation of The Responsibility Ethics

There are ethical disputes in artificial intelligence itself, what's more, there are many ethical problems which exist when applied to education inevitably, such as the ownership of educational data and the safety of educational data. Right now, a new thinking perspective is needed to construct ethical norms. That is, the responsibility ethics which comes into being. At the beginning of the 20th century, Max weber, a German scholar, proposed the responsibility ethics for the first time in view of the relative concept of the ethics of intention, which is an evaluation of behavior and its consequences and the sense of responsibility. In 1979, Jonas further optimized the responsibility ethics through the reflection of modern technology, which can meet the demand of era. It is the return of the spirit of responsibility from ethics, but also becomes a direction towards the future (Wu, 2018). which is enlightenment significance for the ethical problems of "AI + Education".

The responsibility ethics is prominent in ecological and environmental governance particularly, which clearly emphasizes "the principle that whoever causes pollution shall take care of it". It means that whoever destroys the ecological environment shall be responsible for environmental

governance. The same is true for educational data security. Whoever leaked or compromised the security of educational data is responsible for paying for the damage. However, the safety of educational data is also different from ecological environment management. The destruction of ecological environment can be observed by the naked eye directly, but the disclosure of educational data and the exposure of personal privacy are difficult to detect, especially the secret transaction, which is not the communication of openness. Therefore, in terms of educational data security, the most important thing is to rely on artificial intelligence machine creators, teachers, students, schools and data management personnel to supervise together,and to regulate and restrict by the responsibility ethics together.

3.2 The Data Ownership of "AI + Education"

The educational goal of artificial intelligence is to achieve personalized and accurate education through programming programs such as expert system, machine learning and natural language understanding, and so on. However, the technical problems have not been well solved in current applications, so many countries has not promulgated laws and regulations on data ownership. To solve this problem, institutions of artificial intelligence are required to make relevant statements about the data safety on "AI + Education", such as Chinese Association of Artificial Intelligence. The educational data of "AI + Education" refers to the numbers and symbols recorded by artificial intelligence, conducted by teachers and students in the teaching process with the assistance of artificial intelligence. To see Individually, these numbers and symbols are simple and meaningless, but when you look at all the data as a system, it makes sense and generates information. This is how data turns into information on "AI + Education". Through the communication of information, we can acquire the cognitive defects of students and the teaching deficiencies of teachers. As we all know, the educational data is closely around the educational activities in the background of artificial intelligence, and the ownership of the data should belong to both the educator and the educated. The educator leads the educational activities and the educated participate in the educational activities, which is the basic component of the educational activities and the key factor of the formation of educational activities. Therefore, the data ownership of "AI + Education" must belongs to both teachers and students.

The ownership of educational data is different from the right of educational data management. In any case, the educational data are generated by teachers and students together, and the artificial intelligence machine is the helper and recorder only, which does not have the basic characteristics of human beings and cannot be called the participant. Therefore, it does not have the ownership of educational data. As creators of artificial intelligence or technicians who set the programming program of artificial intelligence machines, they do not have the ownership and rights to use of educational data. As technical personnel or managers of educational data, they cannot take possession of the educational data, nor can they give or sell educational data without permission, which is an illegal and ethical behavior. As is known to all, our country does not have corresponding law to restrict at present, and ethics sometimes is difficult to resist the temptation of money. Therefore, education departments and schools can sign the commitment protocol and responsibility agreement about data security with technical personnel (or data managers),to assist in restricting their ethics and datasecurity responsibility.

3.3 Define The Responsibility of Educational Data Security by Responsibility Ethics

Data security responsibility is a corresponding behavior about what we should do for data

security under the circumstance of information technology, Internet and artificial intelligence machine. Information technology and the Internet have brought great changes to education, not only broadening educational resources, but also improving teaching tools. In this process, there will be little educational data involved, not letting out the privacy. However, artificial intelligence is different from Information technology and the Internet at the aspects of educational data, on account of that the data is the core of machine learning. With the continuous increase of data, artificial intelligence must use data to play a greater advantage. Therefore, artificial intelligence can not only record data, but also learn from the collected data,which inevitably involves personal privacy issues.

3.3.1 The Safety Responsibility of Artificial Intelligence Machines

The safety of artificial intelligence, such as the "threat theory" of artificial intelligence, is ethical disputes about artificial intelligence machines. Some people suppose artificial intelligence is absolutely beneficial; some people argue it is a threat to human's survival; the others hold a neutral attitude towards artificial intelligence. In one word, no matter whether artificial intelligence will threaten the survival of human beings in the future, it still seems to subvert the new cognition of human beings and produce a new way of lifestyle, bringing a new hope for the development of intelligent education. Therefore, under the premise of the safety of artificial intelligence itself and within the scope of artificial intelligence ethics, the rational use of artificial intelligence assisted teaching will inevitably bring a brand-new situation for the educational reform.

There is no doubt that the responsibility for the safety of AI machines depends on its creators. As a kind of advanced artificial products, when the purposes of creating artificial intelligence are different, the pros and cons of the nature on artificial intelligence to human will be different. This safety responsibility directly points to the creators of artificial intelligence machines. When the creators has malicious intention, the artificial intelligence created by them must have ethical defects, which may endanger the personal safety of teachers and students. When the creators hold a rigorous and responsible attitude and carefully control the application of artificial intelligence in a ethical and rational way, the artificial intelligence created by them will certainly be beneficial to educational and teaching activities. Therefore, under the premise of abundant professional technical ability, the creator of artificial intelligence must be an expert orscholar with sound personality and noble professional ethics.

3.3.2 The Security Responsibility of Using Data

As an old Chinese saying goes: "security responsibility is greater than heaven". In addition to the security responsibilities of creating AI machines, we must be wary of the security responsibilities of using data. The right to use the educational data on "AI + Education" means have rights to make researches or generate a analysis report for companies according to the data gained from "AI + Education". Generally speaking, once the acquisition of ownership imply the right to use, which means that only teachers and students have the right to use. However, in fact, artificial intelligence, which can generate and feed back relevant information after collecting data, is not only beneficial for teachers to improve classroom teaching effect, but also beneficial to educators, experts or enterprises, which has high research value and guiding significance. Therefore, if anyone who does not own the educational data wants to use any artificial intelligence educational data, and must sign a security statement make clear the intent of the

use of the data and the responsibility to ensure the safety of the data. There should be special emphasis on the technicians and data management personnel of artificial intelligence. They are the first responsible person for educational data management, to supervise and monitorthe data to effectively.

3.3.3 Supervision Responsibility for Data Security

Schools play an important role for teaching activities, which is an important base for the implementation of “AI + Education”. In the face of educational data leakage and invasion of personal privacy, schools should immediately stand up to protect the rights and interests of teachers and students.Obviously, the responsibility of supervising the safety of educational data should be taken by schools. The position and attitude of schools play a huge role in influencing teachers, students and even technical personnel, to attach importance to educational data, as well as the protection of personal privacy. They are the mainstay of the construction of safety awareness and safety responsibility for educational data. Therefore, schools should supervise the security of educational data generated by “AI + Education”, and build a perfect security system for teachers and students, which is what all schools must do in the future.

4. The Path to Achieve “AI + Education” Data Security

4.1 Cultivate Teachers' Artificial Intelligence Application Literacy

Responsibility ethics is not only an ethical morality, but also a specific ethical morality with clear responsibility, which is a conception mixed with law conception and ethics conception. In the application of multimedia equipment and network resources, teachers began to build their own information literacy system. Information literacy is the ability to use information to solve problems. It mainly refers to the comprehensive ability of obtaining, analyzing, generating, using and creating information based on the network. For teachers, it mainly refers to the ability to retrieve/acquire, analyze/generate, receive/store, consume/use and produce/create information in the process of teaching (Zhong, Wang, Huang & Shi, 2003). The application of artificial intelligence is different from the application process of information technology, but it is also based on information literacy. At present, it is urgent to cultivate teachers' artificial intelligence application literacy when using artificial intelligence.

When applying “AI + Education”, the application of artificial intelligence successfully for teachers refers to be equipped with the ability and the character in front of problem solving. It mainly means to grasp the basic knowledge of smart machines, the basic knowledge of “AI + Education”. furthermore, teachers need manage to interact with artificial intelligence, acquire the teaching wisdom on “AI + Education” and the responsibility ethics of applying artificial intelligence data security. All in all, These knowledge about the ability and responsibility constitute the artificial intelligence application literacy of teachers.

4.1.1 Understanding The Basic Knowledge of Artificial Intelligence

The basic knowledge of artificial intelligence machines requires teachers to understand the working principle and corresponding functions of artificial intelligence, such as machine learning, natural language understanding and speech recognition, before applying artificial intelligence. This is the basic ability for teachers, who survive in the era of artificial intelligence,

and it is also one of the necessary abilities for struggling in the future society. In the second place, teachers have to learn to impart these knowledge to students. In daily course teaching, students' cognitive level of artificial intelligence should beimproved subtly, so as to enhance their ability to adaptto the futuresociety.

4.1.2 Using Technology to Empower Education

The basic knowledge of the application of artificial intelligence in education requires teachers to master the application methods and skills of artificial intelligence when applying artificial intelligence machines in classroom teaching, and make artificial intelligence integrate into education better. The depth and breadth of the integration depends on teachers. Teachers are the leader of the classroom and the key factor to integrate artificial intelligence into education. Therefore, the basic courses of artificial intelligence application in education should be set up before teachers start to work, so that teachers can master solid application knowledge and prepare for the successful integration of artificial intelligence into education in the laterstage.

On the basis of mastering the application knowledge of the integration of artificial intelligence and education, it is necessary to cultivate the ability of teachers to interact with artificial intelligence, so that artificial intelligence can become the assistance of teachers' teaching and students' learning. The ability to interact with artificial intelligence mainly includes turning on/off artificial intelligence, adjusting teaching pace, teaching method and oral mistakes according to the feedback from artificial intelligence. All these can improve the teaching performance of teachers, but there is another possibility. That is, teachers' teaching ability is probable to decrease, in reasons that teachers will become dependent on artificial intelligence. Therefore, in view of this problem, teachers should be rational to use artificial intelligence, and to make artificial intelligence your helper, rather than your master.

4.1.3 Cultivate The Teaching Wisdom in The Era of Artificial Intelligence

When carrying out the teaching activities of “AI + Education”, teachers, students and artificial intelligence are important elements in classroom teaching. In the traditional classroom, the interaction of teaching activities only exists between teachers and students, which is simple and easy to control. However, the interaction of teaching activities will exist among teachers, students and artificial intelligence machines in the era of artificial intelligence, with much complex forms and difficult to control. In order to balance the relationship and form of activities among the three, it is necessary to cultivate the teaching wisdom ofartificial intelligence and education.

The teaching wisdom in the era of artificial intelligence refers to that teachers can flexibly deal with emergencies in classroom under the application of artificial intelligence, which is reflected in the manners with flexibility and rapidity of teachers. It is different from the general teaching wisdom, which is produced under the application of artificial intelligence abnormally, such as artificial intelligence suddenly strike, out of control, content error, garbled code and irrelevant answer and other emergencies. When solving these emergencies, teachers' teaching wisdom should take students' safety as the first priority, unlock security threats immediately, and make corresponding teaching response flexibly and quickly.

General teaching wisdom is the flexibility and agility that teachers naturally show after many

years of teaching. Apparently this wisdom can not been taught by teacher training, but only teachers are required constantly reflect on the teaching process, again and again. However, the teaching wisdom in the era of artificial intelligence is more difficult to cultivate and develop than general teaching wisdom. Because artificial intelligence itself has stability and self-learning ability, so the phenomenon above sudden strike, loss of control and other emergencies are very few. Therefore, the formation of educational wisdom of teachers under artificial intelligence needs a longer period and is more difficult to control.

4.1.4 Value The Responsibility Ethics of Educational Data Security

Teachers are professionals with the task of teaching and clearing up students' puzzles, shouldering the burden of cultivating the future talents of the country. They must catch up with the pace of science and technology and actively innovate education and teaching methods. "AI + Education" is a new direction of educational informatization development, which plays an important role in promoting educational innovation and reform. When applying artificial intelligence, teachers should strictly abide by the responsibility ethics of artificial intelligence data security, take data security as their own responsibility, and ensure the privacy safety of themselves and students. Teachers should not only become practical promoters of "AI + Education", and give full passion to the awareness and action of responsibility ethics.

4.2 Cultivate Students' Responsibility Ethics Awareness

In terms of cultivating talents, there are no unified standards and requirements for students, but have the concept of Suzhi Education and the Chinese Students' Development of Core Abilities, which has adirection for cultivating talents for students in China.

4.2.1 New Demands for Talent Cultivation

Suzhi Education is a kind of educational theory to improve national competencies, which is put forward under the exam-oriented education circumstance. It covers many aspects such as curriculum, teaching, educational system and teacher education. For students, the cultivation goal of ability-oriented education is not clear enough. It only focuses on the cultivation of practical ability and innovative spirit, but the Chinese Students' Development of Core Abilities is relatively clear. It refers to the necessary character and key ability that students should have to meet the needs of lifelong development and social development, which is relatively clear, with a strong emphasis on personal cultivation, social care and family emotion, paying more attention to independent development, cooperation, participation, innovation practice (Chinese Education Ministry, 2014) , bringing a new vitality for Chinese education reform and development.

Although Suzhi Education and the Chinese Students' Development of Core Abilities have different training objectives and backgrounds, they both have made great contributions to the education in China. At present, China's education is moving towards the leapfrog state of the era of artificial intelligence. Therefore, there are still some deficiencies in the Cultivation goals of Suzhi Education and Core Abilities, lacking of new goals with era characteristics. Therefore, the era of AI raises a new demands for talent cultivation.

4.2.2 Add The Responsibility Ethics Into Students' Cultivation Goals

In the future when artificial intelligence is fully covered, the deep integration of artificial intelligence and education needs to set up a new training goal for students, namely, the responsibility ethics. It is not only an ethical morality, but also a new moral thinking, which determines the "background" of all social moral phenomena, and its "new" is mainly manifested in "Other-oriented thinking", "complexity thinking" and "situation thinking" (Cao, 2013). Graduates all need a new moral thinking to adaptto future social changes.

Other-oriented thinking is based on other persons as a logical starting point, which means to learn to empathy, respect for differences and uniqueness, which is an important rule of survival nowadays. As a student, one should have a global vision, a sense of community of common destiny, fully respect others, and develop a moral habit of empathy. When we possess other-oriented thinking, the contradiction among humans will be reduced; In the absence of other-centered thinking, there will be more self-centered and the contradictions must increase. In real situation, teachers use other-oriented thinking to customize the teaching design, and students use it to think rationally and actively.

Faced with the complexity of the future artificial intelligence society, as well as the high intelligence of "AI + Education", complexity thinking is a kind of thinking ability that students should master, which is a way of thinking that can clearly understand complex relations and deal with complex things, and the goal is to form an ability of problem solving efficiently. Complex thinking is a kind of nonlinear thinking ability with high logical order, whose opposite side is simple thinking, namely, linear thinking. Students with complexity thinking can make moral judgments on complex issues flexibly and quickly, and show appropriaterationality and critical analysis.

Situation thinking is a way of thinking to make moral judgments and decisions in accordance with moral standards and norms in various real situations. In the era of artificial intelligence, students will confront with a variety of more complex moral problems. In this case, students need to think in special circumstances and make rational decisions according to different situations. In our view, algorithm is a kind of mathematical expression, which seems objective on the surface, but in fact it is also bringing about discrimination issues such as labeling black people as "chimpanzees" or "apes" (Cao, 2017). When faced with these specific ethical problems of artificial intelligence, students should make proper decisions, which is very important and also tests the authenticity of situation thinking.

5. RESULTS

This paper summarized the domestic and foreign research status on the education data security in artificial intelligence era. From the perspective of "the responsibility ethics", the data ownership of "AI + Education" is clarified, and the responsibility for the safety of educational data is determined. From the perspective of teachers, this paper puts forward that it is urgent to cultivate the application ability about artificial intelligence, and from the perspective of students, it puts forward that the responsibility ethics should be included in the goals of talent cultivation for students, in order to makes a preliminary assumption to guarantee the security of educational data in the era of artificial intelligence. "AI + Education" data security is a systematic responsibility ethical issues, involving multiple related subjects, such as teachers, students, schools, creator of artificial intelligence and education data management, etc. This article only raise a temporary crude from the angles of teachers and students. It only put forward two parts

of the path to data security, but not the complete path. this is the deficiency of this study, and is also the direction ofthe future need to effort.

History and reality show that, the development of human civilization will go through a spiral developing process, and the development of "AI + Education" is also this development model. Since the 20th century, less than 30% of countries outside Europe have enacted data protection laws, and few of them have been on "AI + Education". With the further development of "AI + Education", it is urgent for the states to formulate standard data protection law. Data security research needs to be strengthened in the academic community, which can provide reference for future policy formulation.

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Technology and Student Plagiarism: Does Technology Push or Pull Student Plagiarism?

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Abstract: In this presentation, the presenter will address the role of fast-evolving information technologies to both push and pull student plagiarism and other unethical behaviors in the context of college classroom. Based on the analysis of both quantitative and qualitative data collected from college students in Korea, the study categorized types of technology-driven plagiarism committed by college students as well as presenting various technological solutions to prevent student plagiarism such as anti-plagiarism software and process-oriented tools to monitor student progress. Finally, the study will present practical guidelines to best support meaningful learning and promote academic integrity with appropriate use of technology.

Key words: College Learning, Academic Integrity, Student Plagiarism, Technology-driven Plagiarism, anti-plagiarism software

INTRODUCTION

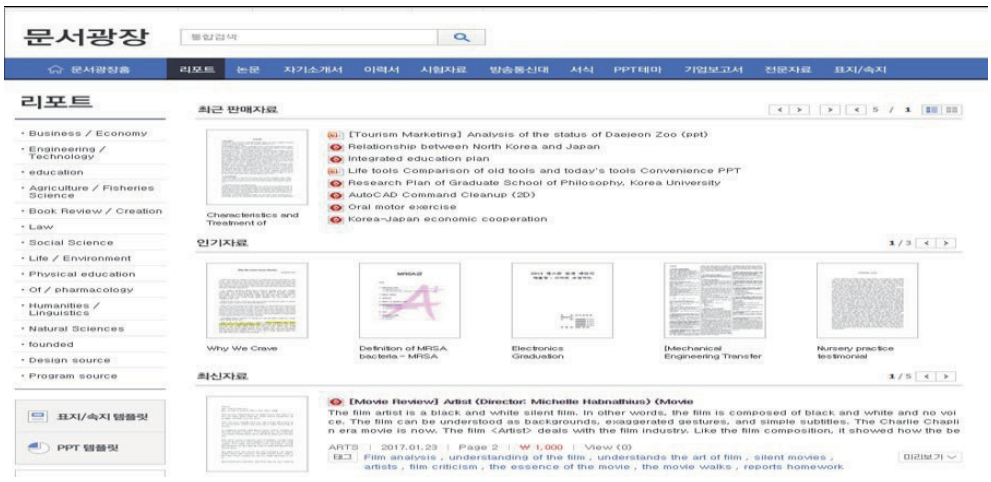
Just like learning, student plagiarism is a rather dynamic and complicated phenomenon with multiple contributing factors, such as (but not limited to) changing school and classroom environments, individual learner characteristics, peer/group dynamics, course structure, and instructional routines. Not all student plagiarism cases are alike yet prevailing instructional and institutional practices tend to treat student plagiarism as if it could be prevented by rather simple, one-size-fits-all solutions such as a plagiarism tutorial or anti-plagiarism software(Oh, Lee, & Reeves, 2016). More importantly, most incidents of student plagiarism seems to be closely intertwined with students increased access to and use of Internet and smart devices(Lee & Lee, 2008). However, technology and student plagiarism seem to be the least researched factor that may have a powerful impact on student learning(Lee & Lee, 2013). It is time for us to take a closer look at the technological environments and social contexts in which our students are constantly exposed when engaged in various types of learning activities and assignments in higher education and some common loopholes that college instructors often overlook when they assign and evaluate learning tasks for their classes.

In this presentation, the presenter will share three real class examples in which students are voluntarily or involuntarily engaged in academic plagiarism assisted with various types of technology.

Case 1: Report Mill Industry and Class Bulletin Board

A college student learned that her report was being traded on an online report sales site. After tracking the ID of the seller, she discovered that one of her former classmates had downloaded dozens of student reports from the class bulletin board, sold them to the report sales site for

money. Over the past two years, the number of stolen reports was over a hundred. She informed the University of this incident, but unfortunately, there was no administrative policy to punish such academic misconduct at that time.



<Picture> 1. Happy Campus: No. 1 Report Selling Site in Korea

Case 2: Student Carelessness vs. Professional Laziness

A college student was making a presentation with the PPT slides that passed down to him from a former classmates. The professor was notorious for recycling exams and assignments for "centuries" and no one got caught yet. But his luck ran out and everyone in the class went silent as the next student started her presentation with the same-looking slides on the projected screen. They even had the same typos!



<Picture> 2. No.1 "Class Ancestry" Site in Korea

Case 3: Online Book Reviews and "Honest Plagiarism"

Soaring college tuition fees put heavy financial burden on students and some of them cannot afford buying all the textbooks each semester. Confronted by a professor who got suspicious that he had submitted a book review without actually reading the book, the student confessed that he synthesized all the summaries he read online and added his personal thoughts and reflection, trying to be really careful not to 'plagiarize.'



<Picture> 3. Online Bookstore and Detailed Summaries

To summarize the three cases briefly introduced above, technologies work as "Push and Pull" factors that can positively or negatively intervene student plagiarism incidents in college classrooms, as shown in <Table 1>:

<Table> 1. Technology as "Pull vs. Push" Factor of Student Plagiarism

Technologies as "Pull Factor" of Student Plagiarism	Technologies as "Push Factor" of Student Plagiarism
❑ The arrival of information age - easy access to digitized information database & faster search engines ❑ The widespread of Web 3.0 ❑ Proliferation of online paper mill industry ❑ Changing classroom environments & learning styles	❑ Using variety of techniques to detect identical text and locate matching sources ❑ Fear of being caught may discourage students from plagiarism ❑ Saving instructor's time and efforts from manually comparing student papers

Emerging Issues and Agenda for Further Research

As a next step, the following issues and agenda are suggested for subsequent research on technology and student plagiarism: First, we need better instruments to address problems with self-report measures. When collecting data from students regarding academic plagiarism, students' level of understanding on what constitutes plagiarism and their abilities to introspect on past behaviors may vary and the issue of honesty or self-image management might compromise self-reported survey data. And we should be also careful when interpreting nuanced responses on rating scales. Second, we need to recognize multiple contributing factors and suggest differentiated, contextualized solutions for each factor. Ignorance may not be the only reason

for students to plagiarize and we need to do better than looking for one-time remedy or relying on punitive, detective measures. Third, we need to understand the complex, increasing role of technologies in student plagiarism. Technologies work both ways as push and pull factors when it comes to student plagiarism. And lastly, we should approach student plagiarism as serious instructional design problem. Students' learning tasks and class assignments are integral part of instructional design. When students fail to be fully engaged and complete them, meaningful learning can never occur. The goal should be promoting academic integrity and designing/ implementing quality instruction. And good instruction takes many forms.

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Visualizing the Student Thought with Thinking Tools in Moral Education

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Abstract: The purpose of this research is to examine using Thinking Tool in a moral education class. In Japan, moral education is subject to a curriculum. So the author would like to determine if students opinions changed through mutual communications while using thinking tools. In addition, thinking tools were used to facilitate students sharing of their thinking and cooperative learning. According to a prior study, the teaching ability of the teacher is not enough and it is not clear what children learned in moral education. The author will study how students learn from each other collaboratively and by using thinking tools.

As the research method, the author observed 28 students at a public high school in Hiroshima, Japan. Worksheets that students used in their moral education class was analyzed to obtain data. Students thinking before and after using Thinking Tool was revealed. After analysis of the data, the author found that after using Thinking Tool the bases for their opinions increased.

Key words: Thinking Tool, moral education,

Introduction

In order to improve and enhance moral education. in Japan, moral education classes have been made into a subject and have been implemented in primary education since 2018. According to a Ministry of Education, Culture, Sports, Science and Technology(MEXT), "In order to cultivate morality that is the basis for living better, teacher nurture develop moral judgment, emotion, practice will and attitude through children look at themselves based on their understanding of moral values, think in various ways (from a broad perspective), and think about things in their own way of life through learning to deepen thinking about (the way of life as a human being)." The current issues of moral education as a subjectification are summarized as follows in MEXT. Issues of Moral Education in Round-table Discussion on the Enhancement of Moral Education

- Influenced by historical circumstances, there is a tendency to avoid moral education in school
- The philosophy of moral education is not shared by the teachers
- It is not clear what student learned in moral because teacher cannot lead the class.
- Compared to other subjects, moral subjects not important among the teachers

According to Akahori(2016), it is important to reflect about yourself from the various perspective of moral value in order to be aware of your current situation. In order to clarify one's way of thinking and feeling more clearly, it is stated that it is important to consider in various aspects and multilaterally.

So by using thinking tools in class, children can consider moral values in multiple and multifaceted ways.

According to a study by R.rechard, learning takes place as a result of making up the meaning independently and thinking. So as to goals it is important to ① Create an opportunity to think and ② Visualize a child's thinking

By visualizing and thinking about their own thinking processes, students act as independent people and work better with others as independent people. Students can develop a kind heart in their lives.

Kurokami (2017) states that Thinking Tools visualizes the thinking process, that creates new idea. Visualizing their thinking help students work cooperatively. Therefore Thinking Tools help to visualize students' ideas, when they have difficulties in expressing their own thoughts.

Method

Observation was conducted in a moral education class. A worksheet was given to 28 students in the second year of high school at a public school in Hiroshima, Japan. The children discussed moral dilemma. Students were asked to think about the moral dilemma. In the contents of the class in this study, children read a story and thought about the moral dilemma.

The title of story was "Marathon tournament". The synopsis of this story is a girl wonders if girl will keep running or help friend. The girl's name is Chikako. Chikako is talented marathon player. Chikako practice to run for the tournament . One day when Chikako practice to run, her friend practice to run too. Her friend's name is Yoshie. Yoshie had been absent from school for a long time. But recently Yoshie recover and practice to run with Chikako. The day of tournament Yoshie and Chikako participate in the tournament. Chikako become the top of the whole at the turning point. After passing the turning point, Chikako notice that Yoshie has a painful look. Chikako wonders if wonders if girl will keep running or help friend. At first, children read story. Second, children wrote opinion on worksheet. Third children used butterfly chart of thinking tool(chart1). Fourth, children used jellyfish chart of thinking tool(chart2). Fifth children discussion other children. Finally children wrote opinion on worksheet.

Chart1

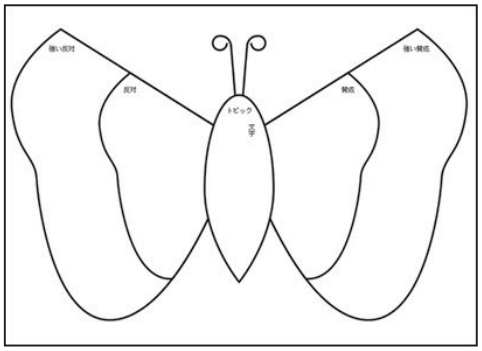
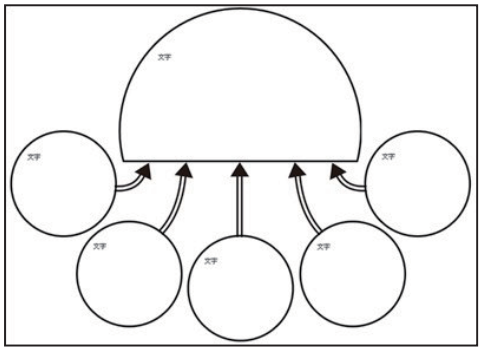


Chart2



Results

The worksheet was analyzed before the using Thinking Tool as well as after the using Thinking Tool. The author classified the part before use of the thinking tool. As a result, 24 students answered that it was better to keep to run and 4 students answered that it was better to help Yoshie. The author classify the results after use of the thinking tool. As a result all students did not change opinion.(Whether it is better to keep to run or help Yoshie.)

The worksheet was analyzed by checking reasons for their opinion. Based on the Worksheet, about 80% of student could raised a new reason after considering the different opinion of other students.

Some samples of student opinions are as follows:

- Student A's reason was changing the way his interpretation of the opposite opinion.
- Student B's reason was to propose a remedy to the opposite opinion.
- Student C's reason was maintain the his or her opinion by providing concrete evidence.

Conclusion

As a feature of this analysis, about 80% of student increased reasons for their new opinions compared to before use of thinking tools. More than half of the students wrote their opinions on the worksheet based on the opposite opinion.

From the point-of-view that about 80% of student were able to increase reason for their opinions, using thinking tools helped visualize student ideas and could help students who have difficulty expressing their thoughts.

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Ethical Challenges Faced by Students in the Educational Environment of Artificial Intelligence

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Abstract: With the development of new generation information technology, human society isentering the era of artificial intelligence, and the application of artificial intelligence has gradually entered the field of education. Students as the main body of teaching, the application of information technology in education brings convenience to students' learning and promotes students' lear ning on one hand. On the other hand, it also has some ethical problems that hinder the development of students. This paper discusses the ethical issues in the application of artificial intelligence in education, analyzes the ethical crisis phenomenon generated by artificial intelligence from different aspects, and puts forward some suggestions for the development of artificial intelligence applied in education from the perspective of information technology and students themselves aiming to help students to use information technology to improve themselves to a certain extent,.

Key words: artificial intelligence, ethics, students,information technology

Artificial Intelligence and its Development

Artificial Intelligence (AI) is a new technical science that studies and develops theories, methods, techniques, and applications system of simulating, extending, and extending human intelligence. Research in this area includes robotics, language recognition, image recognition, natural language processing, and expert systems. The development of artificial intelligence can be traced back to the ancient Greek period. Ancient philosophers and educators studied the laws of human thinking and laid a theoretical foundation for the development of artificial intelligence. In modern times, mathematicians and scientists in Western countries led mathematics rapid development, which also lays the foundation of algorithmic ideas for artificial intelligence. At present, many countries have incorporated artificial intelligence into national development strategies, which shows the importance of artificial intelligence. But technology is a double-edged sword, and it must be treated correctly.

The Educational Application of Artificial Intelligence in Chinahas Received Unprecedented Attention

The changes brought about by information technology affect all aspects of society, including

education. Xu Ye, Huang Yao (2019) indicated “Every change in technology will bring new changes to the field of education.” (Xu Ye, Huang Yao 2019). The rise of the three waves of artificial intelligence has also affected the field of education, and educational technology has ushered in new developments. In recent years, China has issued a series of important documents related to the application of artificial intelligence education. In April 2018, the Ministry of Education issued the "Education Informatization 2.0 Action Plan", proposing "based on emerging technologies such as Artificial Intelligence, Big Data, and Internet of Things, relying on various types of smart devices and networks, innovative research and demonstration of smart education should be actively carried out to promote the transformation of models and ecological reconstruction of education under the support of new technologies." Liang Na, Jiang Yuantao (2019) reports “In November 2018, the 5th "Future Education in the Big Data Era" Forum released the "Artificial Intelligence + Education" Blue Book.” (Liang Na, Jiang Yuantao 2019). All of these indicate that China attaches great importance to the development of artificial intelligence’s application in education, and China's education has entered the eraofartificial intelligence.

Educational Ethics Plays an Important Role in Student Development under the Educational Application Environment of Artificial Intelligence

Chen Guoqiang (1990) indicated “Ethics, the moral code that people should follow when they get along with others.” (Chen Guoqiang 1990). Educational ethics also refers to the relationship between people, people and nature in education, and the rules for dealing with these relationships. The ethics of education mainly reflected in the students are how students get along with teachers and companions, and how students can correctly use various new learning devices. Wang Kai, Zhou Yanyan (2019) stressed “The correct ethics play an important role in shaping students' healthy personality and promote the continuous improvement ofstudents' personality.” (Wang Kai, Zhou Yanyan 2019).

In the context of artificial intelligence education applications, machines are becoming more and more intelligent. Although they cannot surpass humans, their impact cannot be ignored. Therefore, in this case, the ethical education of students is particularly important. Students should always keep a clear head and enjoy the convenience brought by artificial intelligence, so that artificial intelligence can really promote the growth and learning ofstudents.

The Main Ethical IssuesFaced by Studentsin the Educational Environment of Artificial Intelligence

Impeding the Development of Students' Key Competency in the Information Age

The competency of students refers to the quality of all the abilities that students have in theory. Key competency is different from competency. Key competency refers to the essential character and key ability that students should have to meet the needs of lifelong development and social development. In summary, the two important dimensions of students' key competency are humanistic literacy, including humanistic spirit and values. Second, science and technology literacy, including professional and knowledge skills, practical innovation ability and application ability. It is undeniable that artificial intelligence has played a certain role in promoting the development of knowledge and skills and practical skills. At the same time, however, the humanistic literacy and innovation ability of students in the artificial intelligence education

application environment have also been hindered.

Improper use of Technical Tools Hinders Students from Thinking, Inventing, and Creating

With the advent of the artificial intelligence era, students' learning is not just from books and teachers. At present, the convenience of using the network and the richness of resources make students more willing to use the Internet for classroom or after-school learning. Network information resources also enrich the spiritual world of students to a certain extent. However, for students who are not yet fully mature, if they are unable to use the technical tools correctly and are addicted to artificial intelligence and the virtual environment they create, all the things are handled by the robot, that is, the "anesthetic problem" ofthe virtual environment will occur.

Practical applications of artificial intelligence include expert systems, intelligent search, theorem proving, knowledge acquisition, and so on. Baidu in China also involves artificial intelligence. In 2016, the " Baidu Brain" project was officially launched, dedicated to building a comprehensive artificial intelligence platform, which further improved the user's sense of use, but also brought a certain negative impact. For example, the intelligent search function makes students rely on "baidu" and "google" at once, that is, "net search" phenomenon, whenever students encounter problems in learning. Even some of the students directly copied the answers from Baidu and Google's search on the answer sheet, that is, the "net copy" group. Due to the excessive dependence of students on artificial intelligence, many things must be assisted by machine assistance. Students' memory, thinking ability and inventiveness will be greatly weakened, which will greatly hinder the development of students. Thinking, invention, and creation are the essential characteristics and unique development advantages that distinguish people from other things. If the technical equipment in the artificial intelligence environment is not used correctly, human beings will gradually lose their unique advantages,which may lead to the arrivalof the era ofmachine control.

Intelligent Push Puts Higher Demands on Student Information Literacy

In the era ofartificial intelligence, information is flooding all corners of society. The development of technology enables smart devices to intelligently push through the analysis ofmassive amounts of datato understand user preferences. However, the machine may not accurately push the absolutely correct information to the user, which may result in the student absorbing the wrong information due to immature judgment, orpush the wrong information due to technical errors such as code. It is a great problem for the healthy growth ofstudents. Hou Haoxiang (2019) indicated "The ability to collect and judge information determines the student's vision, which is the core to grasp the latest research results and apply them." (Hou Haoxiang 2019). This requires students to improve information literacy, that is, the ability to identify information and process information, is the ability that students must have in the information age. Students should behelped to improve their sensitivity to information, improve their ability to identify and process information, and avoid being overwhelmed in massive amounts of information.

Emotional Problems of HumanBeings in the Machine Age

In the era of artificial intelligence, although machines are more "intelligent," teachers will not be replaced by machines because machines can never replace the emotional impact of teachers on students. In addition to dealing with the relationship between people, human beings must also

correctly handle the relationship between humans and robots.

Alienation of Family and Friendship

Students, especially the lower grades, are in an emotionally sensitive period, and relationships with parents are often evasive. They are more willing to close themselves and not want to communicate. The rapid development of smart devices may cause students to be immersed in the virtual environment created by artificial intelligence, which will eventually lead to a weaker relationship with family members and friends in the real environment. Because of the lack of communication, others are therefore unable to know the problems of students, unable to solve problems in time, may cause depression, autism and other issues, which will be detrimental to the healthy growth of students' psychology. In recent years, the phenomenon of mobile phone addiction among teenagers has expanded wildly.The indulging in mobile phones often leads the adolescents whose self-control is not yet fully mature away from the real world, alienated from relatives and friends, and the more serious ones need the treatment by psychologists.

Disintegration of School, Teacher Trust and Authority

In the era of Educational Informatization, teaching is no longer dominated by teachers in fixed classrooms, and knowledge is less subject to the content of textbooks. Nowadays, students can conduct data inquiry and knowledge learning through online search, and the learning environment is more and more open. Students can listen to the explanations of authoritative experts without leaving the house. They can also interact with them in the network and solve the learning problems in time. Therefore, the absolute authority of schools and teachers in the minds of students has collapsed to a certain extent. Teachers are no longer the authority of omnipotence, and schools are no longer the only environment on which students depend. Artificial intelligence causes traditional learning places and implementers of teaching to disintegrate their trust and authority in the minds of students. Ashok Goel, a professor of computer science at the Georgia Institute of Technology in the United States, created an artificial intelligence assistant to handle the daily standard answer. The robot was named Jill Watson. Jill started to be used in the spring class in 2016, and the students asked Gil more for help than teachers when they encountered problems. This enhanced the students' trust and admiration for artificial intelligence robots, and thus more liked and accepted the learning experience that robots brought to them. The subtle influence has weakened the trust and authority ofteachers in the hearts ofstudents.

Mental Damage, Lack of Emotional Experience

In the era of artificial intelligence, in order to understand the learning state of students more accurately obtain learning patterns, and improve learning effects, some scholars try to use wearable devices for data collection, and through data analysis, they can understand the attention of students and other state of the cerebral cortex more accurately. When students are in class, the researchers let them wear "helmets", install monitoring terminal equipment, and monitor the students' every move, which will make students feel monitored and have no sense of freedom. It will cause students' tiredness of learning, fear of learning, and even refusal to learn, which not only hinders the normal learning of students, but also brings certain harm to the growth of students' minds. At the same time, using intelligent robots to learn the experience, what students get is only the knowledge itself, but did not bring a certain emotional experience, and ultimately lead to "indifferent world." Therefore, Song Lingqing, Xu Lin (2019) indicated "artificial

intelligence can not completely replace the role of teachers as student emotional communicators, and teacher’s role in cultivating students' spiritual world is irreplaceable.” (Song Lingqing, Xu Lin 2019).

Some suggestions inthe educational application of artificial intelligence

Suggestions for the construction of artificial intelligence

From a technical perspective, the development of artificial intelligence has matured, and the focus should be on the security of user information. On the one hand, it is necessary to educate developers on ethics and morals to ensure that developers do not sell personal information for personal interests; On the other hand, Gao Tingting, Guo Jiong (2019) indicated “strengthen technical protection to prevent the disclosure ofprivate dataof users due to technical leakage.” (Gao Tingting, Guo Jiong 2019).

Advice for students' owndevelopment

Grasping the essence ofkey Competency -self-learning ability

In today's information age, the growth of new things is very rapid, which requires us to improve our key competency in this era. As the essence and core of key competency, self-learning ability needs to be possessed by every student. For a large amount of information, we must have autonomous learning plan that suits oneself. We must be able to acquire effective knowledge accurately and quickly, consciously upgrade ourselves, and actively increase our knowledge reserves. We must not be dominated by a large amount of information.

The key to cultivating science and technology literacy -innovation and creativity

In the future society, there is no shortage of people who can learn knowledge, what is missing is someone with innovative ability. The key to innovation is the key to science and technology, which every student in the future society must be equipped with to be able to better drive the advancement of technology. In a smart society, the core of learning is to cultivate students' innovative ability, which is a skill that cannot be replaced by machines. Therefore, we must make full use of machinery and equipment to cultivate our own innovation and creativity.

Acquire the core of humanistic literacy -emotional processing ability

No matter what era, the emotional communication between people is indispensable. Although learning is the nature of students, the healthy growth of students can not be able to interact with the emotions of the people around them. Therefore, emotional processing ability is also a skill that students must pay attention to. This skill is not owned by the machine, and it is also impossible for the machine to provide for students. Students should consciously improve their emotional processing skills in the process ofgetting along with their family, teachers and peers,and learn from the best people.

SUMMARY

With the rapid development of artificial intelligence, the application of artificial intelligence education has gradually deepened. As the main body of learning, students' learning has also undergone earth-shaking changes. On the one hand, artificial intelligence effectively promotes students' learning and improves students' academic performance. On the other hand, it also brings some ethical issues that cannot be ignored. We must foster strengths and circumvent weaknesses, and avoid the phenomenon of counter-ethics while enjoying the scientific and technological achievements, so that science and technology can serve humanity better. At the same time, we must also pay attention to strengthening the supervision of artificial intelligence technology, so that artificial intelligence can serve human beings while avoiding information leakage and other ethical violations.

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07

Chapter 7:

Innovative Schools and Future Education

Proposal of effective questions in high school math class — Through an experience of practice teaching —

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Abstract: According to the Ministry of Education (2015), introducing a learning method called active learning into classes is important. In addition, Programme for International Student Assessment (PISA) research (2012) discovered that the percentage of students who enjoy math is low and many students feel uneasy about math. The purpose of this study is to identify the effective questions asked by teachers in high school math classes to increase student motivation to learn math. However, there is little research on these questions. Therefore, this study will find effective questions asked by teachers in math class to solve those problems.

The classes studied in this research looked at the question of a teacher in two math classes (4 hours total) in the second year of high school. The research method used questionnaire, survey and observations.

As a result of the research, the following questions were found to be important: "Asking questions that students can answer with confidence", "Asking questions that remain in the students' memory", and "Consolidating contents on a blackboard". These three points were discovered to improve student motivation.

Key words: questions, math class, active learning

INTRODUCTION

The purpose of this study is to identify the effective questions asked by teachers in high school math classes. These questions assist students to take math classes independently and actively.

According to the Ministry of Education (2015), introducing a learning method called active learning in classes is important. In other words, this study will devise ideas in the content and activities of the class so that students can learn independently and interactively, and develop general-purpose skills including cognitive, ethical, social skills, education, knowledge, and experience. These are very important.

However, there are situations where teachers in the field do not use active learning classes in high school math classes. In other words, students cannot acquire the knowledge, ability,

thinking skills, judgment skills, expressive skills, and power for learning and humanity, which are the skills described in the course of study for students.

There are also two main problems in high school math classes. The first point is the low motivation of students in mathematics. According to the Programme for International Student Assessment (PISA) research (2012), the percentage of students interested in what they learn in mathematics is lower than the international average, and the percentage of students who feel anxious about learning math is higher than the international average. Also, according to the Ministry of Education (2006), basic computational skills are not declining however students do not understand the meaning of computations. In addition, there are issues that cannot be fully utilized in real life and learning based on the knowledge and skills acquired in class.

The second point is about the class image. According to Akita (1999), university students and new teachers are often regarded as "transmission places" or places where they only give knowledge. In addition, middle-aged teachers say that there are many who think that it is a "co-production site" or a place where the teacher and students interact. Especially in the subject of mathematics, there are many classes that only convey the contents of classes, and the students just listen. In such a situation, dispelling the students' bad image of the math class is important. Also, students cannot participate in active and interactive classes.

Therefore, the author would like to propose asking students questions to raise their motivation. According to the Ministry of Education (2015), questioning is defined as "following the child's thinking and recognition process". Two problems of class image and motivation can be solved by asking students questions in class. In addition, there is little research on these questions. Therefore, in this study will attempt to identify the effective questions in the math classes of high school to improve image and increase motivation.

RESEARCH DESIGN & METHODS

The subject of the research are students in two mathematic classes at a private high school, High School A, in Kobe Japan. The general mathematics class had second-year students studying the humanities that were divided into Group A and Group B. Group A consisted of 12 people (8 men, 4 women), who studied in the humanities course. Group B consisted of 16 people (13 men, 3 people) who studied in the science course. The study looked at two lessons of "Mathematics II" for each group. The unit in the humanities study was on "maximum/minimum of area", and the "arc degree method". The science units were "Sine and cosine addition theorem" and "tangent addition theorem". The research method used the questionnaire survey and observation methods. Based on the results of the questionnaire survey, analysis of what the teacher was talking about and what was written on the blackboard, the author examined the effective questions in the high school math class.

An anonymous questionnaire survey was conducted after each class. The following list is the questionnaire item for the class.

Q1: Where is the place particularly easy to understand? (Page number and range of textbook)
Q2: Where is it hard to understand? (Page number and range of textbook)
Q3: Please tell me what you remembered from the teacher's explanation. (The range here was easy to understand to difficult to understand.)
Q4: Please write your thoughts.

The questionnaire used the free description method. Class analysis was conducted based on these questionnaire items. The observation method was analyzed by paying attention to the contents of the lecturer's talk and the contents on the board. The questions covered in this study are defined as "the teacher asks the students questions".

RESULTS

The results of the questionnaire are as follows: The questionnaire results showed the class range understood by the students. From the results of the free descriptions, when teachers thought students understood when they didn't and asked questions, students did not understand. This had a negative on the students. In addition, not only the contents explained in the class but also how the blackboard was used and the readability of the board were important for the students.

Table 1 Questionnaire results

	Q1: Where it was easy to understand.	Q2: Where it was hard to understand.	Q3: What you remember.	Q4: Comment
1	・Applied example on p109 ・Practice 46	・The reason why the point of intersection of two straight lines has a maximum of k	・Application example 8 ・K is y intercept	・It is easy to see the board ・It is easy to understand the way expression
2	・Description of the angle representing the radius ・How to represent the angle of the arc method	・The fan of D ・Arc length and area ・p 119	・Arc degree method	・It is abbreviated and hard to understand
3	・p140 Example 6 ・Official	・Example 6	・Sine and cosine addition theorem	・I want you to write figures clearly
4	・p 141 ・Isotropic angle of two straight lines	・p 142 Example 7	・How to remember formula ・Addition theorem of tangent	・I want to solve the review work and make it perfect

The followings were found from the observation method: There was a difference between students who understood and students who did not understand depending on the teacher's explanation. The explanation in the situation that the student did not understand was the explanation based on the assumption that the contents and the board which I was talking were omitted and that the student had the knowledge.

On the other hand, easy-to-understand explanations promoted students' understanding by asking questions and content throughout the class and fresh explanations that the students had not received in previous classes. The explanation is such that students could gain common understanding of the class content. Having fun explanations and questions that students were listening to, as in the case of game of rhyming was also important. Students could listen to the teacher's lectures if they could develop a class where they have fun.

In addition, "the readability of the board" affects the level of understanding in the class, other than when the teacher asked questions. Students were asked to fill in the comments of the class freely in the questionnaire survey, but there were responses such as "The board was easy to see" and "It was easy to understand because the teacher wrote clearly." The analysis of the board contents showed that the board that explains the question contents in detail and the board with the "Tips" on the question contents helped the students to respond. In addition, in math classes, by using figures and graphs, information could be visualized, and by making it easy for students to process information, teachers can encourage students to answer questions.

In conclusion, three points of effective questioning by the teacher in the mathematics class of

high school are clarified by these categories.

1. Ask questions so that students can answer with confidence

In response to questions, make it easy for students to answer by giving tips and assistance. As the example in Table 5 shows, if the student is unhappy with the situation or is unsure about his and her answer, the teacher must support and ask questions in a language that the student can easily answer and understand.

2. Ask questions that will be remembered by the students

Make it easy for students to remember the class content. It also needs to be a question that will be remembered. In order to do so, it is necessary to devise ways of emphasizing and giving information on questions that can be connected with society and keywords in classes. By doing so, it is possible to establish memory and to make an effective questioning. In addition, it is desirable that it be full of humor like Table 6 and questions that students find interesting.

3. Materialization of contents by board

The third point is not about asking questions, but using blackboards and whiteboards makes it easy for students to answer questions. The contents can be visually judged by showing a figure, a graph, and an expression in the middle and it becomes easy for the student to answer the question smoothly. Teachers can be effective and can motivate their students to learn by asking questions including the above three points during class.

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What is Distance Non-Formal Education in Society 5.0?: A Case Study of a Remote Island Tutoring System

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Abstract: Educational resources in remote areas are often insufficient. The application of ICT in education has greatly improved the efficiency of the use of educational resources. With respect to current development, in the upcoming "Society 5.0," at least on the technical level, distance education can be implemented in non-formal as well as formal education. The cultural conflict between teachers and students in distance education has a certain impact on the learning effect.

This study focuses on the case of a remote Japanese island that introduced public tutoring after formal classes at a public junior high school. This public tutoring school has recently started an online tutoring system that connects them to teachers in central Japan. This program made a significant change in learners' knowledge and attitudes toward learning. The remoteness of the island reflected a cultural divide between Tokyo and the island that first prevented effective learning, as in other cases of formal distance education. However, a sympathetic one-on-one process of teacher-learner communication caused a change in students' attitudes and tutors' way of talking, suggesting that sophisticated technology with sympathetic personal help works effectively, and there are many possibilities to realize this combination in non-formal education to support individual learning.

Key words: Distance Education, Online Education, Inter-Cultural Communication

INTRODUCTION

In the history of the application of media in education, distance education is a significant case of the use of technology to reduce educational insufficiency. As media development leads the development of distance education, the study of distance education could help deepen the discussion of media in education. This study investigates educational media use in the coming age of quality technology such as AI.

Society 5.0 and Distance Education

In Japan, technological development is officially promoted by the government under the new

term "Society 5.0," which is defined as "a human-centered society that balances economic advancement with the resolution of social problems by a system that highly integrates cyberspace and physical space" (Cabinet Office, n.d.). Following the information society, Society 4.0, this new idea aims at technological evolution with a humanistic approach making use of nascent IT.

Distance education overcomes problems of insufficient resources. especially in remote areas. Starting from education by physical mail, distance education has used the technology of the day: Radio, television, satellite communications, and the Internet. Studies of distance education reflect aspects of educational media development. Where the educational interaction between teachers and students was once limited, it has become increasingly like face-to-face communication without a time lag using advanced technologies. It tends to be a one-way lecture when the target students are in a mass, but the current development of massive open online courses (MOOCs) allows an effective communication style among learners that helps users interact to construct meanings and learn.

Issues in Distance Education through the Internet

MOOCs have helped the development of quality education and removed many barriers causing imbalances in educational resource, as well as addressing issues of continuation, which have always constituted a major problem of distance education. The high dropout rates of the first MOOCs were discussed worldwide, taken out of context, and sensationalized; MOOCs are usually free and easy to register for. Some studies discussed this ease of dropout, but what is rarely discussed is that even paid courses by mail had low continuation rates. Without schooling, distance education has always faced difficulties of continuation, and MOOCs are no exception.

On this long-discussed issue, Takabayashi (2018) pointed out that 1) motivation design and 2) self-regulated learning design would be attractive features of courses to reduce dropout. These two design points are important, not only in the case of MOOCs but in future online distance education. A different point is that MOOCs allow greater interaction between students, as discussed above. Not the lecturer but teaching assistants would play the main role of communicating with learners. However, online distance education includes tutoring and one-on-one communication, which have emerged in non-formal education in Japan.

Non-Formal Education in Japan

Given the many discussions and studies of current distance education, this study focused on the case of non-formal education. Non-formal education, or shadow education, is currently on the increase. Over 60% of junior high school students use shadow education, with higher rates in metropolitan areas, such as 74% in Kanagawa Prefecture (MEXT 2018). This high ratio comes from two new and different styles of shadow education, lecture movie systems and tutoring systems. Lecture movies enable online courses, and tutoring is now more common at lower costs before.

Especially in the case of online courses, most non-formal educational sectors have released video lectures for high and junior high school students. According to one of the largest providers, Studysuppli, the number of registered students has continually increased since 2012 to a current level of 339,000 registered high school students (Recruit 2018), which would include more than one percent of all Japanese high schoolers. Some observers suggest that this trend will soon

extend to junior high students, but it would appear that more junior high school students choose tutoring schools as their shadow education than video lectures, although the classroom lecture style is still the mainstream format.

RESEARCH DESIGN

Given the situation discussed above, this study focuses on an advanced example of non-formal distance education. One tutoring school and its teachers in Tokyo have online experience and video lectures, so this advanced trial of non-formal distance education with a public tutoring school was undertaken by the island's board of education.

Case Description

Currently the distance tutoring is held twice a week, and six students (three first graders, one second grader, and two third graders) regularly take the course. It started once a week in the preceding school year with a total enrollment was 10. Three of those 10 students were third graders, all of whom passed the entrance exam of high school (K10-12). In sessions, the maximum number of students for one tutor is three, but usually two students take tutoring with one tutor in Tokyo. When students want, one-on-one tutoring is also available, which two of them are currently using. Students use the public tutoring school with the island's Wi-Fi connection to connect to the teachers at the tutoring school in Tokyo. Teachers usually sit in the seats they use for face-to-face tutoring, so that they can conduct class as usual.

The class is 50 minutes long, and students first talk with the teacher face to face, and then the session starts when the teacher switches the camera toward the whiteboard to teach the topic of the day. During class, students do not change the camera, so their reactions are visible except in the rare case of an unstable connection. On the other hand, the teachers often switch the camera to show their faces. One tutor with half a year's experience said that he tries to switch the camera frequently so that the students have fun in sympathy with the teacher. The connection system is appear.in, operated by Google.

RESULTS

From the case study, the authors found that online distance tutoring could have a positive effect on students. Not only the students who passed the exam but most of the others were satisfied with the experience of online tutoring and enjoyed it. One finding is that real-time communication, which is similar to face-to-face communication, would be an effective form of supplemental education to make up for the limitations of other online video courses.

Communicative Interaction without Delay but with Cultural Differences

The online tutoring affords the opportunity for individualized educational assistance, which is common in metropolitan but not remote areas. In contrast to the video lectures, tutors had private conversations with students and their chats extended the content of the session. Tutors communicated so as to motivate students using chat, as they do in face-to-face tutoring. Thanks to the stable connection, personal communication was established during the session, in addition to the learning contents and contents.

However, personal chats sometime faced problems. For example, when students tried to

pronounce the word "window," one tutor suggested the phrases "window-shopping" and "Windows PC," which students in the remote island rarely have experience with. Cultural gaps have been discussed in the case of online distance education between countries (Kang 2014, Liu et al. 2010). Online collaboration activities also sometimes face cultural divides and staff dealing with international students are required to have intercultural communication skills (Damary et al. 2017). Since this case did not involve international communication, this issue was not seriously discussed beforehand. However, teachers are the mediators of learning content, and case studies and action research have shown that such relationships of language and culture are not limited to different countries (Kohler, 2015). In this case, tutors soon realized the cultural divide between themselves and their students, and all of them overcome it within a few sessions because of both their high inter-cultural communication competency developed through their teaching experience and the effects of online communication. Takabayashi (2016) indicated that the social distance of diverse students can be smaller online than in real classrooms based on a literature review and interviews. A similar effect of online communication could have occurred in this case as well.

Technological Limitations of Online Communication

Three challenges were found during the development of the online course: Technological issues of unstable connections, communication issues of cultural differences, and the systemic issue of limited time for conversation. The issue of cultural differences was explained above, and the technological issue that the online communication was sometimes unstable, depending on the Wi-Fi situation of either computer, has been improving through the use of a system specialized for education. However, the last challenge brings us to the critical issue of education in Society 5.0.

One tutor pointed out that the 50 minutes of each session is not enough for her to build an emotional bond with the learners. Her suggestion does not mean that the length is the important matter, but she thinks that the five minutes before and after the session are important. In the case of face-to-face teaching, tutors have time with the students outside the session. However, because this is online tutoring, they can talk and see each other's faces only during the session. The session time imposes certain limitations in the case of casual and personal communication, which is easily ignored when we focus on the technological side of teaching. To address this point, we are considering a more sophisticated system that allows relaxed connection before class.

DISCUSSION

This case study showed that online tutoring has the potential to motivate students and affect their learning attitudes because of human interaction. Lecture videos would help students' knowledge, but this case suggests that affective communication is needed and sympathy should be expressed during instruction. Since self-directed learning skills are needed today, virtual educational communication should be considered for at least part of non-formal education.

To investigate this case more deeply, formal interviews with both teachers and students are needed. Since this case is not limited to a particular private tutoring school, other stakeholders such as public supporters on the island and teachers who know the students' daily lives well would also be key informants regarding the effect of non-formal distance education.

Learning as Communication

This case study found that online communication without delay is similar to that of face-to-face tutoring. However, even with this similarity, the distance between tutors and students caused a cultural difference. Though cultural conflicts occurred, differences between tutors and learners were resolved during real-time interaction. The constructivist view of learning is not the main topic of this study, but it implies that distance education is also communication. There are many ways of motivating students using technological gimmicks, but since learning is a communication process, at least today it is easier to have real teachers and tutors who can search for the students' "ignition" point of motivation.

(Non-)Formal Distance Education in Society 5.0

The authors found the possibility of a supplemental educational effect of online courses. MOOCs and other technologies are expected to continue spreading, and in this situation, direct live interaction between teacher and learner should be considered carefully, as dropout and self-directed learning attitudes strongly depend on the communicative act of learning. If Society 5.0 aims at human-centered use of technology, teachers need competence in sympathetic communication. To meet this need, AI might also be taught some patterns of human communication. However, this case study shows that sympathy and strong inter-cultural communication skills are particularly needed when the students are not typical metropolitan learners. Distance education has evolved and increasing numbers of learners are the targets now. Thus, for diverse learners, the combination of technology and the human teachers/tutors is important. The combination could involve AI teachers providing video lectures for mass classes (with some helping pattern in some part), and shadow education tutors conducting real-time interactions to construct the meaning, especially when learners are under K-12, an age when interactions between learners alone are not enough to develop their motivation and attitudes for self-directed learning.

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Output-centered Training Design: A JICA project at Ethiopian Water Technology Institute

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Abstract: This presentation reports on an effort to transform training design at a national institute, so that output of trainees' learning becomes the center of design. An example is about a trainer-training project sponsored by Japan International Cooperation Agency (JICA), Project for Strengthening Capacity for Training Operation and Management for Ethiopian Water Technology Institute (EWTI). Current status of training design at EWTI was analyzed to design transformational process, so that their training will satisfy governmental requirement of occupational standards. It was taken account that the participants of EWTI training are working engineers in water technology fields, not full-time students of a vocational school. Transformational process is explained phase by phase, and recommendations for the next pilot training are also be discussed.

Key words: output, training design, JICA, transformation, TTLM, EOS, TVET

INTRODUCTION

There have been numerous efforts to call for a paradigm shift in designing education and training in all sectors, including school education, higher education, and vocational training. Such keywords have been used as competency-based, active learning, 21st century skills, learner-centered, theory-driven, outcome-based, mastery approach, performance-oriented, among others. However, in many contexts of education and training, there have been strong resistance to change the design, partially because of weak felt-needs for substantial changes, as well as shortage of resources and skills of providers of education and training to create a needed paradigm shift for better quality education and training. In fact, in many occasions including training sectors of developed and developing countries, one can still observe continuation of traditional approach to education and training; i.e., instructor-centered, lecture-based spray of information, and attendance-based qualification without assessment of learning results except for conducting reaction questionnaires.

This presentation reports on an effort to assist transformation of training design at a national institute in a developing country, so that output of trainees' learning will become the center of design. It is from a trainer-training project sponsored by Japan International Cooperation Agency (JICA), Project for Strengthening Capacity for Training Operation and Management for Ethiopian Water Technology Institute (EWTI). The project aims at introducing the latest training design to strengthen the capacity of trainers working at the Institute. The purpose of this paper is to describe how a transformation of training design has been planned and being implemented in the project.

RESEARCH DESIGN & METHODS

First, current status of training design at EWTI was analyzed to plan transformational process, along with an analysis of the capacities of the trainers working at EWTI, as well as a need assessment to determine what areas were of high demands in the practical fields in Ethiopia. As the transformation process was anticipated to introduce some types of trainees' assessment against pre-determined set of learning objectives, related standards and ongoing practices of outcome-based training was also searched. Then, based on the analysis of current practice of training conducted at EWTI, as well as assessments and survey of the related matters, transformational process was designed, proposed to the management of EWTI, and implemented in multiple phases.

ETHIOPIAN OCCUPATIONAL STANDARDS AND TTLM

While seeking related regulations and practices of outcome-based training, Ethiopian Occupational Standards (EOS) was located as preferable ongoing system of qualification of vocational skills. EOS, as shown in Figure 1, specifies occupational standard in each job-related area with units of competencies, assessment criteria, and evidences of skills to be sought for. EOS had already been adopted in Ethiopian Technical and Vocational Education and Training (TVET) system as the core of their curriculum design. Although it was not directly at the level and scope of EWTI's training, many resources were available for vocational high school curriculum in various other areas of competencies, as known as TTLM (Training Teaching and Learning Materials). As EWTI is expected to provide in-service training for working engineers in the field, while TVET is to train full-time students at pre-service level, it was natural to follow the same framework of EOS to place EWTI's training curriculum as an extension of TVET. Therefore, the project adopted EOS and TTLM as the framework of training design. While following the format, the contents will be added to fit the level and scope of EWTI, where EOS coverage was inadequate. Training strategies were also needed to be changed to fit EWTI's situation as an in-service institute.

So, the first phase of transformation occurred at EWTI was to put the selected training materials into TTLM format. Each team was assigned to a 10-day training, whose content was of high demands based on the need survey. It was taken account that the participants of EWTI training are working engineers in water technology fields, not full-time students of a vocational school, so a set of recommendations was given to each team, as shown in Table 1.

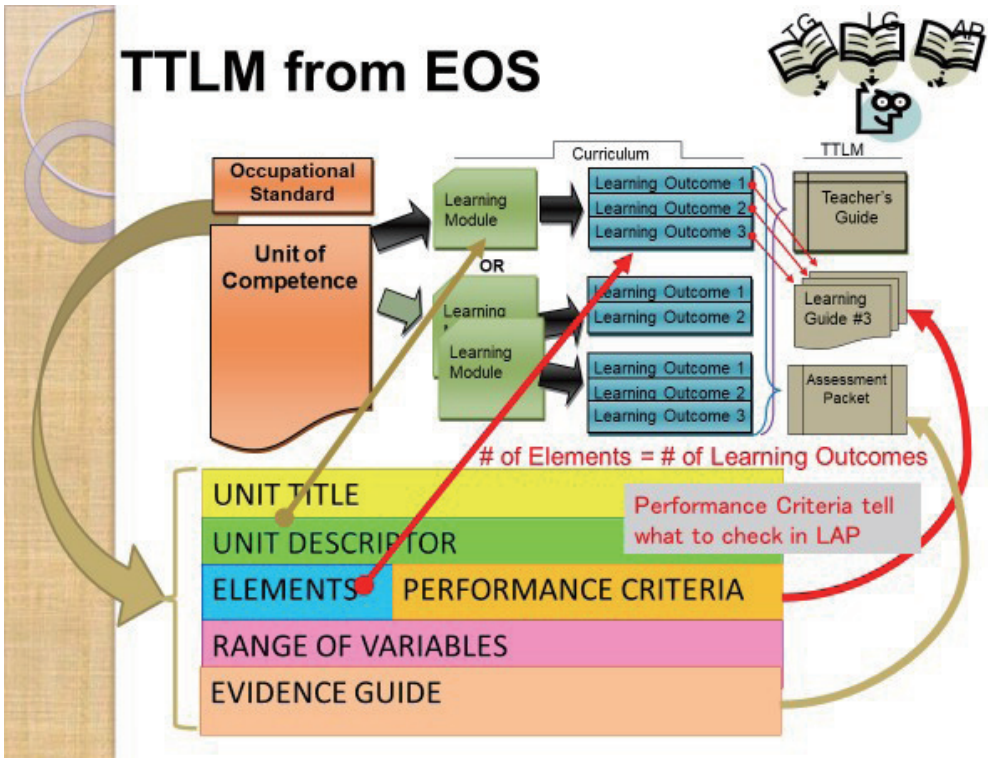


Figure 1: TTLM from EOS

Table 1: Not TVET way but EWTI way (Recommendations)

TVET	EWTI
Students are fulltime (have more time for learning), but no/limited work experiences	Training needs to be efficient (less time for learning), but trainee may have ample/varied work experiences
Teaching start from the basics (assuming nobody knows the basics)	Recommended to check the basics without teaching (some may know them from their experiences) 1) Give a copy of entry test (Event 3) at the end of the previous day (or before coming to training) 2) Each trainer checks basic knowledge before the session to give him/her a chance to review 3) Start each morning by giving the same test, provide feedback/explanation, only if needed
Learning Guides are to be used in group training, as well as in self-study; ✓ *Instruction sheet* in each LO contains steps of self-study (can be used for the students who are absent) ✓ All the materials are to be printed and given to individual students ✓ Introduction of TTLM aims at making students more self-directed and independent, allowing self-paced learning without much or constant direction from the teacher	*Learning Guides* are to be used ONLY in group training with trainer's explanations (tentatively) ✓ *Instruction sheet* will NOT contain steps of self-study (assuming no trainer skip any session) ✓ *Learning Guides* (PPT) are to be displayed by trainers; only handouts and worksheets are to be printed and given to individual trainees (at least for time being to make the conversion easier; can be reconsidered after Pilot training) ✓ Maintain trainer-led group training; introducing self-study only for the basics, to focus to reform training and assessment more practical

NEW METHODLOGY IN EWTI'S TTLM-BASED TRAINING

In February 2019, EWTI and JICA created the first version of Guidelines for Training Operation and Management. Figure 2 summarizes major element in assessment scheme proposed in the Guidelines. Further suggestions have been given to EWTI management to prepare pilot training in the next phase as follows:

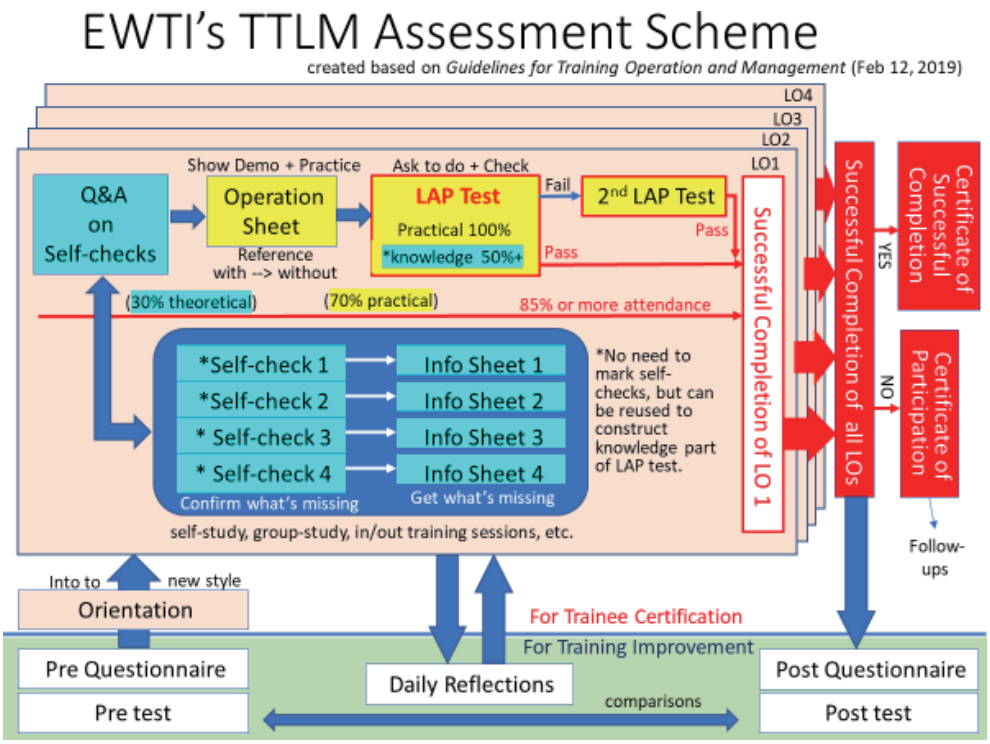


Figure 2: EWTI's Assessment Scheme based on TTLM

Operation Sheet and LAP Test

Operation Sheet describes practical knowledge and skills to be acquired in the training, in descriptive format (with examples) whereas LAP (Learner Application Practice) Test describes it in inquiry format (how to test individual/small group trainees). They are to be prepared for each Learning Guide (LG), usually included at the end. So, the collection of LAP Test should cover what is specified as Evaluation Evidence in respective EOS. EWTI will determine satisfactory completion of each trainees based on LAP tests in each LG, not at the very end of training by conducting separate assessment covering all LGs (for time being, at least until assessment mechanism will be established, separate from training provision). LAP tests, in other words, functions as summative evaluation (rather than formative evaluation: no separate summative evaluation at the end), thus should maintain its quality to assess both knowledge and practical skills properly, and to be conducted rigorously to judge each trainee's passing/ not passing. Second chances will be given to those who fail to pass in the first trial, so training schedule should be planned accordingly.

Self-check Sheet and Information Sheet

Self-check sheets describe basic knowledge and skills underpinning what is described in Operation Sheet/LAP Test, in inquiry format. Information Sheets describe them in descriptive

format. They are usually divided into 2-4 units within each LG. Participants to EWTI training are from the field, so they may possess/lack basic underpinning knowledge and skills. So EWTI should adopt "Self-check first" approach, without going through lectures on the basics (which assumes every participant know nothing like school students). Each trainee will try to answer Self-check Sheets by him/herself. If s/he finds any lack of knowledge and skills, by not being able to fill in answers, then s/he reads Information Sheet, trying to understand the contents, and fill in all answers, before the training session. During the training session, lecture to explain all items in Information Sheet will NOT be given, although explanation about Self-check items may be given upon trainees' request. Training will shift to Operation Sheet and LAP Test, as soon as possible, if no questions are asked. Items on Self-check will be covered during the Operation Sheet and LAP Test, in the form of oral questions, to confirm the trainees' understanding of basic knowledge (Self-check itself shall not be a part of trainees'assessment; they are not Tests).

Daily Reflection Sheet

Daily Reflection Sheet is to collect anonymous opinions from trainees at the end of training everyday. It should tentatively cover three items: (a) what is the most interesting topic of the day, (b) what is the most difficult topic of the day, and (c) any suggestions and comments. It will be collected by the trainer, reviewed by the department, and plan for reactions at the beginning of next day with possible measures taken. This serves only for improving training quality, not for assessing trainee's learning.

Session Record

Session Record shall be kept, showing how each session went, including time spend in each activity, learning contents and methodology, handouts and other related materials used. Pictures can be accompanied to show major activities with images. Records were taken by externally hired recorders in the first pilot in Oct 2018, and the second pilot in April 2019, but it should be managed within the department. In this way, at least one trainer will attend all the sessions, beside trainer him/herself, to maintain the quality of training by following what is planned. This serves only for improving training quality, not for assessing trainee's learning.
Pre-Post Test & Questionnaire

Omitted in the first pilot in Oct 2018, pre-post test of basic knowledge and skills was back in place in the second pilot in April 2019. Additionally, Pre-post questionnaire was administered in some courses in the second pilot in April 2019, to ask their work-related experiences and confidence of the work-related skill (target of the training). Like pre-posttest, both are to measure the gain that took place while training, by comparing pre and post, both from knowledge/skill perspective and practical applicational job skill perspective. They are to be administered at the very beginning and very end of the training. This serves only for improving training quality, not for assessing trainee's learning: Trainees' knowledge will be assessed in each LAP Test, along with performance skills, NOT by the posttest. Pre-posttest should be expanded to cover major basic knowledge in all LGs.

CONCLUSION

This paper has described transformational process of training design, with EWTI's project as an example. It is authors' hope that the next phase of training will satisfy all the elements described

in Figure 3, as much as possible.

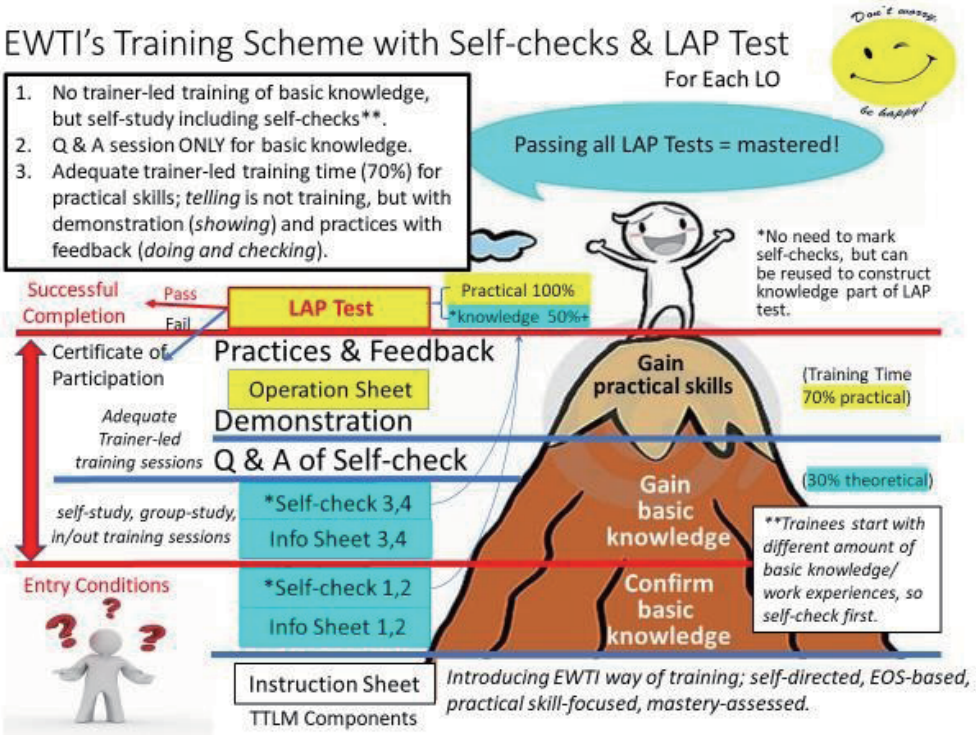


Figure 3: EWTI's training scheme (suggested)

Exploring the Reform of Higher Education in the View of Artificial Intelligence

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Abstract: The great breakthrough of artificial intelligence (AI) makes it a strategic technology which is going to lead the future. As the top of the pyramid of education, higher education cultivates excellent talents for the development of the nation. At the era of AI, the reform of higher education must conform the development of AI. In this study, the relationship between AI and higher education was analyzed from the perspective of dialectics; on the one hand, AI promotes development of reform of higher education, on the other hand higher education causes technological innovation in artificial intelligence. Hence, methods for reform of higher education were proposed at three levels, including reform of teaching activities, talent cultivation and management pattern, to respond the rapid development of AI actively.

Key words: Artificial intelligence, Higher education, Reform of teaching activities, Reform of talent cultivation, Reform of management pattern

INTRODUCTION

Artificial Intelligence (AI) is a new technical science for research and development of theories, methods, technologies, and application systems for the simulation, extension and extension of human intelligence (Negnevitsky 2002). With the rapid development of artificial intelligence technology, it has brought many positive changes to various fields of society, such as smartphones, autonomous driving, smart medical treatment and so on. The State Council issued the "Next Generation Artificial Intelligence Development Plan" in 2017, indicating that AI has been promoted to a national strategy, as the core driving force of industrial change and the strategic technology leading the way to the future. In 2018, the Ministry of Education issued the “Action Plan for Artificial Intelligence Innovation in Higher Education”, which marks that promoting the deep integration of AI technology and education and the intelligent development of education have become important goals for the reform and development of higher education. So far, the compound research of "artificial intelligence and education" is gradually emerging in the field of higher education. However, the current research still stays in the application of artificial intelligence technology in higher education, and how higher education develops artificial intelligence technology; and other aspects; these research show the trend of fragmentation, a lack of analysis of the relationship between AI and higher education, and no consensus on strategies how to deal with AI development in higher education. Based on

this, this article explains the relationship between AI and higher education from the perspective of dialectical analysis and discusses the reform path of higher education under the influence of AI.

The Dialectical Relationship between AI and Higher Education

1. AI promotes the reform and development of higher education

The concept of AI dates back to the 1950s, the first boom marked by the Turing testing and the second boom marked by the computer Dark Blue's victory over the human chess king, but it has failed to achieve a qualitative breakthrough due to technology bottlenecks, or digital data limitations, or high application costs. Therefore, it had not an effective impact on socio-economic life. In recent years, under the dual impetus of the rapid and continuous evolution of information technology and the rising level of economic and social development, AI has become more mature, used in many fields widely, replacing human mental labor increasingly, and has even become the infrastructure of all walks of life.

The greatest advantage of AI over humans is the precision and efficiency of computing power. Therefore, its applications in data-intensive, knowledge-intensive, and brain-intensive industries field can drive rapid innovation and upgrading across the whole industry. Higher education covers a large number of educational data and educational resources, meanwhile it gathers teaching and research funds. Rich and good data, high-density knowledge and brain activity, and a large capital and application market make higher education the most important application area of AI. In 2016, Wuzhen think tank and NetEase co-published "Wuzhen Index: Global AI Development Report (2016)" at the 3rd World Internet Congress Wuzhen Summit, which proposed that the forms of AI in the field of education include personalized tutoring, intelligent testing, intelligent evaluation and so on, pointing out the direction for the reform and development of higher education in the era of artificial intelligence.

2. Higher education breeds innovation in AI

During the ninth collective study of the Political Bureau of the CPC Central Committee in 2018, President Xi Jinping emphasized that AI was an important driving force for next scientific and technological revolution and industrial change, and accelerating the development of a new generation of AI is a strategic issue concerning whether China can seize the opportunity of next scientific and technological revolution and industrial transformation. In the same year, the Ministry of Education issued the “Action Plan for Artificial Intelligence Innovation in Higher Education”, aiming that colleges and universities are going to become the core strength to build the world's major AI innovation center and leading the development of next AI by 2030, providing scientific and technological support and talent protection for China to be in the forefront of innovative countries. This is a declaration to guide and support higher education to enhance the capabilities of technological innovation, talent training and national needs in the field of artificial intelligence.

Innovation is the original driving force of scientific and technological development and the soul of higher education. The essence of technological innovation is talent-driven, and the fundamental talent-driven is education, especially the combination of science and technology (the first productive force) and talent (the first resources) in higher education. Talent is the core element of scientific and technological innovation, and the development of next AI cannot

be separated from the strong support of high-tech talents. In order to enhance the national technological competitiveness around the world in the AI era, the UK has set up a scholarship program to attract talents in the field of AI, meanwhile it expands the content of the discipline constantly, adds Master and Doctoral Degree Programs for AI to provide sufficient reserved talent for the rapid development of AI (Duan, 2019). This provides ideas for the development of AI in China. Higher education integrates the first productivity (science and technology), the first resource of talents and the first driving force of innovation; it provides the basis and talent security for the innovation of AI.

The Reform Path for Higher Education under the Influence of AI

China has the advantages to develop AI at present and it is strengthening the country by AI. Higher education is the driving force of social development and the breakthrough of AI brings the development of higher education opportunities and challenges. Under the influence of AI, higher education should not only improve the educational and teaching activities, but also perfect the talent training system, and also reform the management pattern of colleges and universities.

1. Path to reforming teaching activities

(1) Personalization and customization of classroom teaching

In traditional classroom teaching in colleges where teachers dominate, students' learning is mainly based on what teachers teach in classes. Class contents are basically designed by teachers on the basis of standard teaching materials and training programs, which lacks of students' participation. Besides, few interaction in the classroom leads to low learning interest of students. Driven by the development of information technology, the reform of curriculum teaching in colleges and universities is promoted continuously and the concept of "learning as the center" is gradually formed, that is, the learning activities of students as the center of the whole classroom teaching. Based on this, the teaching schedule is not just lecturing, but a combination of class discussions, video assistance and other ways. Similarly, the learning style is not just passive listening; the transfer of knowledge which was from teacher to student, turns gradually into the effective interaction between teachers and students. Therefore, it is shown the dominant roles of students in classroom teaching gradually; curriculum participation and learning initiative have been effectively improved. But overall lecturing is the main way in classroom teaching in colleges and universities, although medialization has been realized. The application of AI in college teaching makes students' basic knowledge not limited to the classroom, but through the online learning platform easily completed, which puts forward higher requirements for teaching design; that is transform from teaching the basic knowledge to the training students on learning methods and thinking ability (Li, 2019). Therefore, teachers have to adapt to the change of AI and use it to guide students to learn the knowledge by themselves in the classroom teaching. Then teachers have to understand students' learning situation and problems encountered via the learning system timely. Then it comes out the tutoring teaching and teaching according to merit.

(2) General education

The traditional curriculum structure is professional courses mainly, and the understanding of professional concepts and improvement of professional skills depend on lecturing and teaching

resources. However, the differences of university levels, located areas, and uneven distribution of educational resources affect the learning effect directly. The combination of AI and higher education can enable students who are from different regions and universities to enjoy the same high quality and specialized teaching resources online. Therefore, the classroom is no longer the main position for professional knowledge learning; teaching is no longer based on professional knowledge, but training students' quality and ability and shaping values instead, in order to cultivate talents with innovative ability, logical thinking, rational judgment and sound personality. Compared with the professional education pay more attention to "teaching", the general education of colleges and universities focuses more on "cultivation", which is an indispensable way of educating people in the stage of higher education and is the most effective way to achieve quality education; the purpose is not to train professional talents, but to train the humanistic qualities and scientific spirit of college students. The fundamental of higher education is to educate people. The development of AI impacts the traditional curriculum structure, it may really bring higher education back to its teaching essence——general education. With the help of AI, intelligent testing and evaluation systems is going to help teachers to get rid of a lot of repetitive work, which makes them devote to teaching method innovation, the refinement of curriculum thinking elements and personalized teaching design.

2. The path of talent cultivation reform

(1) Changes in the structure of talent cultivation

At present, the talent cultivation structure includes three levels in higher education, specialized, undergraduate and postgraduate education. With the application of AI in higher education, the future structure of higher education talent cultivation is likely to become undergraduate, graduated education and doctoral education (Cheng, 2018). Specialized education is to train technical talents with a certain professional skills. The development of AI impacts labor-intensive and technology-intensive industries, a large number of technical work can be finished by AI; it is going to affect the traditional specialized education inevitably, the specialized education gradually reduces or even suspends eventually.

Undergraduate education is the most important component of higher education. With the increasing enrollment of undergraduate colleges, undergraduate education is no longer a threshold. Under the influence of AI, the enrollment and training scale of undergraduate education will be further expanded and is likely to eventually be popularized; more students will enhance their knowledge and inner value. Based on basic and undergraduate education, graduated education is a high-level innovative professional education in China, including master's education and doctoral education two levels. The continuous innovation of AI will place higher demands on social talents who have both innovative thinking and strategic vision. In this context, graduated education is likely to become the minimum standard of advanced talent cultivation, which forces universities to strengthen the quality and scale of graduated cultivation, the scale of doctoral students will increase, and training systems will be more perfect. Therefore, the level of graduated education is likely to be re-divided into two levels, master and doctoral education, parallel to undergraduate education.

(2) Refactoring the pattern of talent cultivation

Talent cultivation is the fundamental task of education. The “New Generation Artificial

Intelligence Development Plan" states clearly: "Using intelligent technology to accelerate the reform of talent cultivation model." Therefore, it is necessary to evolve and reconstruct the talent cultivation model in terms on objectives and methods in the AI era. At present, the higher education object of talent cultivation is mainly on professional personnel in China. The rapid penetration of AI in various fields forces object of talent cultivation in collage from professional personnel to composite professional talents who combine AI. On the one hand, on the basis of increasing the training of AI professionals, universities focus on cultivating "AI plus" composite talents to provide innovative and entrepreneurial talents to various field where AI develops (Fang, 2019); on the other hand, colleges and universities should also actively establish a talent training mechanism based on cross-disciplinary integration, broaden the educational content on AI in other subject areas, and cultivate the "Plus AI" composite talents to adapt to the development of AI to provide elites who can acclimatize themselves to renew of AI to various field. In the specific method of talent cultivation, colleges and universities should transform the "enterprise-college-research system" to the teach-research-use system ". They should build up a number of talent training practice platforms which combine education, training and research. With the help of artificial intelligence, they should achieve more efficient technology and achievement transformation and accomplish the integration of the campus science and technology innovation system, industrial innovation system and social innovation needs.

3. The path of management pattern reform

(1) Network migration of managed pattern

University management mainly includes teacher, student, examination, evaluation, research, administrative, financial, and property management, the progress of AI drives the university management pattern to network migration (Yang, 2018). In teacher management, AI evaluates teachers and assists management on the basis of teaching contents and collation and analysis of teachers and students behavior data and emotional data. In daily teaching activities, teachers and students can freely form a curriculum group on the intelligent platform to achieve online sign-in and answering questions. In student management, AI provides timely feedback to administrators by analyzing students' classroom performance and behavior cognition, providing support for students' comprehensive quality evaluation and a realistic basis for assisting schools and teachers to guide students' development correctly. AI can free proctors from examination work; it identifies student information through intelligent scanning, determine student location and distribute test papers, and maintain good order during the examination process. Based on AI and big data, teaching evaluation will be more objective, specific, scientific and accurate, then educational evaluation will achieve digital innovation. In the process of research, administration and financial management, AI can realize the rapid, real and effective big data collection and analysis, providing support for management decision-making. In property management, image recognition and visual communication of AI make it possible to maintain campus security and it plays an important role in the identification of illegal personnel, security warning and handling of safety activities.

(2) The revolutionary reorganization of management system

In China, university management is dominated by administrative level system now; the departments are clear and have efficient collaboration, the level of authority relations is relatively clear, management is conducted in accordance with the standardized process, and providing

a favorable organizational guarantee for the normal operation of colleges and universities. However, under the background of the rapid development of AI, the shortcomings of the current management system in universities are exposed; the procedural and administrative management system lacks the adaptability to cope with new changes, multiple layers and steps limited the education within various rules and frames, which should be innovation-oriented (Ouyang, 2019). AI has the advantage of accurate and fast communication of superior instructions, documents, work and the processing of things in school, which can help colleges and universities to realize the intelligent, visual and data-based management to develop gradually. With the help of AI platform, people can be free from a large number of repetitive and cumbersome affairs, the total number of administrative and management personnel will show a gradual downward trend. Combined with the decentralization, decentralization, optimization of services, and constant improvement of the internal governance structure of colleges and universities, AI can help management to reduce works from responding to superior inspection and evaluation, to devote to the field of innovation development and first-class discipline construction, and to implement the organization of colleges and universities flat and fine management finally, then to improve management and efficiency.

Conclusion and Outlook

From the angle of dialectics, AI and higher education promote and support each other. Higher education provides the basis for the rapid development of AI and the breakthrough of AI will promote the transformation of teaching activities, talent training and management pattern in colleges and universities. In the era of AI, higher education should attach importance to and actively respond to the continuous innovation and development of AI to promote the deep integration of educational resources and AI constantly, providing support for discipline development, talent training and two-class construction.

ACKNOWLEDGEMENT

This research was supported by “Humanities and Social Science Research of Ministry of Education, China (Project No. 19YJC760169)”, “the Natural Science Foundation of Jiangsu Province of China (Project No. BK20170272)”, and “Brand Professional Construction Project of Thirteenth Five-Year Plan in China University of Mining and Technology”. At last, we thank anonymous reviewers for their precious time and pertinent suggestion.

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Promoting Regional Systemic Education Reform with School-to-the-Future Project-A Case study in Chengdu City

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Abstract: In the age of rapid technology development and social revolution, it has become a consensus that education needs systematic reform instead of simple tinkering. The challenges and the promises that brought by artificial intelligence made systematic reform inevitable, and it needs the collaboration among the educational administrative departments, research institutions, enterprises, school administrators, teachers, students and employees, parents and even the entire society to make it happen. The question is how to effectively coordinate the effort of all the stakeholders, and promote the reform with clear goals, plans, strategies and steps. Since 2013 the Education Bureau of Chengdu initiated the school-to-the-future project, which aiming on exploring regional systematic education reform through integrating multiple administrative and research resources within the region and building regional advancing mechanism. This project encourages and supports the schools to make innovations on various education factors, including the education philosophy, teaching and learning resources, curriculum design and implementation, instructional methods, assessments, construction and utilization of intelligent campus, school management and technology use. This paper introduces the theoretical framework, implementation strategies and working experiences of this project, which might be helpful reference for the regional systematic education reform.

Key words: School-to-the-future project, Regional systematic education reform, Educational innovation

INTRODUCTION

Our society has entered into an age of rapid technology development. The upgraded technologies, including the new generation of information technology, biotechnology, new energy technology, new material technology and intelligent manufacturing technology, are bringing the next big revolution to the human civilization. Among all these technologies, Artificial Intelligence has become the driving force that reshaping the industrial and economic ecology. It is reconstructing the relationship between human and technology as well as human and the tools. This brings out both promises and challenges to the current world. On the one hand, repetitive, predictable, routine physical and cognitive work is replaced, the efficiency and productivity are promoted, and innovated products and services are rewarded. On the other hand, bigger divides among distinct social, geographical or geopolitical groups appear because of the

uneven distribution in the access to, use of, or impact of the artificial intelligence technology. The other severe challenge is the value of human kind. Along with the transformation of many industries, many jobs are disappearing, and the professional knowledge and skills that people once made for living are becoming obsolete (Harari, 2018).

The challenge that brought by AI to education is unprecedented. The value of the education needs to be reconstructed to bring educatee intellectual, social and economic increment in an AI-based society; the purpose of the education needs to be redefined to give the young the things they need to develop into members of the society (Dewey, 1938) , and the methods of the education need to be redesigned in an AI-supported learning environment. In other words, a systematic change in the current education system is inevitable, and almost every country is standing on the same starting line.

Many efforts have been made on the systematic change of education. Some focus on the change of the education purposes. New literacy systems as the framework of educational purposes have been proposed by many countries and institutes. For instance, the well-known 21st century skills include life and career skills, learning and innovation skills, information, media and technology skills (Framework for 21st Century Learning). The United States released Common Core State Standards which focuses on developing the critical-thinking, problem-solving, and analytical skills (Common Core State Standards Initiative). Obviously, instead of being limited on disciplinary knowledge and skills, the purpose of the education has shift to a comprehensive set that aiming on meeting learners' cognitive, cultural, technical, interpersonal and intrapersonal development need.

There are also national or regional programs focused on systematic change. For instance, in 2016 Finland released their new national curriculum framework, in which the contents that encompass many disciplines and "phenomenon-based' pedagogy were advocated. The reform in Finland also included the change on educational spaces, assessments, and technology use (Finnish National Agency for Education). From 2007 to 2011, Singapore selected eight schools to participate in a school-to-the-future program, aiming on building three-dimensional (3D) virtual learning environments to overcome the limitation of certain region, optimizing the application of the ICT tools in teaching, and innovating the curriculum and assessments (Gao, 2013). In 2016, the Chinese Academy of Education Sciences initiated the plan for China's future school, which proposed that the main development direction of schools in the future is to promote innovation of learning space, learning style, school curriculum, educational technology and school organization. These practices provided significant experiences and inspirations of how the systematic reform could be carried out in a nation, a region, or a school.

The question is, how to make systematic education reform happen in a specific region in China? What is the mechanism that can coordinate the strength and effort of all the stakeholders toward the common goal?

RESEARCH DESIGN & METHODS

This study utilized a case study design. The "school-to-the-future" project is the major case for this study. The participants include the Education Bureau of Chengdu City, Education Bureau of five counties in Chengdu, the researchers who work on this project, and 42 schools who are selected as the experimental basis. Data were collected through interviews and observation. The

administrative authorities who are in charge of this project, the researchers, and the principals/ teachers of 42 experimental schools were interviewed to describe their working mechanism, innovative attempts and experiences from the practice. The classrooms of each school were observed twice, focused on the pedagogy change and technology use. The data was analyzed through qualitative analysis procedure (Creswell, 2007) to create codes, themes and categories. Data resource triangulation and member checking (Stake, 1995) were used as validation strategies.

RESULTS

Project overview

Chengdu City is one of the biggest cities in China with the population over 16 million. It is also one of China's "national central cities" which are geographically and economically important modern metropolis with the mission of leading regional development and participating the international competition. The development of this city needs large number of high-quality human resources, and a high-quality education system is highly needed as the support. Based on its favorable geographical environment, economic status and strategic development vision, the Education Bureau of Chengdu City started the school-to-the-future project as a strategic initiative for regional systemic education reform from 2013. Thirteen top-ranking primary and secondary schools were selected as the first batch of the experimental basis at the beginning, and 29 schools and five counties were added in 2016, which makes each county of Chengdu City at least has one school as the experimental basis for future education. The original intention of gathering these schools together is to ease the difficulty of the systematic reform: each school is encouraged to find their possible breakthroughs based on its own characteristics, and hopefully through experience sharing and integration, the small breakthroughs may evolve into a big new system.

In the Chengdu City's initial plan for school-to-the-future project in 2013, the mission of the experimental schools and counties was stated as making the schools innovative educational establishment that prepare the young to participate, influence, and be responsible for a rapidly changing unknown future. The integration of the educational practices with the technology tools and resources is recognized as the leverage of the reform. The experimental schools and counties were also encouraged to conduct unprecedented experiments through trial-and-error, and keep revising and improving their measures.

The theoretical framework for the school-to-the-future project is based on the 21st century skills, constructivism (Piaget, 1980), social development theory (Vygosky, 1978), connectivism (Siemens, 2005) and knowledge building theory (Scardamalia & Bereiter, 2003). It puts the human as the center of the education: the learning paradigm, learning environment and the learning resources should work together to support the human being to realize their best potentials and be prepared for the unknown future. It emphasizes both individual property and social attribute of the learning, and advocates the cognitive agency of the students on deciding the purpose, methods, paths and resources on their individual or community inquiries. The framework also stated that all factors of the education system should open to possible disruptive innovations brought by the technologies.

Emerging themes

Macro and micro level change

The reform that brought by the school-to-the-future project happened in both macro and micro level. The educational administrative, including the education bureau of Chengdu and the education bureaus of five experimental counties, focused on the reform of the macro system. This includes setting the reform goals, strategies, redesigning the value system and making developing plans with the support of research institutions. In the meantime, they try to promote the reform on education governance system, management system, school evaluation system and funding system with specific policies. For instance, Wuhou county tried new administrative methods like proactive management (take measures before things happen) with the support of big-data technology. They also employ new funding policy that is in favor of the schools that have good records on planning and implementation of technology infrastructure instead of equal distribution. For the schools, they worked on the change on the micro level, including education philosophies, school management, organization structure, the mechanic of information flow, HR system, teaching management system and academic innovation. Reform in school also happened on curriculum, pedagogies and assessments for distinct subjects, the organization of distinct learning communities, the design and implement of distinct lessons, as well as the learning methods and process of different students. The macro and micro level change influence and promote each other as a cycle to realize the systematic change.

Multi-layer administrative measure as driving force

One trait that makes this project unique is that it is driven by the administrative measures. In the implementation plan, three layers of administrative subjects are identified: the education bureau of Chengdu City, the education bureau of the counties, and the experimental schools. The education bureau of Chengdu City is responsible for the overall project planning, top-level measure designing and policy-making. The administrative authorities of each county are responsible for coordinating regional resources, providing funding support as well as providing technical and human resource support. The experimental schools are responsible for integrating resources, conducting the reform, reflecting and summarizing the working measures and experiences. The administrative authorities use their administrative measures to advance the project. For instance, the education bureau of Chengdu city made the performance of each county on the project part of the annul administrative evaluation system. The education bureau of the counties also put scores on experimental schools in their annual evaluation if these school made significant progress on this project. These measures make sure that the counties bureaus and the experimental schools see the importance of the project and put enough resources and efforts on it.

Cooperation mechanism among government, enterprises, research institutes and schools

Collins and Halverson (2018) stated that education is a complex, sophisticated and closely coordinated system, and the educational reform cannot only work on one element, but ignore the relationship and connection between this element and other. Therefore, to make significant change in education, the work must be systematic, and all the parties needs to work together toward the same goal. Based on this argument, the school-to-the-future project built a four-way cooperation mechanism among the administrative authorities, technology enterprises, research

institutes and experimental schools. The administrative authorities take the lead of coordinating the resources from all parties through making corresponding policies, dedicating special funds, calling for special meetings, and organizing theme training programs. Technology enterprises provide project consultation service, technical service and technical products based on the requirements from the administrative authorities and the schools. For instance, before the project plan was released, technology enterprises including Apple and Cisco were invited to provide suggestions and feedback on the plan design. Some technology companies deeply involved in the integration of the technology and educational practice, and provide on-campus technical services and customized teacher training. The research institutions (including University of Electronic Science, Sichuan Normal University and Chengdu Institute of Educational Sciences) provide theoretical guidance and intellectual support to the administrations and the experimental schools. They also conducted annual inspection and evaluation to the experimental counties and schools. The results of the evaluation were provided to administrative authorities to see the progress and challenges. Specific status report and suggestions based on the evaluation result were provided to each school to direct possible next move. The school plays the role of putting all the resources into practices, and working as a community to look for breakthroughs in classroom teaching, curriculum development, assessment, teacher professional development and other factors.

Paradigm shift of learning as the core of changing

The core element for the education reform is the paradigm shift about learning. The learning is conceptualized as a social, cultural, distributed, and collaborative process rather than merely an individual act (Bereiter, 2002; Kafai, 2006; Lave & Wenger, 1991). The inquiry is considered as sustainable emerging process aiming on deep understanding and systematic idea construction instead of completing pre-determined tasks (Zhang et.al, 2011). The learners should take epistemic agency on making learning decisions and creating knowledge instead of receive knowledge as passive consumers. The changes that are made in the "school-to-the-future" are designed to support this paradigm shift on learning and make it go deeper. For instance, the key principle for the technology infrastructure construction in schools is to make internet connection readily available around the campus, so that the learning can happen anywhere and anytime with the support of the internet resources and online learning community. The learning spaces should also make ubiquitous, fluid, customized, and social learning happen naturally. Based on that consideration, some schools like Zongbei Elementary school tried to expand the concept of the space from traditional physical space to an integration of physical space, network space that supported by information technology, and virtual space supported by AR and VR technology. They also tried to change the original single-function space to gray space with variable and flexible functions. The technology tools such as power interface, projectors and network terminal as well as human-computer interfaces in each learning space are also readily available, so that the information, resources and tools can be used to resond to the emerging learning needs whenever necessary.

Data as the center of the technology infrastructure construction and implementation

At present, the experimental schools realized that the data is the core element of the technology infrastructure. These schools' major direction of the technology infrastructure construction is moving from "digitization" to "datalization", and then "intelligent". In the era of "digitization", many schools build various of isolated applications and thus "data islands" become the common problems. The experimental schools started to build unified database and tried to connect the

data from the existing applications and build standard entries for new applications. The data from multiple resource was then put together and analyzed, and students' data panorama, teachers' data panorama, schools' data panorama and data dashboard for distinct users are created. These data presentations are then interpreted by the users to improve the school management, classroom teaching, curriculum development and teachers' professional development. The data is also used on supporting proactive management, individualized learning and career planning. Some counties like Wuhou County and Chenghua County is building county-level data center to collect, analyze and present the education data for each school, and tried to improve their administrative level though data-alerted proactive-management and data-supported decision making.

DISCUSSION

As an administrative measure driven project, the school-to-the-future project in Chengdu has its advantages and disadvantages. The advantages include the incomparable power of administrative authorities on gathering resources. The administrations can also use the administrative measures such as changing funding policies, giving incentives based on evaluations, issuing administrative orders to compel the participants keep making breakthroughs. However, administrative power also has its disadvantages. The major motivation of conducting the education reform come from the pressure from the upper-level administrations instead of the internal needs of the schools and counties. This is the major reason that the school-to-the-future program are advancing slower than expected. Some schools even use the title of "experimental school" as the leverage for asking more funding from the government instead of seeing this project as a mission of the school. How to raise the intrinsic motivation of the schools for the education reform and better utilize the administrative power on project management and development are the important challenges that needs to be addressed in the future.

The breakthroughs that made by the project are significant, but most of them are at the micro level. The change on the macro-level is very limited. The county-level management system is a very complex system of labor division and power distribution, which makes thorough change very hard to make. Moreover, to most of the counties the "school-to-the-future" project is only one of the many projects that assigned by the higher-level administrations, not a decisive work that influence the future of the county. The ones who are in charge of the project belongs to one department of the county bureau, and generally they do not have the strength and resource to take actions on county-level reform. In this case how to make significant macro-level education reform remains an open question.

The school-to-the-future project is an attempt of current education system to meet the challenge of the information technology. The current methods and experiences from this project might not work on the challenges that brought by AI. What competencies are necessary for the AI-based society is still under discussion. Although some actions have been taken, including incorporating AI-related knowledge and skills into curriculum (such as brief introduction to AI, the methods and ethics about living and working with AI, AI-related coding, AI-related STEAM inquires), compiling textbooks for AI, and hosting AI-related innovation project competitions. However, the knowledge about how to really relate AI knowledge and skills with students' development remains unclear. The AI tools for teaching are also utilized at a preliminary stage due to the lack of the data of students' learning and on-campus living. Even with sufficient data, how to leverage the power of AI to advance the learning is still a challenge. In the future, there might be more technologies that brings unpredictable opportunities and challenges, and the educational

reform projects like school-to-the-future needs to be open and dynamic enough to embrace the change.

In conclusion this case study about the "school-to-the-future" project reveals the mechanism and driving forces of a regional systematic education reform case to meet the challenge of the technology development and social evolution. The measures and experiences can be useful to the policy makers and researchers who are interested with the regional systematic education reform, and the challenges may also help them to go deeper in the relevant research and practice.

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Educational Event Evolutionary Graphs: Construction, Applications and Challenges

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Abstract: As a semantic network that describes the evolution and development of relationships between events, event evolutionary graph can enhance the interpretability of artificial intelligence and have applications in finance, information science, education and other fields. Considering the similarity between knowledge graphs and the event evolutionary graphs, the construction and applications of knowledge graphs in the field of education can provide reference for the construction and applications of the educational event evolutionary graphs. In this paper, literature review method is applied to introduce the construction of knowledge graphs. Meanwhile, case study method is used to survey the applications of knowledge graphs in education. The construction of educational event evolutionary graph are discussed. And then we put forward four applications scenarios of educational event evolutionary graphs including answering why-questions and how-questions, as well as heuristic questions and solutions. Finally three major challenges of educational event evolutionary graphs: the construction, knowledge verification and the integration of educational event evolutionary graphs are analyzed. It is expected to provide reference and inspiration for better construction and applications of educational event evolutionary graphs.

Key Word: knowledge graphs, educational event evolutionary graphs; construction; applications; challenges

INTRODUCTION

With the continuous development of technology, artificial intelligence has entered the stage of cognitive intelligence from computational intelligence and perceptual intelligence. The realization of cognitive intelligence is of milestone significance for the development of artificial intelligence. Knowledge Graph, as one of the important knowledge representation methods in the era of big data, provides rich background knowledge for the realization of cognitive intelligence and becomes one of the key technologies in artificial intelligence.

Knowledge Graphs technology is applied in the field of education to represent the correlation between knowledge points and provide services for personalized learning, transforming scattered, disordered and massive knowledge into aggregated and structured knowledge. Educational Knowledge Graphs are conducive to interdisciplinary knowledge integration, core concepts and ability penetration, to promote students' deep learning and develop their higher-order thinking ability. Educational Knowledge Graphs can meet the integration needs of disciplines.

However, at present, the Educational Knowledge Graphs only describe conceptual knowledge, descriptive knowledge, individual knowledge and positioning knowledge, while the procedural knowledge and empirical knowledge is missing. Existing Educational Knowledge Graphs are mostly composed of entities or concepts and their relationships, lacking the expression of event knowledge. An event refers to a group of things that take place in a certain time and environment, involving several characters and showing several action characteristics. And when one event leads to another with a certain probability, there is a connection between the two events, and the event evolutionary graph is composed. As shown in Fig. 1, "Gas leakage of the apparatus" is an event, while "The volume's measuring result of 1mol gas is smaller than true value" is the result of "Gas leakage of the apparatus" event, and "Gas leakage of the apparatus" event may trigger the occurrence of "Checking on gas tightness" event. It is clear that entities or concepts are also appears in the nodes of event evolutionary graphs, such as the event "The measuring result of oxygen content in air is smaller than true value" contains entities "air" and "oxygen".

In order to better interpret the construction of event evolutionary graphs, we apply literature review method about knowledge graphs construction. At the same time, we use the case study method of knowledge graphs applications in education, so as to help clarify the typical applications of event evolutionary graphs in education.

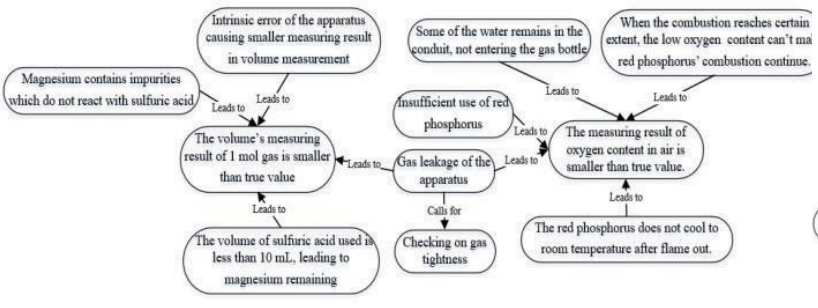


Fig. 1. A Running Example of Educational Event Evolutionary Graph

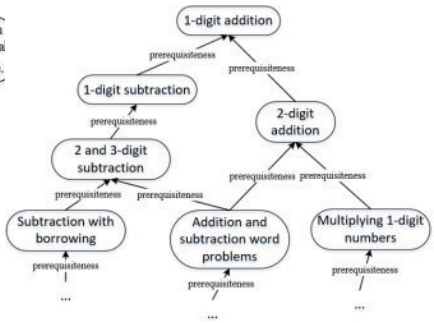


Fig. 2. A Fragment of the Khan Academy Knowledge Graph

RESEARCH DESIGN & METHODS

Event Evolutionary Graphs and knowledge Graphs are composed of nodes and the relationships between the nodes. The nodes in the knowledge graphs are entities or concepts, while the nodes in the Event Evolutionary Graphs are events. Both knowledge graphs and event evolutionary graphs can be denoted as $K=\{E,U,\tau\}$, where (1) E is a node set. For knowledge graphs, E is an entity set, while for event evolutionary graphs, E is an event set, and (2) U is a set of directed edges, (3) R is a set of relationships between nodes, and (4) τ is a mapping function defines the mappings from the edges to the relationships. Considering the similarity between the formal definition of knowledge graphs and the event evolutionary graphs, the construction and applications of knowledge graphs in the field of education can provide reference for the construction and application of the educational event evolutionary graphs. In this paper, literature review method is applied to introduce the construction of knowledge graphs. Meanwhile, case study method is used to survey the applications of knowledge graphs in education. Based on these work, the construction and applications of Educational Event Evolutionary Graphs are discussed.

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Literature Review about Knowledge Graphs Construction

The key technologies and methods of Knowledge Graph Construction are shown in Table 1. The key technologies include relation extraction, entity linking and knowledge inference. The main methods are adopted to construct Knowledge Graphs are also listed in Table 1.

Relation extraction is an important task for constructing knowledge graphs, and becomes especially more challenging when learning with limited labeled data. Another important and challenging technology is entity linking which means detecting from unstructured text with the corresponding entities in a knowledge graph. Meanwhile, knowledge inference can also be used to complete knowledge graphs.

Table 1 Key technologies and Methods of Knowledge Graphs Construction

Key technologies	Methods
Relation Extraction	Supervised Learning (Zhou 2005, Lu 2015, Miwa 2016, Bai 2019) Semi-Supervised Learning (Lin 2019, Zhang 2019) Un-Supervised Learning (Smirnova 2019, Li 2019)
Entity Linking	Probabilistic Generation Model (Le 2019, Blanco 2015) Graph-Based Method (Shen 2018, Phan 2019, Alhelbawy 2014) Deep Neural Network Methods (Liu 2019, Fang 2019)
Knowledge Inference	Inference method based on symbolic logic (Urbani 2015, Motik 2014) Inference method based on statistic (Nickel 2016, Galárraga 2015, V.lker 2015, Chakrabarti 2018)

Case Study of Knowledge Graphs Applications in Education

Khan Academy, an online education platform, has built a knowledge graph of mathematics. As shown in Fig. 2. The line between knowledge points represents the sequence of knowledge points. Teachers can obtain students' knowledge mastery through the sequential relation between knowledge points and the corresponding relation of learning materials. For instance, if the students do a wrong questions about single-digit multiplication, then the students may not totally

grasp double-digit addition or digits addition. Then teachers can provide a little easier test than single-digit multiplication locate the students did not fully grasp knowledge, to obtain mastery of students, so as to provide personalized learning materials for students and for personalized learning path. The connection between nodes has a certain transitivity, that is, one-digit addition is the pre-knowledge of two-digit addition, two-digit addition is the pre-knowledge of one-digit multiplication, and one-digit addition is the pre-knowledge of one-digit multiplication.

Knewton, a well-known online education platform in the United States, locates the difficulty model of students through the knowledge graph, which is constructed by Knewton adaptive ontology and has the characteristics of expandability, scalability and measurement (Jones 2018). Knewton mainly considers four kinds of logical relations, namely, containment, assessment, instruction and prerequisiteness. Containment relations are where one knowledge point contains another, such as knowledge point "hydride" contains knowledge point "hydrogen". Assessment means that a certain content is a way to evaluate a certain knowledge. Prerequisiteness refers to a specific explanation of a certain knowledge, through which learning resources related to the knowledge point can be found. The necessary conditions represent the relationship between the knowledge points, and only when the knowledge points are mastered, can the subsequent knowledge points be learned. Knewton platform utilizes these relationships to integrate different disciplines, different knowledge, and all of the learning resources together, forming a huge knowledge graph. The platform is based on the knowledge graph, diagnosis students' cognitive level, push personalized learning resources, and recommend personalized learning path, etc.
Tsinghua University has built the first eduKB of Educational knowledge graph for basic education in China, covering nine subjects (Chinese, Mathematics, English, Physics, Chemistry, Biology, History, Geography and Politics). It contains more than 22 million triples, more than 1.62 million entities, more than 1,000 concepts and more than 4,000 attributes. The platform provides graph search, reasoning, Question and Answer and other functions based on the Knowledge Graph.

"Tang poetry garden -- semantic retrieval and visualization platform based on knowledge graph" developed by Beijing Normal University provides learners with tang poetry retrieval functions, such as poet information inquiry, poet friendship inquiry, poetry location, style and teaching stage inquiry.

Based on the above cases, application scenarios of knowledge graphs in education mainly include five aspects: disciple knowledge query, knowledge association query, disciple knowledge automatic question and answer, disciple knowledge resources recommendation, and personalized learning path recommendation.

1. Disciple Knowledge Query

Based on the education knowledge graphs, learners can query a certain knowledge point and its related knowledge points. For example, if learners want to know the knowledge point related to "oxygen", they can input “oxygen” in the query box, and the knowledge points which are related to this knowledge point will be presented.

2. Knowledge Association Query

Learners can obtain the co-relationship between knowledge points. First of all, entity recognition

technology is applied to mapping the knowledge points to the specific entities in the graphs. And then, graph algorithms are used to search all of the paths between the knowledge points in the educational knowledge graphs and the paths are visually presented to the learners.

3. Disciple Knowledge Automatic QA

The question answering system based on disciple knowledge graphs will directly provide the answers that learners require according to their questions and improve learners' learning efficiency.

4. Disciple Knowledge Resources Recommendation

With the knowledge point as the core, the educational knowledge graphs gathers multi-model learning resources, establishes connections among resources through the knowledge graphs, and presents the discipline knowledge in the form of network structure, so as to provide learners with better learning resources, learning services, learning tools, learning activities and so on.

5. Personalized Learning Path Recommendation

Educational knowledge graphs establish a connection between relevant learning knowledge and connect the current knowledge content of learners to the subsequent relevant learning content. Based on this, it can recommend a personalized learning path suitable for learners' existing knowledge level. Educational knowledge graphs provide personalized learning path for each learner according to their learning profile, so as to realize the personalized teaching of learners.

RESULTS

The Construction of Event Evolutionary Graphs

The data sources used for the construction of the disciple event evolutionary graphs mainly include two parts. One part comes from the field of education, including course standards, teaching materials, teaching plans, test sets. These data sources are of high quality and can ensure the authority and accuracy of data. Another part of data sources come from the open field, including structured data, semi-structured data and unstructured data, among which structured data includes open knowledge graphs, such as DBPedia and CYC, semi-structured data includes forms on web pages, and unstructured data includes web pages.

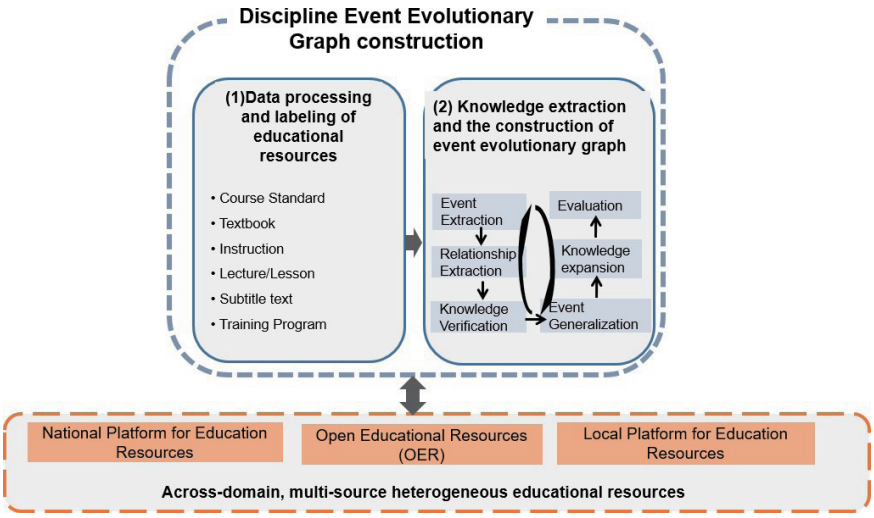


Fig. 3. The Framework of the Construction of Educational Event Evolutionary Graph

In order to ensure the quality and authority of the data in the educational event evolutionary graphs, a top-down approach is adopted to construct it. First of all, based on data sources in the field of education, experts from different disciplines participate in the construction of event knowledge ontology, including the ontology of event trigger words, event elements and event types, combined with the characteristics of the disciplines and different students. Then, crowdsourcing labeling, event automatic recognition and acquisition technologies, relationship extraction technology are applied to build educational event evolutionary graph combined with domain experts.

The Applications of Educational Event Evolutionary Graphs

Based on the analysis of the application cases of disciple knowledge graphs in education, the application scenarios of educational event evolutionary knowledge graphs include answering why-questions and how-questions, as well as heuristic questions and solutions. For example, a user might search for "Why the results of the experiment to measure oxygen content in air are smaller?" Or "How do air tightness check?" All these questions can be answered based on the Educational Event Evolutionary Graphs. Event evolutionary graphs can be used to support the educational knowledge interlocution and heuristic problems generated.

In addition, Educational Event Evolutionary Graphs can also support heuristic questions and heuristic answers. It is very important to ask proper and heuristic questions to promote learners' continuous practice and reflection. In this process, learners internalize various explicit knowledge into their implicit knowledge by analyzing, solving and reflecting on problems. However, the quality of the questions raised for learners is very important. For example, ask, "Why are the results for measuring oxygen in the air so smaller?" If the students have not fully mastered this knowledge point, the teacher can put forward another question to inspire the students to think according to the Educational Event Evolutionary Graphs and the generalization of the above events, "What are the reasons for the smaller experimental results?" It can also inspire students to carry out knowledge transfer by thinking about the reasons for the small experimental results familiar to learners. For example, the teacher inspires students to ask "What are the reasons for the small experimental results of measuring the volume of 1mol of gas? Are there similar reasons for measuring oxygen levels in the air?" In the process of asking questions, educational event evolutionary graphs trigger learners' analogical thinking of knowledge.

The Challenges of Educational Event Evolutionary Graphs

Event Evolutionary Graphs can be applied in many aspects in education, but it also faces many challenges, including:

1) The construction of Event Evolutionary Graphs

In the process of constructing Event Evolutionary Graphs, the key technologies such as event identification and extraction, event relation extraction and event generalization are all related to the better application of event graph in education.

2) Knowledge verification.

The quality of knowledge should be taken into account when constructing the Educational Event Evolutionary Graphs. The satisfied services provided by the Event Evolutionary Graphs are based on the high-quality of graphs.

3.The integration of Educational Event Evolutionary Graphs.

The integration of Educational Event Evolutionary Graphs includes the integration of Educational Event Evolutionary Graphs from different data sources, as well as the integration Educational Event Evolutionary Graphs and knowledge graphs. All of these need constant improvement of technical level to play a better role in education.

Conclusion

In this paper, based on the similarity of knowledge graphs in education and educational event evolutionary graphs, literature analysis method is adopted to conduct the construction of event evolutionary graph. Meanwhile, case study method is applied to obtain the applications of educational event evolutionary graphs. The challenges of educational event evolutionary graphs are also discussed in this paper.

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Research Trends on Cognitive Load Theory in Korea

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Abstract: The purpose of this study was to investigate research trends on cognitive load theory in Korea. To achieve the purpose, following research questions have been established. First, what is the subject of researches related to cognitive load theory in Korea? Second, what is the trend on keywords in researches related to cognitive load theory in Korea? Third, what is the topic of researches related to cognitive load theory in Korea?

For this study, 97 papers that listed in Korea Citation Index from 1991 to 2018 were analyzed. The papers were selected by the keywords 'cognitive load in education' and 'instructional presentation strategy' and so on through 'RISS', 'KISS' and 'Google Scholar'.

The results of this study were as follows. First, the subjects of research were mostly undergraduate students and elementary school students. Second, cognitive load, working memory, cognitive load theory and e-book were addressed as the main keywords of cognitive load theory. Third, the topics of research were mostly about cognitive load theory, learning data presentation method and working memory. The result of this study provides basic data for eliciting a future research topic.

Key words: research trends, cognitive load, cognitive load theory, korea research trends

INTRODUCTION

The information processing process of the human brain has limitations into learning complex problem solving ability due to the limitation of the working memory (Sweller, 1988). Cognitive load theory emerged from an interest to develop effective teaching-learning conditions and environments in order to overcome the limitations of human working memory capacity (Renkl & Atkinson, 2003). When a learner gets new information, the information is processed in the working memory. At this time, it is called the cognitive load for learner to recognize cognitive burden in processing the information (Sweller, 1988).

In Korea, research related to cognitive load began in the late 1980s. Since 1990s, research related to hypermedia in education has begun with various measures (Eom, 1999; Kim, 1994; Ko, 1993). Then relevant studies appeared when the web-based or multimedia technologies began to be applied to learning (Kim, Sin, Ahn, Eom, & Delyne, 1998; Oh & Jin, 2004; Oh & Kim, 2003).

As a result of the improvement of multimedia technology, learners have increased their opportunities to learn with various multimedia, such as flash, video, tablet pc and digital textbook. It leads research that can express the impact of multimedia data on how a learner learns in terms of the cognitive load theory (Jung & Kim, 2012; Jin & Oh, 2003; Kim, 2005; Kim & Kim, 2004; Lee, 2005; Park & Kwon, 2010; Ryu, 2010). Recently, there has been a lot of research on cognitive load theory with regard to complex tasks and cooperative learning (Joo, Nha, & Kim, 2017; Kim, 2015; Lee & Kim, 2016; Si, 2016).

Cognitive load theory provides important guidelines for the design of learning materials using multimedia (Ryu, 2011). Successful multimedia learning requires that one consider the limitations of learners' working memory capacity (Jin & Oh, 2003). In other words, it is important to minimize any unnecessary cognitive load on learners by adjusting screen design, menu provision methods, learning data presentation methods, and learning data presentation timing. It says that research on cognitive load theory should precede for the efficient learning with multimedia such as digital textbooks or smart pads. Therefore, for successful multimedia learning to occur, it is an important to look at the advanced research related to cognitive load theory published to date. Nevertheless, the current research trend analysis related to cognitive load theory is insufficient.

Therefore, the purpose of this study was to explore trends in studies related to cognitive load published in Korea. To achieve this purpose, the following research questions have been established. First, what is the subject of the research related to cognitive load theory? Second, what is the trend on keywords in the studies related to cognitive load theory? Third, what is the topic of research on cognitive load?

RESEARCH METHODS

This study was conducted by analyzing various research related to cognitive load theory published from January 1991 to May 31, 2019. Specifically, the analysis was conducted on research published in academic journals in Korea. The data were selected according to the authority, power, and relevance criteria of Hart (2008). First, the analysis targets were collected through academic databases such as ‘RISS’, ‘KISS’, and ‘Google Scholar’. Keywords such as

'cognitive load', 'cognitive load theory' and 'instructional presentation strategy' were used for searching. Furthermore, the keyword 'education' was included in the search to clearly select the research to be analyzed. From the results, 7,782 papers were selected as the first to be analyzed. Second, the research was selected as the second based on the KCI's listing and candidate sites for registration, which reflect expert's strict verification. As a result, 135 papers were selected for analysis. Third, the criteria was modified and supplemented after reviewing to educational technology experts to verify the validity of the literature analysis criteria. The experts consisted of one professor and two doctors in educational technology. The results of these experts' reviews led to 110 papers being selected for analysis, excluding research that is not directly related to cognitive load in education such as those relating to 'leadership' and 'driver'. Fourth, 97 papers that have subjects were selected for the final analysis. Through this process, the final selected papers for the analysis were 95 papers from the list and 2 papers from the list of candidates.

The purpose of research trend analysis is to identify trends in studies in sub-disciplinary areas or specific topics and exploring future developments based on them (Chang, Park, & Koh, 2013). Content analysis, which is mainly used in research trends analysis studies, is a method used to classify the data to be analyzed based on a particular word or category, and then derive uniformity from it (Ryu, Lim, Yoon, & Jeong, 2016). Furthermore, the content analysis is a research method that describes communication expressed in language or text objectively, systematically, and quantitatively (Berelson, 1952). This method of content analysis is meaningful because it allows objective and quantitative data to be analyzed as a way to obtain quantitative data from data expressed in languages or letters (Chu, 2005). The content analysis method has increased its usability in research trend analysis due to the advantage that it can systematically analyze advanced studies and then present the results in a clear way (Moon, 1993; Ryu, et al., 2016). Therefore, the content analysis method was used for the comprehensive and systematic analysis of research related to cognitive load in this study.

In this study, the selected study was analyzed by modifying and supplementing the steps of the content analysis method presented by Hong & Jeong (2014). The steps of the content analysis method are as follows. First, establish a research question or hypothesis. Second, collect the messages to analyze. Third, determine the analysis nomenclature and the unit of analysis. Fourth, carry out the actual content analysis. Fifth, carry out the statistical processing of the analysis results. Sixth, interpret the statistical results.

The content analysis steps in this study were as follows. First, research questions were established to analyze trends in research related to cognitive load in education from various perspectives in accordance with the procedures of the content analysis method. Second, the analysis targets were selected among Korean academic journals on cognitive load in education. Third, the analysis framework was developed, including by years, keywords, targets, and listing or not, and it was reviewed by experts. Fourth, the coding sheet was developed based on the developed analysis frame, and the coding of 97 selected papers was carried out. Fifth, the coding data were analyzed, and the results were statisticalized. Sixth, based on the results of statistical processing, the results were interpreted through consultation among researchers.

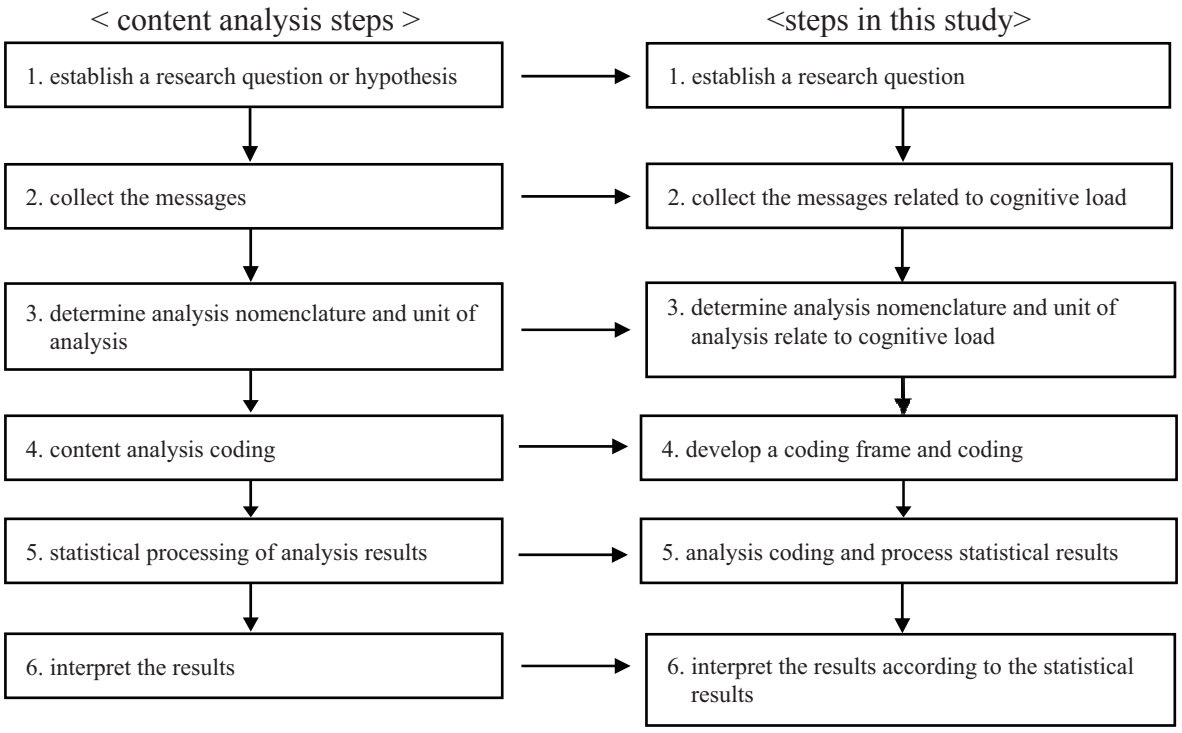


figure 1. research steps

RESULTS

Among the 97 final selected papers, three research that have various groups of subjects were analyzed in duplicate. The results of the analysis of research subjects are shown in <Table 1>. According to the results, undergraduate students were selected at the most (58%), followed by elementary students (22%), middle school students (9%), high school students (5%), adults (5%), and graduate students (1%).

< Table 1> **Results of the analysis of the subjects of study** **(N=100)**

Index	The number of papers	Percentage
undergraduate students	58	58.0%
elementary students	22	22.0%
middle school students	9	9.0%
high school students	5	5.0%
adults	5	5.0%
graduate students	1	1.0%
Total	100	100.0%

Keywords presented in the abstracts of the research were analyzed to look at the research trends by keywords related to cognitive load. The analysis results are shown in <Table 2>. According to the analysis of the keywords presented, 'cognitive load' was mentioned the most at 53 times, followed by 'working memory' at 22 times. Further, 'cognitive load theory', 'e-book' and 'contiguity principle' were mentioned a lot as well, and they played a complex role with the various factors related to cognitive load.

< Table 2> **Results of research trends by keywords**

Rank	Frequency	%	Keywords
1	53	11.6	cognitive load
2	22	4.8	working memory
3	20	4.4	cognitive load theory
4	12	2.6	e-book
5	8	1.8	contiguity principle
6	7	1.5	academic achievement, hypertext
7	6	1.3	teaching efficiency, learning data presentation method
8	5	1.0	meta cognitive, cooperative learning, GSR, multimedia learning
9	4	0.9	multimedia, eye tracking, metal, central processing unit, e-learning,reading learning, hypermedia
10	3	0.7	teaching design, advanced organizer, mental model, text length,cognitive load measurement, multimedia design, schema, navigation tool, 4C/ID model, learning agent

(Continue to next page)

<Table 2> **Results of research trends by keywords (continue)**

Rank	Frequency	%	Keywords
11	2	0.4	spatial contiguity proximity principle, task difficulty, task special
12	1	0.2	self-efficiency, graphic organization, internal motivation, college education, meta-cognitive regulation, flow, disorientation, looking, prior knowledge, speed type, visual cues, visual aids, practical tasks, animations, cognitive overload, self-regulating learning, self-efficiency, working memory load dispersion effect, consistency, support information, progress control method, learning load, Korean speech standard speed, cooperative learning, cooperative load, screen segmentation effect, type of exercise practice, external cognitive load, expertise effect, self-directed learning, presentation method of flipped learning prior data, overall task presentation, information presentation type, dual-coding, cognitive belief, expertise level, cognitive effort, cognitive function, motivation, English learning, complex task, multimedia learning theory conceptual diagram, personalization text, product-oriented approach, path analysis, higher education, higher thinking ability, open educational resource, shared cognitive, process approach, task difficulty awareness, task motivation, task performance, task type, scientific argument activity, science learning, interactive cognitive load, teaching-learning strategy, teaching presence, concrete operation period, drawing and writing, drawing division presentation, grounded theory, navigation structure, intrinsic cognitive load, argument activity level, height concept, eye movement, multi-text, short-answer type, tool development, pupil size, motivated message, mind map, multimedia assisted learning, multimedia effect, meta cognitive prompt, mobile learning, motion graphics, flow virtual reality, dance appreciation, practice type, problem resolution process, problem solving ability, aesthetic

			experience, sensitivity analysis, reaction time, deployment, complex problem solving, essential cognitive load, partial task sequencing, partial task exercise, fragmentation, non-structural complex task, non-essential cognitive load, usability evaluation, prior recognition function, pre-training, illustration, interaction effect, situation model, physiological signal, productive failure, generative lecture, generative learning, descriptive answer, design strategy, mathematical word system, math anxiety, math self-concept, mathematical pattern, performance load, performance efficiency, scaffolding, visual information, time-compression speech, test effect, practical task, language information, episode buffer, error memory, online education video, online learning, web navigation, semanticmap, anthropomorphic perception, understanding, cognitive meta cognitive support, cognitive load factors, subjective survey scale of cognitive load, cognitive support tools, cognitive learning ability, cognitive efficiency, withdrawal practice, temporary information effect, natural selection, potential average comparison, recognition, information integration, metal model shape, mental efficiency, split attention effect, attention, augmented reality, intelligence type, knowledge gap, vocational training, vocational training teaching-learning model, inference, computational thinking ability, coaching, teddy bear, reasoning, computational thinking, retention, retention and transfer test, assessment load, fall-down menu, representation and solution eliciting, lexical information processing, projects, prototype development, lack of reading, learning analysis, learning efficiency, learner awareness, learner-centered content design, learner characteristics, learning strategies, learning efficiency, function areas, resolved example effects, cooperative mechanisms, screen composition, screen design principles, efficacy, DRM procedures, e-learning content types,
Total	451	100.0	learning by imagining, PBL, PDA-based learning program, physiological signal, spit-attention, subject scale, verbal, visual

The results of the analysis of the topics related to cognitive load are shown in <Table 3>. In this study, the topics related to cognitive load were divided into 21 detailed areas in line with the coding sheet reviewed by experts. Specific areas of detail are cognitive load theory, multimedia learning, eye tracking, learning data presentation method, task type, hypermedia/text, working memory, learner characteristics, academic characteristics, prior knowledge, meta cognitive, self-directed learning, teaching-learning design, mental model, e-learning, e-book, motivation, flow, virtual reality, cooperative learning and self-efficiency.

The results of analyzing the research topics related to cognitive load are as follows. First, in 1991 to 1995, a study was conducted on the topic of cognitive load theory and hypermedia/text. Second, in 1996 to 2000, the largest number of studies on hypermedia/text were found, which was an increase from the work done in 1991 to 1995. At this time, meta cognitive, learning data presentation methods were followed. Third, in 2001 to 2005, the research on working memory was the most common and saw a significant increase from previous years. Studies here were shown following the learning data presentation method, cognitive load theory, and hypermedia/

text order. Fourth, in 2006 to 2010, research was shown in the order of cognitive load theory, learning data presentation method and working memory. Fifth, in 2011 to 2015, studies were mostly conducted on the cognitive load theory, learning data presentation method, and working memory, similar to the period of 2006 to 2010. There was also an increase in research done about e-books and a rise in researches about cooperative learning. Sixth, there was a lot of research made on the cognitive load theory, learning data presentation method in 2016 to 2019.

<Table 3> **Results of topic analysis of research**

Index	1991-1995	1996-2000	2001-2005	2006-2010	2011-2015	2016-2019	Total
cognitive load theory	2	0	8	35	31	24	100(23.8%)
multimedia learning	0	1	4	4	6	6	21(5.0%)
eye tracking	0	0	1	0	7	3	11(2.6%)
pr learning data od esentation meth	0	3	11	21	27	17	79(18.8%)
task type	0	0	2	2	8	7	19(4.5%)
hypermedia/text	2	5	8	1	2	0	18(4.3%)
working memory	0	2	17	9	7	1	36(8.6%)
learner characteristics	0	0	4	3	1	6	14(3.3%)
academic achievement	0	2	2	2	2	4	12(2.9%)
prior knowledge	0	1	1	4	2	2	10(2.3%)
meta cognitive	0	4	8	2	3	0	17(4.0%)
self-directed learning	0	0	1	0	0	3	4(1.0%)
teaching-learning design	0	1	3	4	4	6	18(4.3%)
mental model	0	0	1	2	1	0	4(1.0%)
e-learning	0	0	0	2	1	5	8(1.9%)
e-book	0	0	0	1	11	0	12(2.9%)
motivation	0	0	0	2	4	4	10(2.3%)
flow	0	0	0	1	1	0	2(0.5%)
virtual reality	0	0	0	0	2	6	8(1.9%)
cooperative learning	0	0	0	0	10	2	12(2.9%)
self-efficiency	0	0	0	0	4	1	5(1.2%)
Total	4 (0.9%)	19 (4.5%)	71 (16.9%)	95 (22.7%)	134 (31.9%)	97 (23.1%)	420 (100.0%)

CONCLUSION

According to the results of the subject analysis, the research was mainly conducted with undergraduate students. The reason for this is that compared with other test subjects, researchers can better compare and analyze results by applying different variables to undergraduate students because of the varying degree of prior knowledge retention.

In keywords trend of cognitive load, there are such prevalent keywords such as cognitive load, working memory, cognitive load theory, e-book, contiguity principle, etc. In spite of the importance of prior knowledge in advanced research, the number of its keywords was found to be small. According to a study by Kalyuga (2009), the effectiveness of the instructional design based on the cognitive load theory may vary depending on the learners' level of expertise. This is because the degree of cognitive load may vary depending on the degree of prior knowledge the learners have. Also, the levels of intrinsic cognitive load can be perceived differently

depending on learners' prior knowledge (Schnotz & Kürschner, 2007). Van Gogg and Paas (2008) pointed out that cognitive loads may vary depending on the degree of the learner's knowledge or expertise. Based on these, it is suggested that researches related to prior knowledge is necessary under the cognitive load theory.

In topic trend of cognitive load, many studies on cognitive load, learning data presentation methods, multimedia learning, and working memory were conducted. Specific features include: First, research related to cognitive load had started since the early 1990s and has since been conducted in earnest in 2000. Second, hypermedia and hypertext were the main components in the early and mid-1990s, and studies related to learning through various multimedia bases such as e-learning, e-books and virtual reality have been appearing since 2000. This is attributed to the increase in various multimedia-based learning as the use of computers has spread in earnest in the field of education since the 2000s. Furthermore, research on e-books was the most active from 2011 to 2015. This is because the Ministry of Education, Science and Technology (2011) has adopted digital textbooks as a new teaching-learning material, increasing the educational use of e-books. Also, from this time on, there has been a lot of research related to cooperative leaning. This is inferred to be the effect of the advanced study results that cooperative learning is effective in reducing the cognitive load on learners and in successfully carrying out learning tasks (Kirschner, Pass, & Kirschner, 2011; Si, 2016).

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Research on the construction and application of Smart classroom teaching model based on educational big data

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Abstract: With the advent of the era of educational informationization 2.0, the informationization teaching environment of primary and secondary schools has been greatly improved. With the continuous integration of information technology and classroom teaching, the traditional classroom teaching mode gradually turns to Smart classroom teaching, creating good conditions for data collection, analysis and utilization of teaching and learning behaviors in the teaching process. Big data in education is an important product of smart classroom, which can profoundly influence front-line classroom teaching and positively intervene teachers' teaching and students' learning process. On this basis, based on the real needs of current primary and secondary school classrooms, this study proposes a smart classroom teaching model based on educational big data, analyzes the advantages and disadvantages of current primary and secondary schools in the process of applying educational big data, and hopes to provide reference and guidance for the optimization and reform of smart classroom teaching in the era of big data.

Key words: Big data, smart classroom, classroom model, class example sharing

INTRODUCTION

With the advent of the era of education informatization 2.0, intelligent education has been formally incorporated into the strategic system of national education informatization development. [1]Intelligent education is the product of continuous integration of information technology and education, and Smart classroom is the basic unit of intelligent education, as well as the main front and main channel of front-line teaching. [2]Smart classroom has a perfect information environment, which provides a guarantee for the collection and analysis of educational data. Although different scholars have different views on smart classroom, most scholars' discussions on the characteristics and connotation of smart classroom mainly focus on the following aspects: first, smart classroom has the characteristics of openness, sharing, integration and interaction[3]; Second, a large amount of process data is generated and recorded in the Smart classroom teaching, which can provide data support for precise and personalized

[1] Foundation project: based on "DIGITAL READING ENVIRONMENT CONSTRUCTION AND APPLICATION FOR BEHAVIORAL DATA ACQUISITION AND ANALYSIS" project of integrated innovation youth project of education informatization application in 2019 in Guangdong province.

teaching.

In 2012, the United Nations released a white paper titled "big data for development: challenges and opportunities", which pointed out that "the era of big data has come, and the emergence of big data will have a profound impact on all sectors of society." In the same year, the United States department of education released "promoting teaching and learning through educational data mining and learning analysis." [4]It is not hard to see that big data has exerted a profound influence on the education system, and data is constantly promoting the innovation and reform of education mode. However, in a smart classroom environment, what teaching links can big data influence and promote? What limitations exist in the application of big data in education? What's the potential value of big data in education? These problems are of great practical significance to front-line teaching and will be discussed in this paper.

RESEARCH DESIGN & METHODS

1. Smart classroom teaching model based on educational big data

At present, the classroom of primary and secondary schools still has problems of patternization and staticness. Classroom interaction is often "dynamic" for teachers and "motionless" for students. It is difficult for students to achieve personalized teaching according to different levels, and teaching students in accordance with their aptitude can only become a fantasy in the current classroom. [5] In addition, it is difficult for traditional classrooms to retain data of classroom teaching process and share classroom contents quickly. Class time and place are relatively fixed, and the value of class is mainly reflected in the specified 45 minutes, which has not been deeply explored. But wisdom class to provide an opportunity to solve the problems existing in the traditional classroom, the wise generated a lot of teaching behavior in classroom teaching and learning behavior process data, through the data mining analysis, accurate grasp the students' learning and teachers' teaching effect, so as to study influence factors analysis, leading to targeted improvement strategy of teaching. Through in-depth information construction of primary and secondary school education and constant exploration and practice, a set of smart classroom teaching mode of message education big data is preliminarily summarized, as shown in figure 1.

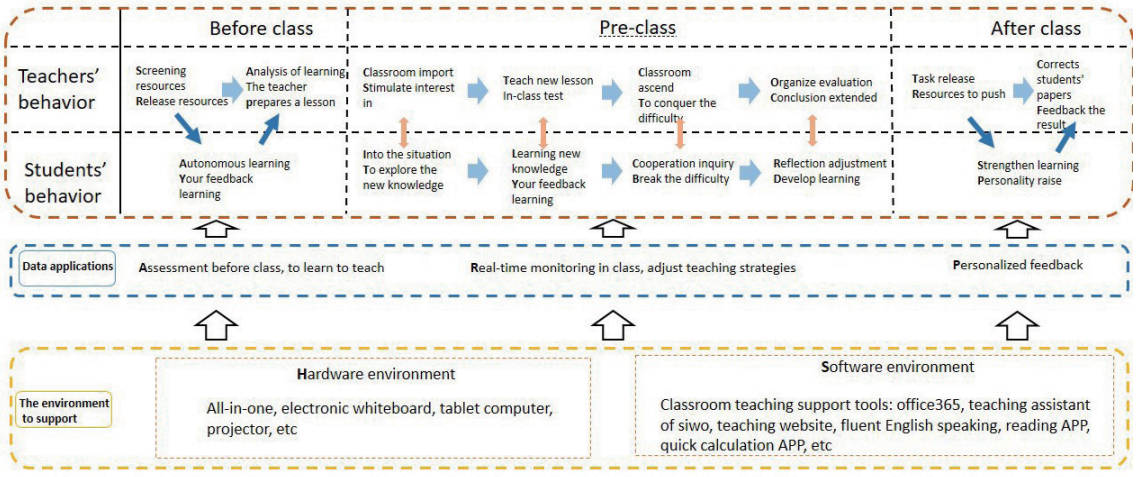


fig 1

First of all, the teaching mode of smart classroom based on educational big data must have a certain software and hardware basis. Traditional classroom teaching tools are single, mainly using chalk, blackboard and paper materials, so it is difficult to achieve the retention of teaching process data. The implementation of smart classroom is based on cloud computing technology and adopts "cloud + end" service mode to deploy and apply the information platform of smart classroom. At the present stage, primary and secondary schools have complete hardware foundation, especially in primary and secondary school cities. Basic equipment such as teaching tablet, interactive all-in-one machine and projection are relatively perfect, so they have the hardware foundation to retain big data of education. The software environment is further improved in the hardware environment. Depending on different software platforms, the corresponding data collected by primary and secondary school teachers can be helped to provide support for the classroom.

Secondly, appropriate application strategies of big data in education should be developed to truly integrate with the classroom. The efficient interactive classroom constructed by big data in classroom teaching has the characteristics of data pulse control, omni-directional interaction, accurate feedback and light negative and high quality, which can achieve the teaching goal of "low cost, high efficiency, light negative and high quality". Big data time frame this study proposed the wisdom of the classroom teaching mode based on the education of the big data mainly for education before, class, after class big data: how to combine teaching process before class, through data pulse, help teachers to detect learning, targeted teaching strategy; In class, teachers can conduct real-time detection on students, collect, analyze and share data, enhance the interaction between teachers and students, improve classroom efficiency and timely adjust the classroom progress. After class, students at different levels can receive personalized feedback or push resources to achieve hierarchical teaching.

Finally, classroom data is the core content of educational big data, and the application of educational big data should also return to the classroom. Combining with the teaching of primary and secondary schools, respectively from the Angle of teachers' teaching and students learning, further influence how the data interpretation of the education teaching process: before class, teachers can screening high quality resources, including the class, the related video, courseware, etc., based on the wisdom of classroom information technology platform, release to students, students autonomous learning, feedback and learning situation, through the analysis of the data of feedback to teachers, to carry out the preparation, and ready to in-class test questions in advance; In class, data is mainly used to improve the efficiency of real-time detection. Through the visualization of data analysis diagrams, teachers and students can find the existing problems, solve the weak knowledge points, and promote the continuous optimization and adjustment of teachers and students. After class, according to the learning effect of students in class, teachers push tasks or resources to students in different levels, so that students can get personalized improvement, students complete the task, and teachers feedback the correcting results after correcting. Take figure 2 as an example. On the left are the questions students need to fill in, and on the right are the feedback they get.



fig 2

2. Advantages and limitations in the application of big data in education

(1)Advantages in the application of big data in education

a. Accurately judge the learning situation

Understanding students' learning conditions is a prerequisite for teachers to carry out teaching design accurately. However, in traditional classrooms, it is difficult for teachers to obtain students' learning conditions before preparing teaching design. Some teachers with long teaching age mainly judge students' learning situation according to their completion of homework. Or according to their previous teaching experience to prepare teaching design. We have to admit that, according to the past teaching experience or student the day's work situation is able to judge the students' learning, but teachers have no scientific data as support, there is no way to accurately judge the students ahead of time for each knowledge point, or students for different knowledge, grasp the extent of what are the differences. However, in the smart classroom environment based on educational big data, teachers and students can log in relevant information platforms or some apps that support teaching. Teachers can use these platforms or apps to assign some preview tasks, and ask students to complete the preview tasks, and then feed back the preview results to teachers through the platform or APP. The platform or APP will help teachers to analyze students' answers automatically, so that teachers can understand students' understanding of each knowledge point, so that teachers can prepare lessons more purposefully.

b. Real-time classroom interaction between teachers and students

The interaction between teachers and students can help students quickly integrate into the classroom, and the effective interaction can also help students to grasp new knowledge more firmly. Good and effective interaction between teachers and students can also help teachers

understand students' mastery of new knowledge and test the effect of students' classes. However, in the traditional classroom, the interaction between teachers and students is usually the teacher's questions corresponding to students' answers. This question-and-answer form cannot comprehensively cover all students in the whole class, and the teaching effect detected is not comprehensive, real and objective, so it cannot represent the learning situation of the whole class. In the intelligent classroom environment, teachers can publish the test content on the information technology platform through the information technology platform. After students log in to the platform, they will answer the questions and click the submit button after completing the answers. Then, the teacher can see the students' answers, and share the answers with all the students. The teacher can adjust the next teaching strategy according to the results of the students' answers. Obviously, in a smart classroom environment, real-time classroom interaction can help teachers and students find their own problems in time, optimize teaching strategies and modify learning methods in time.

c. Promote personalized learning

The great educator Confucius once said, "teaching students in accordance with their aptitude", which is an ideal state, and also a state that every teacher expects to reach. However, due to China's national conditions, the number of students is large while the number of teachers is small. Usually, one teacher needs to face at least 40 students. Therefore, it is impossible for teachers to achieve personalized tutoring. In addition, because each child has different prior levels, they should accept different knowledge. In the traditional classroom, these problems are difficult to solve. In the wisdom of classroom environment, each student's learning behavior data were recorded, the system can carry on the corresponding according to each student's learning resources to push, at the same time, teachers can also according to different students of different learning levels of learning tasks, targeted to promote student learning, to better the students' learning situation.

d. Enhance classroom value

In the traditional classroom environment, students can only complete corresponding courses in a fixed place in the school. Each class lasts for 45 minutes, during which each student should carefully listen to the lecture. Students cannot repeat the process of watching the teacher's explanation, nor can they share other students' notes. Obviously, this kind of learning is closed. In the wisdom of classroom environment, students and teachers will have its own tablet computer, log on to the same teaching system in the process of class, the class process, the system will keep the classroom teaching and students' learning data, after class, teachers can share this lesson through the information technology platform of teaching content, students' notes, etc., so that the school fixed course become more open, so that the class value from the inside to the outside of the campus, campus let each lesson can play a greater value.

(2) Limitation in the application of big data in education

a. Data between different platforms is closed

At present, a large number of information technology platforms or apps flood into the campus, but these platforms or apps have different data management centers and data analysis methods. However, information platforms or apps are not related to each other, and data are like islands,

which cannot form comprehensive education big data. At present, due to technical barriers between manufacturers, it is difficult for primary and secondary schools to form their own education big data system, which also leads to the inability to comprehensively and deeply analyze students.

b. Hardware facilities are limited

In recent years, the eyesight of primary and secondary school students has been declining year by year, which has also aroused concerns from all walks of life. Therefore, careful use of electronic equipment and refusal of electronic equipment to enter the campus have put a bottleneck on the construction and development of smart classroom in China, and it is difficult for big data in education to exert its potential value. Although many primary and secondary schools have built smart classrooms and equipped students with tablet computers, they can only be used on campus, and students cannot take them out of class. Without hardware support, it is difficult for students to realize personalized learning. Due to these limitations, it is difficult for ordinary primary and secondary schools to carry out intelligent classroom teaching in a large scale and exert the value of big data in education.

RESULTS

From the perspective of using educational big data to promote teaching in primary and secondary schools, this paper constructs an Smart classroom teaching model based on educational big data, and elaborates on the model. Finally, it analyzes the advantages and disadvantages existing in the application process of educational big data.

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A programming lesson method using both flowchart and scratch

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Abstract: This research is about a programming lesson method that simultaneously using flowchart and scratch. In recent years, people's interest in programming education has increased, and visual programming such as scratching has become the mainstream of programming introduction. On the other hand, flowchart have been used as a problem solver for a long time. Comparing flowchart with scratch, flowchart can reduce the motivation to learn, but it is also effective in improving problem-solving thinking ability, which is highly versatile. Conversely, scratch has an effect of improving learning motivation or is less versatile. So we designed scratch as the main teaching material, using a flowchart diagram and similar parts of scratch, and devising a teaching method that teaches both simultaneously.

Key words: Programming Education, Flowchart, Scratch, Motivation, Logic Thinking

INTRODUCTION

To training programming talents, most countries are promoting on programming education from middle childhood. With the revision of the guidelines for educational guidance in 2020, Japan came to implement elementary school programming education (Ministry of Education 2017). The Chinese government also plan to build an artificial intelligence course from the elementary school to junior school, which was announced in "Notice of the new generation of artificial intelligence development plan" at 2017 and submitted an opinion to expand programming education (China Government 2017) .Britain already established programming education subjects "Computing" at elementary school since 2014 (Ministry of Education 2014).

One of the most popular languages for programming for children in recent years is scratch. Scratch has features such as primarily event-driven, object-oriented programming, visual language, don't require syntax, and can custom blocks (Scratch wiki). Scratch has been used worldwide to teach algorithm and students to different age from primary school to college (Maloney et al., 2010).

Flowchart, which use graphics to represent algorithms and processes, have long been one of the ways to learn programming thinking. However, used flowchart to programming is more difficult to than visual programming language (Daniela G, Francesco M 2015), learning motivation is

reduced (Osman E, Adile A K 2017) and other problems. Therefore, it is not suitable for teaching children to programming.

The first author has participated programming class which is using scratch in Japanese elementary school 10 times as an assistant in 2018. At that time, author saw some situations well.

- Children never learn about programming logic, so they aren't good at making their thoughts into a procedure.
- Children can't understand the meaning of the order of blocks, connect the blocks in the order different from the example, and I can't understand the cause even if the result is wrong.
- Children can't introduce their work to other children as well.
- Hagiwara Yoshihiko (2007) pointed out that the meaning of creating Flowchart in problem solving is the following three.
- To make the process of solve problems clearly by visualized.
- Easy to tracked the process. Therefore, when there is a problem with the process, it becomes easy to find and correct it.
- Helping to clarify issues when solve a problem with a group, and improve understanding when explaining the process and idea.

Taking advantage of the above characteristics of flowchart, author thought that flowchart might be a means to solve some problems in the early stage of learning scratch, and devised a method for assisting learning scratch by using flowchart.

RESEARCH DESIGN & METHODS

Using flowchart in the scratch lesson is not want children learning about rule of flowchart or how to draw a flowchart accurate. The purpose is let children make the process clearly by visualized there thinking into a picture step by step just like Figure 1.

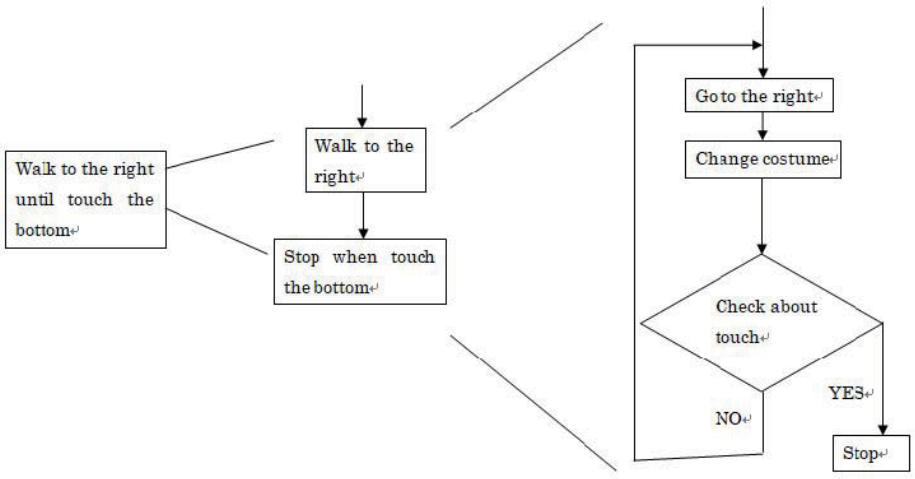


Figure1.Visualized the thinking and become to flowchart

First step, find what action will be take and make they in order. Second step, let children know what command/block they have, and thinking how to use the command to let the character do

the actions. In this way, children can clearly see how many steps are they need, and the arrows will show them what they need to do next.

When comparing Scratch and flowchart parts, you can see that the shapes of the basic parts are similar like Table 1. By using this to make children recognize, I guess that after understanding the flowchart, it may be easier to make the program with scratch. Furthermore, if the program does not work as expected, referring to the flowchart, it is easy to find problems from motion errors. Especially for beginners like a child, it is easy to confuse about repeat the operation from where to where, but it may made easier to understand with the flow chart.

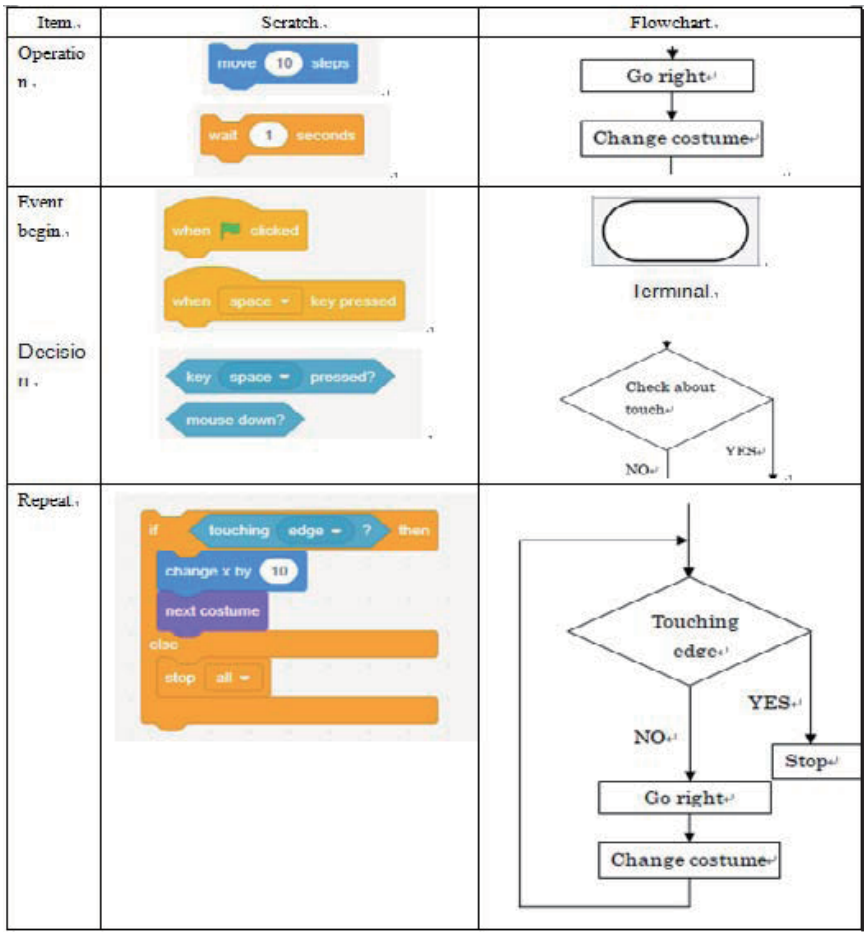


Table1.compare the parts between scratch and flowchart

When children introduce their program to others, make a program in a group, they can use flowchart to make exchanging ideas and share their thinking with other children be easier.

CONCLUSIONS

This teaching method plan to practice at next month, and will measure the effect.

As a prediction, flowchart can be used as an assistant tool for learning scratch to eliminate the reduction effect of learning motivation. When creating a program with Scratch, flowchart can help program configuration. Furthermore, the synergy of learning can improve the understanding and programming ability of flowchart and scratch. By visualizing and proceduralize ideas, awareness of logical thinking can also be improved. Being accustomed to representing ideas with figures may also be useful when learning decision tree parts of artificial intelligence in the future.

In order to measure the effectiveness of this teaching method, using the questionnaire from an objective evaluation of the computer programming education using the SIEM(Dohi Shinichi et al., 2004)

to measure motivation. Using the questionnaire from The impact of critical thinking attitudes on the conclusion derivation process(Hirayama Miru, Kusumi Takashi 2004) to measure Awareness of logical thinking. Record the programming process and results and analyze changes in programming ability. Finally, after analyzing the results of measurement, consider improvement plans for teaching methods.

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08

Chapter 8:

Data-based Learning Interventions and Learning Analytic

Design and application research of cognitive learning RM2A model for STEM project based on the gesture-based technology

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Abstract: Virtual Reality (VR) is the link between real world and virtual environment by human movement interact with machine. As a core interactive method of VR, the Gesture-based Technology (GBT) can provide a good reason for teachers and students to let them interact with teaching and learning resources. Under the literature review of GBT and STEM education, this research has designed a RM2A cognitive learning model based on the GBT for a STEM practical projec. The RM2A model include four cognitive learning pathway that "Rote learning to assimilation (RA1)", "Rote learning to accommodation (RA2)", "Meaningful learning to assimilation (MA1)", "Meaningful learning to accommodation (MA2)", which are with the elements of assimilation, accommodation, rote learning, and meaningful learning. To evaluate the RM2A's effect for students, a STEM project empirical study has been taken in an O state university of America. After the data analysis and discussion process, the RM2A model of GBT lead students' development of self-learning, collaborative learning, problem-solving, and creativity development. Finally, this research will provide people who focus on VR and GBT's educational implementation, the better understand to link between VR resources and students' learning.

Key words: Gesture-based technology, RM2A model, STEM education, Cognitive learning

1. Background

Virtual Reality (VR) is the link between real world and virtual environment by human movement interact with machine. The cognitive learning process is very important for students' cognitive development. Based on the relative VR technology, the cognitive learning is a kind of conception change process that people can use their senses to learn, such as visual, auditory, kinesthetic (Chen C., P., 2015)[1]. However, the method how to use VR to integrate with the process of classroom teaching is a problem about technology and this also is a problem about teaching and learning.

The Ministry of Education of China put forward the "13th Five-Year Plan of Education Informatization", which mentioned that "the situation that people hard to entry, hard to see, hard to move, and hard to reproduce are the core issues that hard to solve" [2]. It can be found that the Ministry of Education has begun to pay attention to this issue because the traditional knowledge transfer way and learning methods are too old and lack of interactivity can promote the characteristics of students' deep construction. GBT can promote the application of virtual

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interactive materials in experimental and demonstration courses, and to develop new methods and teaching such as virtual lesson preparation, virtual teaching, virtual exams, etc. it can be seen that the GBT support virtual environment can solve the above traditional classroom's problem.

For framework to integrate GBT into classroom teaching, STEM education is a multi-disciplinary teaching and learning concept[3]. The research of project-based learning (PBL) process based on the GBT can develop students' cognitive learning under the GBT's STEM.This process can fulfill the demand of China or even to the world to let ICT integrate with education. Therefore, the research of STEM practical project based on the GBT has important theoretical and practical value.

2. Literature review

2.1 Gesture-based technology (GBT)

GBT is a technical realization of human-computer interaction through limb, arm, and finger movement, and it is also a new and important function of VR implementation. GBT generally interacts through inertial sensing, optical sensing, or integrated sensing[4]. The inner architecture of GBT is consists of gesture movement devices, software, real-world devices, speech recognition devices, and hand-help digital devices [5]. The equipment includes data gloves, torque balls, tactile feedback devices, force feedback devices, handheld interactive devices, etc. [6]Based on the above devices, user can choose one or more devices to implement the interactive teaching application. It provide a diverse interactive equipment for GBT, researchers generally pay attention to the teaching application of Leap Motion for with good curvature features, distance features, correlation features, and connected features (Marin G., et al., 2015). For this reason, Leap Motion is suitable applications in the situation of teaching projects related to STEM education.

2.2 STEM education

STEM education is a multi-disciplinary integration education concept that emphasizes learning practice of students. It is the abbreviation for "Science", "Technology", "Engineering", and "Mathematics", and this idea was first provided by Yakman of Virginia Tech University on the report for National Science Council (NSF) in 1990[7].

The main feature of STEM education is to carry out Project-based Learning (PBL). In the PBL process, students can use the tools of GBT to learn the knowledge of multi-disciplinary integration [8]. The STEM education has the collaboration feature [9], students can engage in

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collaborative task interaction in an open learning space, which provides a very suitable learning situation for the innovative application of GBT.

2.3 Link between STEM and GBT

The goal of STEM education is to solve real problems in the process of PBL learning[10], the multi-disciplinary migration of knowledge support by GBT can be linked with the cognitive learning of learners so that to achieve the goal of both knowledge development and cultivation of cognitive ability. The concepts such as STEAM+H[11]and STEMx[12] have been proposed to add more inspiring and supportive educational elements to STEM or STEAM education.

However, there are some problems and defects in these implementation paths. Because STEM education is a multi-disciplinary and integrated PBL process, STEM education needs more appropriate supporting learning resources. But the specific resources that can satisfy PBL and promote students' knowledge development are very scarce[13]. For this point, the application of GBT can enrich the interactive form of STEM classroom teaching by use GBT equipment or tool to support the teaching and learning practice of STEM education. The research based on GBT can link with the knowledge learning of STEM in the process of physical movement of students, which can provide a theoretical explanation for GBT to promote students' cognitive development.

2.4 STEM project support by GBT

According to the systematic characteristics of different subject knowledge, the inquiry learning model can guide students to explore. To apply GBT in the STEM teaching process, the process supported can improve the learner's ability by movement imitation, skill training, etc[14]. The process needs make best use GBT to mobilize the learner's visual and audio help teachers create multi-sensory interactive learning activities.

2.5 Research questions

Based on the literature review about GBT, STEM education and the link between STEM and GBT. The research procedure will answer the research questions as below:

- What is the GBT's function to students' cognitive development in the virtual reality environment?
- What is the teaching process for the STEM project based on the GBT and the method of hardware design, software design, and resources develop in detail?
- What is the perceived knowledge level of those who learn in the STEM project support by GBT specific to students' performance, GBT learning, GBT technology, GBT resources, self-learning, collaborative learning, problem solving, and creativity development?

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3. Cognitive learning RM2A model based on GBT

According to the research literature, this study applied GBT to classroom teaching, which is beneficial to the advantages of GBT in the teaching process. Because of the influence of GBT on learners' external body movements, students can improve the cognition through imitation and training, which means the cognitive learning strategy supported by GBT should focus on the cognitive learning process related to GBT and the influence of GBT on cognition learning.

3.1 The cognitive learning changes on two-dimension

Under the guidance of cognitive constructivism and cognitive learning research of Piaget and Ausubel, the study divides the internal changes of learners into assimilation and accommodation, and the learners' influence of external environment was divided into rote learning and meaningful learning. According to two-dimension of internal and external, the cognitive learning process includes assimilation, accommodation, rote learning, and meaningful learning.

- Assimilation is the process of learners' assimilation of knowledge. It is generally believed that knowledge assimilation happens only if the knowledge that learners learn is what he needs and is consistent with his intention to learn.
- Accommodation is the process of learners' assimilation to knowledge. The accommodation is related to the change of internal cognition, which is a process that learners achieve the goal of learning by changing their original cognition.
- Rote learning is a process that learners acquire knowledge in a specific background. The learning materials are not specific and separate from each other. The materials are not strongly related to the existing knowledge structure of learners either.
- Meaningful learning is that learning happened in the process of connecting various old and new knowledge. Learning materials can be linked with the existing cognitive system and new knowledge can be integrated into the learner's knowledge structure.

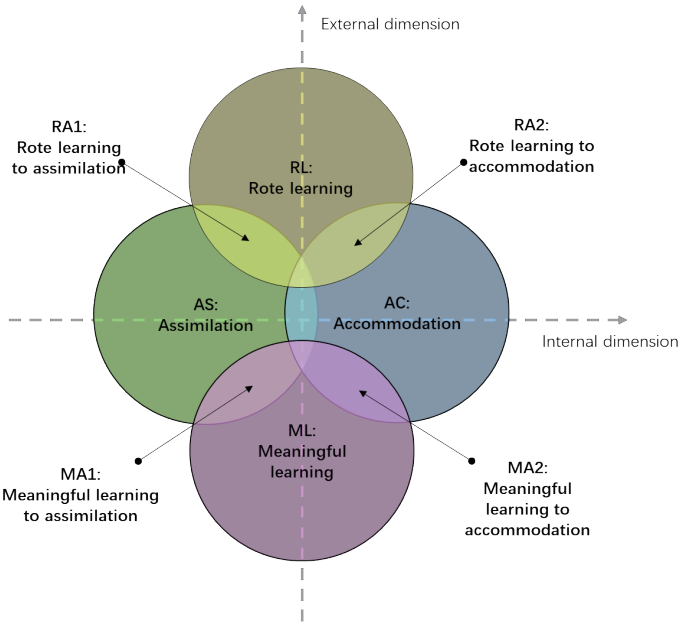


Fig. 1 The RM2A model on two cognitive dimensions

3.2 The cognitive learning strategy support by GBT

According to different interaction features cognitive changes presented at different stages and under the guidance of cognitive constructivism, the cognitive learning strategy supported by GBT come out.

- Rote learning to assimilation (RA1) is a learning strategy to assimilate knowledge by rote learning. When knowledge to be acquired is not strongly related to the existing knowledge, learners think that knowledge to be acquired is in line with their own learning intentions, which will change cognition rote learning to assimilation.
- Rote learning to accommodation (RA2) is a learning strategy to accommodate knowledge by rote learning. When knowledge to be acquired is not strongly related to existing knowledge, knowledge to be acquired can guide learners and change the internal cognitive structure of learners, which change cognition by rote learning to accommodation.
- Meaningful learning to assimilation (MA1) is a learning strategy to assimilate knowledge by meaningful learning. When knowledge to be acquired is not strongly related to the existing knowledge, learners think that the knowledge to be acquired is in line with their own intentions but this does not change their cognitive structure. Then learners will absorb knowledge.
- Meaningful learning to accommodation (MA2) is a learning strategy to accommodate knowledge by meaningful learning. When knowledge to be acquired is closely related to the existing knowledge, learners change their cognitive structure by coming knowledge and accommodate knowledge through meaningful learning.

The cognitive learning strategy supported by GBT propose four specific cognitive learning process that is not independent and change constantly.

4. Methodology

4.1 Participants

The research was taken in the “O” state university of America, and all the participants are students of scientific or technological study areas of “O” university, about percentage 67% is male and 33% of whom is female. The number of participants is 58, the control group (N=28) and the experimental group (N=30). Participants were all volunteers, and the level of knowledge about VR or GBT is close to average level.

4.2 Experiment procedure

The STEM project experiment of this research was named “Cyber Science Skill (CSS)”, which the teaching process is two weeks. The main content of the STEM project is use Leap Motion to interact with Skeletal model in virtual space. In the virtual reality environment, the Leap Motion controller can rotate, zoom and view the model to promote students’ GBT performance. In the process of teaching, there are five parts teaching activities have been taken to construct the STEM project.

Part one, the teacher will pretest the students by give them the questionnaires of the two types. Part two, the teacher gives students enough time to prepare their knowledge about GBT and

STEM project's content. This part's cognitive learning of GBT is RA2, and MA1. Part three, the teacher will continue give the teaching lesson to students at the classroom, and teacher will introduce the "Cyber Science Skull (CSS)", an app of Leap Motion and modify by research team, let students as group to work together familiar to CSS. This part's cognitive learning of GBT is RA1, and RA2.Part four is lesson of classroom, teacher will test students' performance to CSS by Leap Motion, and introduce the Form 1+ 3D printer, basic function of Form 1+, and the method to combine Leap Motion and Form 1+. This part's cognitive leaning of GBT is RA2, and MA2. For the final part, students need familiar the method of LM combine with Form 1+. The cognitive learning of GBT is MA1, and MA2.

Time	"Cyber Science Skull (CSS) " of Leap Motion (3 weeks)				
	Part 1	Part 2	Part 3	Part 4	Part 5
Activities of Experimental Group	1. Pretest. 2. Basic function of Leap Motion.	1. Knowledge preparation. 2. Familiar to Leap Motion. 3. Collaboration through Social APP	1. Introduce the class "CSS" to students. 2. Group working for "CSS".	1. Knowledge building on "CSS". 2. Basic function of Form 1+. 3. Collaboration through Social APP.	1. Combine Leap Motion and Form 1+. 2. 3D printing the work of CSS. 3. Posttest.
Activities of Control Group			1. Introduce the class "CSS" to students.	1. Basic function of Form 1+.	1. 3D printing the work of CSS. 2. Posttest.
Equipment	Leap Motion	Leap Motion,	Leap Motion	Leap Motion & Form 1+	Leap Motion & Form 1+
O2O type	Offline	Online	Offline	O2O, Group working	O2O, Group working
Cognitive learning of GBT	RA1	RA2, MA1	RA1, RA2	RA2, MA2	MA1, MA2

Fig. 2 The teaching plan of "Cyber Science Skull (CSS)" STEM project



Fig. 3 Experimental procedure of "CSS" STEM project

4.3 Questionnaires

For the questionnaires, Gesture-based Technology Learning Scale (GBTLS) and RM2A-GBT Scale, were used in this study. Totally twenty-four items among the GBTLS and RM2A were asked, and the Likert scale for answering consisted of 1 (Strongly Disagree), 2 (Disagree), 3 (Average), 4 (Agree), and 5 (Strongly Agree). The GBTLS scale consisted 6 items which were categorized into 3 subscales. Descriptions of the three subscales are presented below:

- GBT learning (GL): assessing students' understanding and interactive process with GBT.
- GBT technology (GT): measuring the feelings of students' during use GBT's hardware and software.
- GBT resources (GR): measuring the features of interesting and expanding of Leap Motion .

The RM2A-GBT scale consisted 15 items which were categorized into 5 subscales. This scale was designed from the RM2A model and the core ability of students' 21st century skills[15] for the closely relationship between ICT and students' motivation, self-learning[16], collaborative learning[17], problem solving[18], creativity development[19], and relative e-learning skills[20]. Descriptions of the five subscales are presented below:

- RM2A-GBT use (GU): assessing students' GBT use during the RM2A model.
- RM2A-Self-learning (SL): assessing students' self-learning performance and development during the RM2A model.
- RM2A-Collaborative learning (CL): assessing students' collaborative learning performance and development during the RM2A model.
- RM2A-Problem solving (PS): assessing students' problem solving performance and development during the RM2A model.
- RM2A-Creativity development (CE): assessing students' creativity development during the RM2A model.

4.4 Data Collection Procedure

Before responding to the questionnaires, all the participants were informed of the purpose of this research. All of the volunteers were responded to the two questionnaires in an anonymous way.

4.5 Data Analysis

For the data analysis method, the IBM SPSS has been used of the function that basic descriptive statistics, reliability test, correlations analysis, and ANOVA test. The correlations and ANOVA

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analysis were used to determine the relationship among students' STEM project performance, GBT design, and the students' cognitive development support by GBT.

5. Results

5.1 Reliability

The data will be acceptable for the alpha ranging from .699 to .888 for the technology and the content of technology. (Gall, Gall, & Borg, 2003) To test the reliability and validity of the designed scale, 13 volunteers were tested with the GBTLS and RM2A scale before the experiment. Cronbach's alpha coefficient was .79 and .72 respectively by using alpha reliability coefficient test, which proved that the reliability of the two sets of questionnaires was highly acceptable.

5.2 Performance evaluation of two groups

This research will comprehensive evaluate students' performance for GBT learning process. The result of students' performance as shown in Table 1, the pretest of the two groups shown that performance of control group (Mean=2.37, SD=.995) and experimental group (Mean=2.12, SD=.968) is close to normal and no significant differences. After the experimental procedure, the posttest shown that there is a significant difference among control group (Mean=3.61, SD=.906) and experimental group (Mean=4.39, SD=.936), which indicated that the experimental group's performance is better than control group from the ideas of students, peers, and teacher/assistant. Based on the two groups' Mean and SD, the Effect Size (ES) has been taken to shown that the comparison between control group and experimental group is attain the significant differences for Cohen's d=0.847.

Table 1 Results of the students' GBT performance evaluation

	Control group (N=28)		Experimental group (N=30)	
	Mean	SD	Mean	SD
Pretest	2.37	0.995	2.12	0.968
Posttest	3.61	0.906	4.39	0.936

5.3 Descriptive statistics of GBTLS and RM2A-GBT

To evaluate the students' outcome by GBT STEM project learning process and the benefits for students' cognitive learning by GBT, the two scales of GBTLS and RM2A-GBT have been taken separately to experimental group in the ending of the STEM project period.

For the scale of GBTLS, the highest level is "GBT learning" (Mean=4.55, SD=.379). The "GBT technology" (Mean=3.91, SD=.658) and "GBT resources" (Mean=4.28, SD=.639) is quite acceptable. For the scale of RM2A-GBT, the highest levels are RM2A-GU (Mean=4.51, SD=.461), RM2A-SL (Mean=4.53, SD=.407), and RM2A-CD (Mean=4.32, SD=.564). And the sub-scales of RM2A-CL (Mean=3.87, SD=.719) and RM2A-PS (Mean=4.03, SD=.645) is a little low. That is, compare with GBT support deeper learning and development, the attitude toward GBT learning, students' self-learning, and creativity development are tend to higher.

For details of GBTLS and RM2A-GBT's results, the higher level tend to beginning phase and ending phase of RM2A. For the sub-scale of GBTLS, the highest levels are "GBT learning for understand" (Mean=4.56, SD=.558), "GBT learning for interact" (Mean=4.42, SD=.554), and "GBT resources for interesting" (Mean=4.58, SD=.649). There are some items close to average levels, include "GBT technology for hardware" (Mean=4.51, SD=.461), "GBT technology for software" (Mean=3.92, SD=.732). That is, compare with device or technology itself, the students are more interest in the interaction and understand for GBT.

Table 2 Summary of Descriptive Statistics for the scale of GBTLS and RM2A-GBT

Domain	Number of Items	Mean	SD-Standard Deviation
GL-GBT learning	2	4.55	.379
GT-GBT technology	2	3.91	.658
GR-GBT resources	2	4.28	.639
RM2A-GU	3	4.51	.461
RM2A-SL	3	4.53	.407
RM2A-CL	3	3.87	.719
RM2A-PS	3	4.03	.645
RM2A-CD	3	4.32	.564

For the sub-scale of RM2A-GBT, the highest levels are "RA1 during GBT use" (Mean=4.56, SD=.558), "RA2 during GBT use" (Mean=4.36, SD=.593), "MA1 during GBT use" (Mean=4.53, SD=.560), "RA1 during self-learning" (Mean=4.61, SD=.494), "RA2 during self-learning" (Mean=4.44, SD=.607), "MA1 during self-learning" (Mean=4.61, SD=.494), "MA1 for problem solving" (Mean=4.42, SD=.649), "MA1 for creativity development" (Mean=4.44, SD=.772), and "MA2 for creativity development" (Mean=4.56, SD=.558). There are some items attain the level of average, include "RA1 & RA2 during collaborative learning" (Mean=3.75, SD=.874), "MA1 during collaborative learning" (Mean=3.81, SD=.822), "MA2 during collaborative learning" (Mean=4.11, SD=.887), "MA2 for problem solving" (Mean=4.00, SD=.894), "MA1 & MA2 for problem solving" (Mean=3.83, SD=.845), and "MA1 & MA2 for creativity development" (Mean=3.97, SD=.810). That is, compare the rote learning to assimilation and accommodation (RA1 and RA2) of RM2A, the meaningful learning to assimilation and accommodation (MA1 and MA2) of RM2A is hard promoting during a short-term STEM education process.

Table 3 Summary of Descriptive Statistics Results for the sub-scale of GBTLS and RM2A-GBT

Domain	Item No.	Mean	SD-Standard Deviation
GBT learning for understand	1	4.56	.558
GBT learning for interact	2	4.42	.554
GBT technology for hardware	1	3.94	.791
GBT technology for software	2	3.92	.732
GBT resources for interesting	1	4.58	.649
GBT resources for expand	2	3.97	.941
RA1 during GBT use	1	4.56	.558

RA2 during GBT use	2	4.36	.593
MA1during GBT use	3	4.53	.560
RA1 during Self-learning	1	4.61	.494
RA2 during Self-learning	2	4.44	.607
MA1 during Self-learning	3	4.61	.494
RA1 & RA2 during Collaborative learning	1	3.75	.874
MA1 during Collaborative learning	2	3.81	.822
MA2 during Collaborative learning	3	4.11	.887
MA1 for Problem solving	1	4.42	.649
MA2 for Problem solving	2	4.00	.894
MA1 & MA2 for Problem solving	3	3.83	.845
MA1 for Creativity development	1	4.44	.772
MA2 for Creativity development	2	4.56	.558
MA1 & MA2 for Creativity development	3	3.97	.810

5.4 Correlations between the scales of GBTLS and RM2A-GBT

To evaluate the correlations between different items of GBTLS and RM2A-GBT, the correlation analysis has been taken and Table 4 presents the results. There are statistically significant positive correlations between GR and GL ($r=0.508$, $p < 0.01$) of GBTLS, and statistically significant positive correlations between RM2A-GU and GL ($r=0.440$, $p < 0.01$), RM2A-GU and GR ($r=0.487$, $p < 0.01$) , RM2A-SL and LM ($r=0.681$, $p < 0.01$) among the two scales. There are also have significant correlations between RM2A-CD with RM2A-SL, RM2A-CL, and RM2A-PS ($r=0.611$, $r=0.544$, $r=0.549$, $p < 0.01$) respectively. This positive relationship between scales of GBTLS and RM2A-GBT indicated that GBT is benefit with students' cognitive learning, and students' creativity development has a strongly relationship with themselves' developing of self-learning, collaborative learning, and problem solving.

However, there are weaker link between the items for correlations. For this weaker link correlation shown that the collaborative learning and creativity development can also promote the GBT use performance in turn, and the problem solving, as a key outcome, plays an important role in the areas of students' device learning, self-learning and collaborative learning.

Table 4 Correlation analysis for the scales of GBTLS and RM2A-GBT

		1.	2.	3.	4.	5.	6.	7.	8.
1.	GL	-							
2.	GT	.155	-						
3.	GR	.508**	.243	-					
4.	RM2A-GU	.440**	.089	.487**	-				
5.	RM2A-SL	.341	.065	.349	.681**	-			
6.	RM2A-CL	.341	.291	.297	.445*	.279	-		
7.	RM2A-PS	.416*	-.074	.241	.225	.383*	.447*	-	
8.	RM2A-CD	.324	.105	.184	.434*	.611**	.544**	.549**	-

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

6. Discussion

The results of descriptive statistics of GBTLS and RM2A-GBT indicated that students are more interesting in the knowledge of GBT (GL-GBT learning) than the functions or features of GBT (GT-GBT technology, GR-GBT resources). Moreover, students are more interesting in the basic cognitive understanding for knowledge (RM2A-GU, RM2A-SL, RM2A-CD) than the deeper understanding of knowledge (RM2A-CL, RM2A-PS). During the STEM project, the development of GBT use, Self-learning, and Creativity development are better than collaborative learning and Problem solving. This suggested that researchers need give more time and more basic guiding resources to help students deeper understanding.

In addition, the results of subscales of GBTLS and RM2A-GBT shown that students' cognitive learning are more stay in the areas of RA1 and RA2 than MA1 and MA2, which most is Rote learning process than Meaningful learning. The reasons of this situation are technology and time. For technology, the students need more time and group working to grasp basic skill to control the virtual item by Leap Motion.

Finally, for the results of correlations between the scales of GBTLS and RM2A-GBT indicated that there is a significant relationship between the sub-scales of RM2A-GBT. This result directly confirms the research questions of this study that "What is the GBT's function to students' cognitive development during in the virtual reality environment?" The Rote learning and meaningful learning pathway of GBT lead students' development of self-learning, collaborative learning, problem-solving, and creativity development. And the development of students' performance, have promoted students' cognitive learning in turn. These results have provided a link between GBT' learning and students' cognition development.

7. Conclusions

In conclusion, this research has provided a framework to link between gesture-based technology and students' cognitive learning and development. This study focused on the GBT using process to design a RM2A model for STEM project based on the GBT to explain the process that how VR device help students' knowledge learning and understanding. The RM2A model include four part that Rote learning to assimilation (RA1), Rote learning to accommodation (RA2), Meaningful learning to assimilation (MA1), and Meaningful learning to accommodation (MA2). To assessing the effective outcome of the RM2A model, this research has implemented a "CSS" STEM project to construct the 3D model by Leap Motion, a kind of GBT device, and let students use Leap Motion and Form 1+ 3D printer to make the physical model. After the experiment's data collection, analysis and discussion process, this research indicated the STEM project of GBT is much better for students' RA1 and RA2 in short-term learning process. And in the long-term learning process, the STEM project of GBT can increasingly promote students' MA1 and MA2, that the developing is based on the development of students' RA1 and RA2. Finally, this research will provide people who focus on VR and GBT's educational implementation, the better understand to link between VR resources and students' learning. For the future studies, this research will continue focus on the benefits to students' and teachers' of relatively VR technology, virtual reality environment, and the interactive learning resources.

Acknowledgments

Funding of this research work was supported by the "13th Five-Year Plan for the development of Philosophy and Social Science in Guangzhou", under the grant number 2019GZQN20.

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Narratives to Transform from“ Negative ” to “Positive” ——according to the monologue on SNS posted by a Chinese youth coming to Japan with family visa

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Abstract: The purpose of this research is to clarify narrative which makes transition from negative to positive, according to the monologue on SNS posted by a Chinese youth who came to Japan with a family visa. By analysis the data collected from his moments, It can be inferred that he says “jiayou” to himself is just like a monologue he write to himself on the SNS. This narrative turn negative reality into a positive future by cheering on himself.

Key words: SNS,Recovery process, Narrative, Chinese teenager

INTRODUCTION

As Japan increasingly accepts immigrants, there are 2471458 people who have foreign nationalities in Japan over the long term, according to the report from the Osaka Immigration Bureau 2016.

More than a quarter of them are Chinese nationality (711486 people). It is in 10% of "family visa" according to the qualification classification. After entering Japan, the quality of their life is not stable and lack of support from the society.

With the development of SNS (social networking service) communication technology, LINE, WECHAT, people beyond national boundaries can also use network communication tools to build interpersonal relationships with family members and friends. In order to understand the cross-border world of young people more deeply, it is very important for researchers engaged in intercultural education to focus on the connection of networks. (Murata, Guchuan, 2014).
Yamada (2000) has claimed that narrative is “the act of connecting two or more events”. We can not change the events that occur in the real world, but what of those events are "musubu" as they are. We can change the way we organize and make sense of our experience, and change the outlook for the future. When a person encounters a negative event, combine the event with other "kotoba" to create a narrative that transforms reality.

This study is to clarify the narrative which makes transition from negative to positive. It is thought that when such a person encounters a difficult situation, it becomes a power to transform life while encouraging others as well.

METHODS

Participants

The Participant of this survey, Mr. A's profile. Chinese, born in 1994, moved to Japan for the

third year after graduating from high school in China. He came here by the family visa and nowliving by himself. Dose Part-time job in a drugstore. Can speak a little Japanese.
2011-2014 One-year transfer from high school.
2014-2016 Dream of Performing Arts Activities in BeiJing. Looking forward to Idol, dream to be a dancer.
2016 – Now living by himself. in Osaka.

Data collection

The content of Mr. A's SNS(WeChat) is collected as data. Mr. A has posted photos and text on moments for three years (2016-2018,1520 pieces). Moments are updated about three times a week. In this study, 490 blog pieces of A (2017.5.30-2018.12.7) were included in the data.

Data Analysis

The text data of the moments is conducted by narrative analysis. The first step is to read the data repeatedly.

The second step is coding. Categorize important ideas that often appeared in data.And divided the data by patterns. Finally, gather the patterns to generate concept.



Figure 1 one piece of moments

RESULTS

A is very negative about the current situation. He said “I’m very embarrassed because I don’t have anything now ”“My whole body hurts ”“I’m too old so I have to give up my dream. “On the other hand, he is very positive about the future. He said “One day I can stand on the stage and sing.” He want to change himself. When he feel negative, find himself cannot see his future, he says“jiayou!”which means “fighting” or “cheer up! “to himself. This word is just like a monologue he write to himself on the SNS. This narrative turn negative reality into a positive future by cheering on himself.

Make assumption. By giving meaning to the experience, you can switch from negative to positive and handle your potential as reality. " Life can not be returned. If I did not leave" Chuo Wushu School "in Shandong Province, I might become a muscular pan-pan guy now and become 185 cm at junior high school. If I am in high school, you may be able to walk proudly and confidently, if I study at a foreign affiliated school in Dalian, now I am knowledgeable, can speak fluent foreign language and graduated from a good university, I should be positive... "Using the Assumption " if " to get something he want “knowledgeable, fluent foreign language, good university”. The Assump-tion is not just a comfort method, but it brings in the elements of the self that you want, which you lack right now, and leads to the formation of a creative “possible world” created within the present context. This makes it possible to become a way to improve

the current situation, and to have a self-education ability.

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Learning and analyzing the application of digital learning in technology enterprises[1]

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Abstract: With the advent of the artificial intelligence era, it is an irresistible trend for enterprises to adopt digital learning instead of traditional corporate training methods. Digital learning plays an active role in the enterprise talent training strategy and brings good economic benefits to the enterprise. Digital teaching will produce complicated data. Learning and analysis technology is to use big data to quantitatively analyze learners' learning behaviors, provide evidence for learners' self-evaluation and corporate learning assessment, and also make decision-making and pre-judgment actions for decision makers. Provide data support. This paper introduces the study analysis, to explore its potential applications in enterprise digital learning, and learning challenges facing the analysis.

Key words: Learning analytics, Learning analysis technique, Corporate e-learningIntroduction

Introduction

Traditional education analysis methods, the data collected lacks rationality and diversity, and the collection period is long, the data processing methods are limited, and the overall effect is not satisfactory. As companies establish a network learning platform similar to MOOC, it provides the possibility to learn and analyze technology under educational data. The study and analysis mean to study and test, and supplemented by the teaching process. The 2019 Horizon Report mentions analytical techniques in important technologies for education in the past year or less (Horizon report,2019). With the continuous maturity of technologies such as the learning management system, it will eventually change the concerns that the learner's learning process

[1] 基金项目：“赣鄱 555 英才工程”领军人才培养计划［赣才字[2012]1号]专项资助
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cannot be tracked and the learning cannot be predicted. In the future enterprise education, collect the many learning data and behavioral data generated by employees in the process of digital learning, and predict the learning outcomes of students through deep mining, and correct the student learning plan. By collecting learning feedback, we will continuously improve the education system, enhance learning results, and enhance corporate efficiency.

Learning analysis technique

The first learning analysis conference in 2011 was held in Canada. The conference proposed that learning analysis technology is a series of data to collect, organize and analyze learners' learning process and learning environment to optimize teaching effects (Horizon report,2011). The 2012 Horizon Report proposes that learning analysis techniques interpret and analyze the massive data of students (Horizon report,2011), assess student learning progress, and predict future performance. Professor G.Siemens believes that using data and models to predict student learning, measuring students' current learning levels, identifying problems, and making predictions and recommendations for learning (G.Siemens,2011). The American Higher Education Informatization Organization believes that learning analysis uses data model management to analyze learner learning levels and intervene (Horizon report,2011). It is not difficult to find that these definitions not only have the definition of learning analysis technology, but also the way of learning and analyzing. It can be known from this that the learning analysis has the following characteristics.

(1) Diversified data sources. Referring to the learning platform such as MOOC, the current learner's learning data mainly includes informal learning such as participation in learning time, personal space, participation in discussions, and participation in traditional forms such as quizzes and submissions. The data acquisition needs to be highly informatized, with many types and comprehensive coverage.
(2) Modern tools. Data is collected, classified, explored, and analyzed using modern technology, and analysis results are generated according to procedures, and feedback is timely.
(3) Visualization of the analysis results. The purpose of learning analysis is to improve, intuitively and visually analyze the results of the analysis, to provide an intuitive understanding of the learner's learning situation, and to provide decision-making basis for corporate education decision-makers.
(4) For decision makers and learners. Learning and analyzing direct service objects are decision makers and learners. The results presented can help students improve their learning efficiency. They can help decision makers analyze the learning benefits of enterprises and make timely countermeasures.

The value and characteristics of enterprise digital learning

Almost all of the top 500 companies in the world have their own training system - "Enterprise University". The construction of “enterprise universities” has received much attention in the development of these enterprises. At present, digital learning of enterprises mainly has the following characteristics.

(1) Centered on learners. The digital learning objects of the enterprise are all adult learners. The learning methods are diversified, the learning content is not limited, and the learning

time is not fixed. It requires the learners to have strong autonomy. At the same time, diversified courses and subdivided knowledge have realized individualized learning of employees, which has improved the interest of employees and improved the efficiency of corporate education(Li,K.D. 2001).

(2) Learning is practical. Enterprise digital learning emphasizes the application of learning, and it is necessary to apply the knowledge learned to work, to generate benefits, and to reflect the value of enterprise education. Decision makers will make more reliable judgments for the development of enterprises based on the benefits of corporate education.

(3) Learners have multiple identities. The digital learning method allows learners to no longer be limited to traditional teacher-student roles. Learners can also become innovators and communicators of knowledge, stimulate learners' interest in learning, and promote learners' transition from passive to active learning, saving business education costs.

(4) Lifelong learning . Enterprise digital learning is part of continuing education, meeting the learning needs of learners to study anywhere, anytime, and providing strong support for employees' lifelong education.

Application of Learning Analysis Technology in Enterprise Digital Learning

(1) Measure, collect, and analyze learners' learning behaviors and data. At present, education data mining is mainly divided into five categories: Clustering (Clustering, outlier analysis); Relationship mining (Association Rules Mining, Sequential Pattern Mining, Social Network Analysis); Prediction (Decision tree, Timing Analysis, Regression Analysis); Upward analysis and visualization; text mining, etc. (Romero,C,& Ventura, S. 2007). Data collection sources include: classroom learning data, distance learning data, digital management data, and scientific research database data.

(2) Provide data basis for learners to self-examine and decision makers to optimize teaching. Learning analysis technology is a kind of data analysis technology, which is different from the traditional data analysis and processing methods. Learning analysis technology has a clear purpose for the processing of data, and is real-time and dynamic (Hu,Y. l. 2016). The learning analysis tool can quantify the student's entire learning process behavior or academic performance as a visual result, which is convenient for the learner to self-assess. Learning analysis technology also provides lecturers and managers with timely data on the dynamic changes of enterprise learning. By counting the content searched on the webpage, the frequency of interactions in the website, and the changes in the final assessment results, we can find that everyone is generally concerned about hot content and learning. what problems exist and how the effectiveness of learning.

(3) Provide a reference for enterprises to achieve personalized teaching. The level of enterprise employees and the knowledge reserve are very different. Each learner has his knowledge structure and learning style. In the traditional enterprise centralized face-to-face classroom learning activities, the lecturer can complete the learning feature analysis according to the performance and observation of the learner to determine the teaching content and plan. In the online learning environment, learning behavior and performance can only understand the learner's learning characteristics and performance by analyzing the learner's data in the learning behavior, and promote the enterprise to understand the learner's personality. At present, many studies have begun to pay attention to the design

and development of personalized learning in the network environment, such as adaptive learning systems. Learning analysis aims to enable teachers to use advanced technologies such as data mining and artificial intelligence to enhance the deep understanding of teaching and learning according to the needs and abilities of different students, and to provide individualized teaching for each student.

The Challenges of Learning Analysis Technology

(1) Information security (Li, 2016). Learning the application of analytical techniques will not leave the issue of privacy leaks. Learning data sources for analytical techniques, including learner learning time, academic performance, learning changes, etc. Exploring this data not only captures the user's learning information, but also violates privacy. Therefore, in the process of enterprise learning system optimization, data mining and data protection should be synchronized, the supervision mechanism should be strengthened, and data should be used reasonably.

(2) Data application value. Digital learning by enterprises can produce complicated data. Due to the current evaluation system and technical level, the data utilization rate is low, the data collection method is not reasonable, and the data integration under the offline line is difficult. Therefore, enterprises need to constantly improve the learning system, improve data utilization, open up the offline channel, improve data circulation efficiency, improve data analysis level, digest data and apply it to practice. Efforts to integrate and optimize and upgrade to an enterprise knowledge management system, realize multi-platform interoperability of user data, truly meet the needs of employees' mobile learning, and achieve lifelong learning.

(3) Data quality. The quality of enterprise learner data collection is closely related to the results. Complex and high-dimensional data is generated throughout the education process, which requires highly efficient calculations. At the same time, the long data collection process may produce problems such as the authenticity of the data, and it is necessary to consider the update and maintenance of knowledge when designing the data analysis system.

(4) Input and cost-effectiveness (Feng,Zhang ,& Li,2014). "Ten years of trees, a hundred years of tree people" - policy makers have to face the problem of long investment cycle and low rate of return for corporate education. Establishing a learning platform or purchasing a learning system requires huge human, material and financial resources to maintain and operate. At present, some enterprise universities actively explore the development model. In the end, whether learning analysis technology can make the enterprise education department make accurate decisions in the era of digital learning, self-reliance, and realize the transformation from huge financial transfusion to self-hematopoietic, which has positive significance for enterprise development.

(5) Rooted in corporate culture (Zhang,2009). The achievement of a company depends on the basic philosophy and spirit it conveys. Corporate training and education are not only about providing learning knowledge, but more importantly, letting employees understand the company's purpose and values. This is another challenge for enterprises to use learning analysis technology to optimize the digital learning style of enterprises,

enhance employee culture, identity and belonging, enhance corporate culture and enhance corporate competitiveness.

Conclusion

Enterprise digital learning is the eternal theme of enterprise talent training. The use of learning analysis technology has a far-reaching impact on mining the invisible value of enterprise digital learning, helping employees to complete the knowledge structure, improving the enterprise talent training mechanism, and improving the overall competitiveness of enterprises. With the continuous maturity of learning and analysis technology, the value of enterprise digital learning is more and more obvious, providing technical potential for China's enterprise transformation and transformation, industrial upgrading, and playing an active role in building a learning enterprise and a learning society.

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International Collaborative Projects

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Abstract: I have been hosting the international collaborative project based on Instructional Design theories such as ARCS model or "Learner Centered Theory"(2016) suggested by Dr.Reigeluth. We have been proceeding with this event, Named World Youth Meeting and Asian Students Exchange as follows: 1) Conflict resolution that was caused by the cultural differences among students 2) Effective ICT utilization before the face to face meeting 3) How to use the Internet for the project; exchanging Data via the network 4) Experiential Learning 5) E.F.L should focuses on "Intelligibility" 6) Globalism rather than Populism. World Youth Meeting is the international youth conference that has been hosted by Ministry of Education in Japan and local boards of education. This year we will celebrate its 20th anniversary. It started in 1999 in Japan, and more than 1,000 participants have joined and discussed various themes such as "My Identity as a Member of the International Community," and so on

Recent AI technology enlighten ICT utilization for young generation who learn English as E.F.L especcialy Asian country. we believe the more they get the opportunity to do presentation in English, the more they could get ability to break through the wall of global issues.

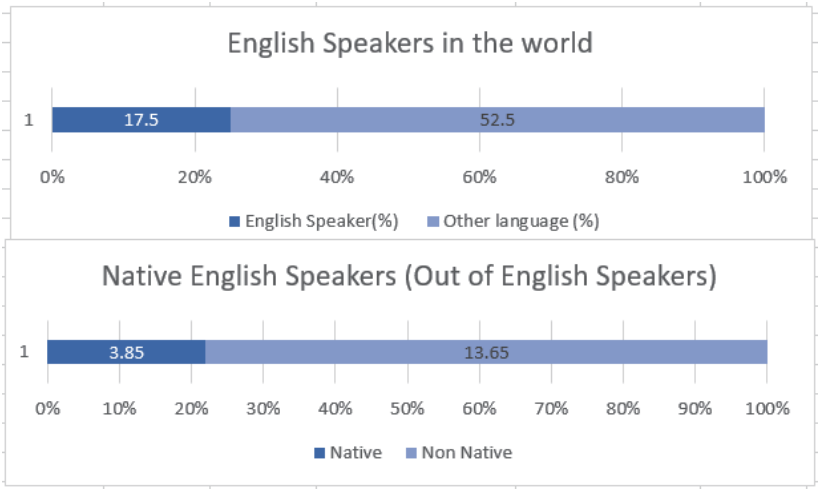
Key words: Authentic setting, Experiential learning, ICT development. Asian Countries

INTRODUCTION

On coming 5th and 6th of August, it will be the 21st anniversary of the World Youth Meeting in Japan. participants countries are China, Japan, Korea, Cambodia, Philippines, Malaysia and Nepal so on.The sister project is Asian Students Exchange Projects. We recently welcomed the 19th anniversary of the "Asian Students Exchange Program" in Kaohsiung, Taiwan. From Japan, about 160 participants had the chance to join this event conducted by the international teachers steering committee.

Our group comprised 11 high schools and 4 universities from different prefectures in Japan. The Japanese teachers involved are also working group members for the World Youth Meeting in Japan. Our students enjoyed this occasion a great deal, and came to learn how much fun the visited country could be after experiencing the homestay program. They were also able to

employ authentic English communication to complete their collaborative presentations. The "Asian Students Exchange Program"and " World Youth Meeting " are one aspect of active-learning, based on the instructional design that recently leads Japanese courses of study, focusing on "Interactive Leaning, Self-directed Learning and Deep Learning".



The number of English speakers throughout the total world population of 7 billion is about 1.75 billion people. Only 22 percent of this figure are native speakers. Japanese, Korean and Chinese who live in East Asia belong to the non-native speaking segment, it is the remaining 78 percent of speakers. "Tsedal Neeley, 2012, HBR"

Information devices such as computers, the Internet, translation sites, and presentation software have not only changed the way they teach, but have also improved their quality year by year. What is happening in Hong Kong is being broadcast simultaneously not only in Japan but all over the world. This kind of communication environment is changing young people's learning attitude. I think about protectionism and environmental problems. Young people are also starting to think about LGBT.

In recent years, students have been taking advantage of ZOOM and SNS with their smart phones. As information becomes faster and more accessible, Students become to try vivid international discussions. These are making a big difference from just listening classes, Chalk and talk style The Zone of Proximal Development allows learners to participate in the classes and learn more.

RESEARCH DESIGN & METHODS

Project Based Learning

This kind of authentic learning environment is more widely known as "project-based learning". Our students start their preparation in September and continue until January, challenging themselves to write reports as part of their reflective learning. As the preparatory activity, students started discussion regarding the overall design of the collaborative presentation expected be done on the designated day. They use tools such as Google Document or Skype to create their reports and confer with presentation partners often based in a different country or prefecture than themselves.

The Japanese students have become much more able to use English than several years ago, so that they could communicate directly with the foreign group members without the need for translation by their teachers. Their communication ability also makes it possible to argue about the order of presentation sheets or more effective expressions for their presentation scripts. Sometimes students had to face conflicts caused by communication and cultural

misunderstandings, but they were able to use English to resolve these differences.
After two decades of study accumulated by their predecessors in this event, students have become better able to articulate their ideas and opinions, achieving their desired outcome. Forming collaborative English presentations through patient discussion, they could reach agreement on finding better ways to make their presentation slides and scripts. Keeping persistent manners in forming their joint presentations is what has come to be known as "peace education" or acquiring "globally minded skills". Of course, recent technological developments to help in sharing opinions, such as Google Document or the Skype conference system, definitely support and facilitate their activities before the event.

Students' English Ability

Students communicate in English, focusing more on effectively overcoming conflict and deepening their discussion, not merely acquiring academic performance skills. They are required to maintain the persistent attitude to be a globally minded person, that successfully leads them to ways of creative thinking, going through the process of broaching conflict to reaching collaboration.

Thanks to the teachers steering committee students could learn how to use English to overcome conflict. Finally, they could experience real inter-global discussion, finding solutions to avoid any cultural or personality-based clashes.

RESULTS

Effective Presentation

Through their presentation experiences, students have acquired an understanding of the need to observe the following points to best make effective presentations:

1 Focus on prosody and pronunciation
2 Paying attention to keywords
3 Interaction with audience through direct questioning.
4 Gesture, eye-contact and paying attention to how they look.
5 Keeping the attitude of being an active listener.
6 Making appropriate pause before sharing keywords.

Conclusion

Due to the effective educational design, we could best find the suitable project to improve both English competency and global minded study supported by ICT and concept of Instructional Design.

In Japan, new courses of study start from 2020 that advocate 3 pillars comprised of Self-Directed learning, Interactive Learning and Deep Learning.

We think about future solution regarding AI and English expressions as follows. For Asian students, English presentations are an important tool to express effectively their opinion internationally using English. 300 English presentation samples have been archived. The

following elements are necessary for the English presentation. Short sentence is easy to say and to understand. as in spoken language. One sentence has one meaning. Elements of presentation are Greeting, Transition, Diagram Description, Photo Description, How to Say a Topic Sentence, How to Say a Supportive Sense. How to speak the conclusion of a topic. How to develop specific examples. These include English expressions appropriate to the student level, and when they are provided by the library, finally students get suitable , effective sample sentences with the help of AI when making the presentations. AI will be incorporated into English presentations, and getting along with the fact of Internet and SNS spread. AI will support " Conflict resolution". Student will share their opinion relying on AI to find appropriate English expression made by forerunner who attended the WYM or ASEP for the past 20 years.

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The Different Images of Good Mentors between Novice and Experienced Mentors: Based on the Analysis of a Text- Mining Approach

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Abstract: The aim of the present study is to uncover different mentors' awareness of effective mentoring between novice and experienced mentors participated in teaching portfolios workshop. In the context of developing mentors' communication skills and reviewing strategies through the course of a three-day intensive workshop, six consecutive meetings were conducted. The data of the discussions and reports among 11 mentors (three novice mentors, four experienced mentors, and four supervisory mentors) were recorded and analyzed by quantitative content analyses method using the Tiny Text-Mining tool (TTM). In collected textual data, 1,484 different types of words were found during mentors' reflections on their consultations with their mentees. The analysis revealed the following three points: (1) distinctive words appeared on the reports of the experienced mentors who could explicitly reflect on and explain their difficulties and satisfaction as mentors; (2) novice mentors often confessed their worries and difficulties about their mentoring styles and communication skills; (3) regardless of their mentoring experiences, several mentors often mentioned mentees' progress during teaching portfolio creation and consulted the mentoring process to discover the mentees' educational philosophy.

Key words: Faculty learning, Interdisciplinary collaboration, Quantitative research, Professional development

INTRODUCTION

The research literature suggests that the professional development of teachers can be improved by fostering scholarly teaching, that is, a systematic and critical examination of how learning in each discipline can be improved (Burbank & Kauchak, 2003). The most effective method of optimizing faculty development practices is peer mentoring based on real-world practices that may enable faculties to examine their own practices, reflect on their methods, and socialize with mentors.

In the context of education, it is commonly accepted that a mentor teacher leads, guides, and advises another teacher who is less experienced in a work situation characterized by mutual trust and belief. Mentoring is often identified as an essential step in achieving career success. Therefore, mentors working with mentees must work toward competence in areas such as consulting, mediation, negotiation, intervention and clinical supervision (Koki, 1997; Ramani et al., 2006).

Nevertheless, not all mentors recognize the value of the mentoring relationship. Since mentors

and educators in specialized areas rarely receive training on the mentoring process, they are often ill-equipped to face challenges when taking on a major mentoring responsibility (Ramani et al., 2006). The actual learning processes of individual faculties that occur as a result of peer mentoring have not been described in detail (Castle, 2006; Clarke & Hollingsworth, 2002; Zwart et al., 2008).

The aim of the present study is to uncover different mentors' awareness of effective mentoring between novice and experienced mentors participated in teaching portfolios workshop at Osaka Prefecture University College of Technology in 2016.

The foregoing study revealed that there was a difference in the perceptions of mentorship between novice and experienced mentors. However, only a few studies have explored the influence of experiences on mentors' perceptions. Consequently, whether the same findings will be revealed in the analysis of reliable quantitative data using the Text-Mining tool.

Previous Studies on Peer-Mentoring

Since 2009, Osaka Prefecture University College of Technology has conducted an intensive three-day seminar guided by mentor teachers to create teaching portfolios. It is designed to engage mid-career faculty members in the theory, practice, and scholarship of teaching and learning and to establish and support a faculty community of practice that provides mentorship and leadership in higher education (Kato, 2013; Kato, 2014; Kato, Hogashida, Kaneda, Kitano, Furuta et al., 2018; Kato, 2019). Their mentors also have opportunities to consult with a supervisor who has vast experience in teaching and mentoring different levels of trainees at peer-support "mentor meetings."

Previous studies have analyzed discussions at the final mentor meeting by employing the Steps for Coding and Theorization (SCAT) method, which is a sequential, thematic, qualitative data-analysis technique (Otani, 2008; Otani, 2011). With SCAT, the authors have anecdotally reported that mentors encounter the following six categories: [Reflection on immature mentor], [Waiting for mentee's awareness], [Education data collection], [Recognizing mentee's growth], [Leadership skills], and [Values of TP]. In unbalanced mentee–mentor relationships, in particular, novice mentors become anxious and refrain from asking questions or advising older mentees, but rather content themselves with merely listening to their stories (Kato et al., 2018).
Learning from mentoring experiences – related data contained seven subcategories and two categories. Category 1 [reflection on immature mentor] included the following four subcategories: <difficulties of human relations >, <inductive approach>, <self-awareness of immaturity>, and <no sense of accomplishment> (Kato et al., 2018).

The other study, designed as a quantitative content analysis, intended to explore how mentors perceive mentorship as part of professional development and how they evaluate their own mentoring experiences (Kato, 2019). The author focused on discussions at the final meeting by analyzing with TTM method. Differences among three groups of mentors, namely, novice, experienced, and supervisory were identified.

Although previous exploratory studies (Kato et al. 2018) yielded significant insights into individual mentors' awareness toward mentorship, concerns have been raised that mentor experiences may influence the difficulties and personal satisfactions they experience while

mentoring. An enhanced understanding of the perceptions of mentorship may help develop the professional development that will foster diversity among future academic educators and researchers in higher educational institutions.

RESEARCH DESIGN & METHODS

Participants

Nine mentors and two supervisors participated in this project and were divided into two groups: namely, Group A and Group B. Table 1 presents the distribution of the participants according to their mentoring experience, academic background, and affiliation. Among the eleven mentors, three were novice mentors who had never worked with mentees before.

Table 1 Mentors' Profiles

Group	Mentor (Age)	Mentoring experience	Academic background	Mentors' Affiliation
A	A* (Fifties)	More than five times	Chemistry	Technical College
	B** (Forties)	More than five times	Chemistry	Technical College
	C (Forties)	Four times	Mechatronics	Technical College
	D (Forties)	First time	Mechanical engineering	Technical College
	E (Thirties)	First time	Education	University
B	F* (Fifties)	More than five times	Educational technology	University
	G** (Fifties)	More than five times	Mechatronics	Technical College
	H (Fifties)	More than five times	Mathematics	Technical College
	I (Forties)	More than five times	Information Science	Technical College
	J (Forties)	Three times	Chemistry	Technical College
	K (Thirties)	First time	Chemistry	Technical College

(* supervisor, ** coordinator)

Data Collection

Two group discussions were conducted and recorded with the participants' permission. Although Group A recorded discussions and reports at all six peer-mentor conferences, Group B only recorded their discussions during the final meeting on August 10, 2016. In the group discussions, a supervisor acted as a facilitator and encouraged the participants to reflect on their mentoring process and the changes they were aware of prior to and after the mentoring experience. The questions were intended to elicit the mentors' awareness of what their role as a mentor entailed and what problems and difficulties they experienced during mentoring. The supervisors as interviewers primarily addressed the mentors' perceptions of their learning from the mentoring process and asked them to describe the mentoring process. The author transcribed audio-recorded data after the meetings.

Data Analysis

In the context of developing mentors' communication skills and reviewing strategies during the three-day intensive workshop, the data of the final discussion and reports, were analyzed by the quantitative content analyses method of Tiny Text Miner (TTM), a free text-mining tool for the English and Japanese languages (Matsumura & Miura, 2014). This technique enables Japanese language morphological analysis for the large text dataset in simple way.

The transcripts were prepared for analysis as follows. First, synonyms used in the final discussion and reports were identified and substituted with a single word so as to reduce the number of word categories and ensure more accurate results. Plural nouns were replaced by singular nouns to enable the software to recognize them as the same word. In addition, a proper noun was identified by its function and transformed into an appropriate noun with the same meaning. After this preliminary work, the software counted word frequencies generated by mentors in each discussion during the mentor meetings.

RESULTS

Extracted Words on Mentoring Experiences

The number of extracted words is displayed in Table 2. In total, 2,434 words were extracted from the data (40:58 min) of Group A and 2,493 words from that (63:25 min) of Group B. In total, 5,027 words were extracted from the transcripts of the two final meetings and 1,484 different types of words were found in their reflections on their consultation. Novice mentors devoted less to the reflective mentoring process discussion than the experienced and supervisory mentors. Table 2 summarizes the basic statistics of mentoring reports at the final meetings of both groups.

Table 2 Number of Extracted Words

Group	Num.	Num. of cases	Total num. of words	Different num. of words
Novice	3	55(11.1)	767(15.3)	292(19.7)
Experienced	4	214(43.1)	2434(48.4)	649(43.7)
Supervisory	4	227(45.8)	1826(36.3)	543(36.6)
Total	11	496(100.0)	5027(100.0)	1484(100.0)

*The counted frequencies with percentages given in parentheses.

Cluster Analysis for the Category of Mentoring Experiences

To elucidate the major images of good mentorship, co-occurrence relation among the words was analyzed based on a cluster analysis. First, morphological analysis was performed by using TTM, and the dataset for further multivariable analysis was created with frequency-used (more than one time) nouns, adverbs, and verbs. Then, a cluster analysis was performed to the created dataset. The statistical distance between the variables was calculated as a Euclidean distance, and a Ward method was used for clustering. Figure 1 showed the dendrogram of mentoring experiences.

As shown in Figure 1, the dendrogram can be roughly classified into four clusters, which are typically associated with mentors-mentees relationship during three-day intensive workshop.
Cluster 1 consists of the words indicating basic verbs that describe human activities such as say, do, and be. Custer 2 consists of the words corresponding to the words corresponding to the characteristics of excellent mentors such as “great”, “can listen to (mentee’s voice)” and “do what is possible to”. Cluster 3 includes the words effective mentoring techniques such as “timing” and “share”. Cluster 4 seems to consist of several sub-clusters, including 28 words. The statistical analysis on four clusters indicated that mentoring experiences influenced the awareness of characteristics of excellent mentors (cluster 2) and mentor excellence (cluster 3), and challenging process (cluster 4).

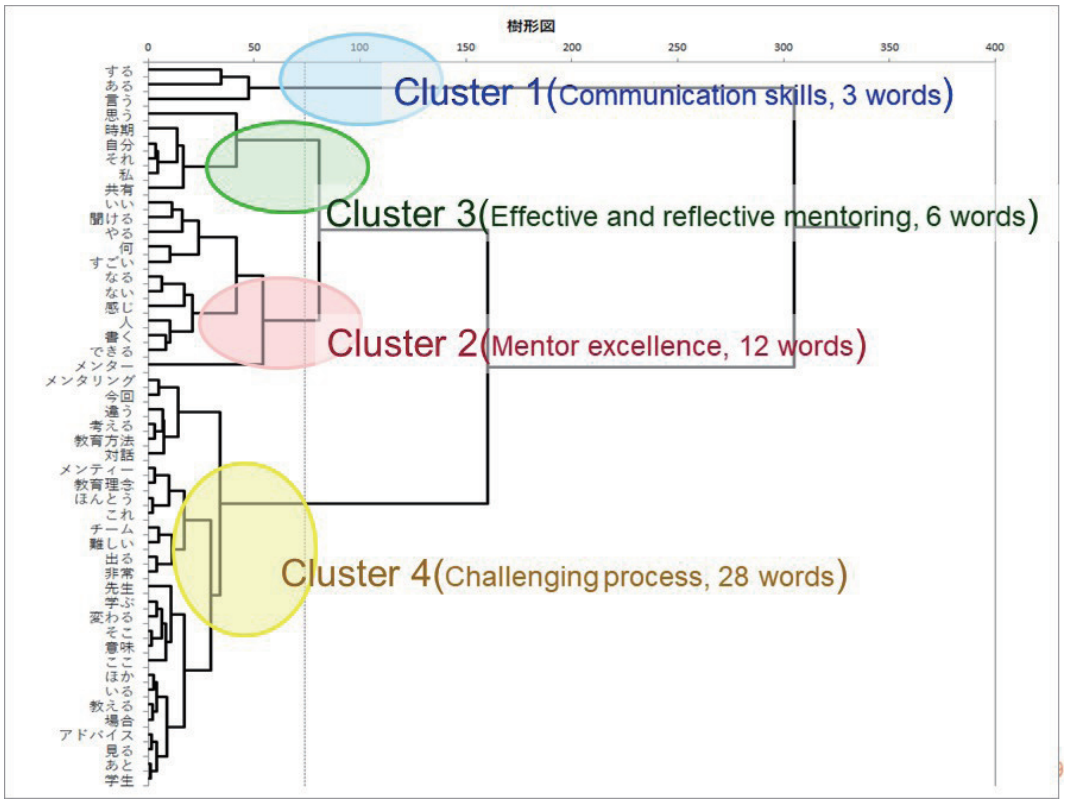


Figure 1 Number of Extracted Words

Differences in Frequency by Three Groups

The author conducted chi-squared tests and Fisher's exact tests for independence on the frequency of the common words between the three conditions (novice, experienced, and supervisory) by employing statistical software on the web, js-STAR. As shown in Table 3, the estimated values of counted frequencies are given in parentheses, which are calculated on the basis of total number of words of each group: Novice (767 words), experienced (2734 words), and supervisory (1836 words) in Table 2.

Both the chi-squared tests and Fisher's exact tests revealed statistically significant differences in the frequency of reflections on mentoring in relation to 4 clusters ($\chi 2(6) = 26.864$). This results indicates that the observed cell counts are significantly different from the expected cell counts, and there is a statistical relationship between the categorical variables, as shown in Table 3.

The residual analysis indicated that there were different awareness toward mentoring experiences among three groups of mentors, namely, novice, experienced, and supervisory (Table 4). With regard to the novice mentors' reports on their mentorship, novice mentors mainly reflected on their mentoring process with their mentees and did not mention effective mentoring skills. This tendency indicated that novice mentors reflected on teaching portfolio creations with their mentees, which was the main concern of mentorship in the intensive workshop.

On the contrary, experienced mentors reported effective mentoring skills and role of mentor than novice and supervisory mentors. The nature and quality of the social interactions that experienced mentors reported in the reflections varied with those of the novices and supervisors.

Relative to the third cluster [effective mentoring], mentors recognized the importance of helping mentees identify their problems. The third cluster (effective mentoring) showed that asking questions in a timely fashion and taking an accepting attitude toward their mentee were effective. This tendency indicated that experienced mentors emphasized the importance of information sharing between mentors for improving their mentor skills.

Table 3 Differences in the Frequency of the Mentoring Experiences by Three Groups

	Novice	Experienced	Supervisory
Cluster 1 Basic Activities (3 words)	113 (114.4)	372 (365.8)	242 (246.8)
Cluster 2 Mentor Excellence (12 words)	96 (121.8)	382 (389.4)	296 (262.8)
Cluster 3 Effective Mentoring (6 words)	99 (98.9)	348 (316.5)	182 (213.6)
Cluster 4 Challenging Process (28 words)	140 (112.9)	331 (361.3)	247 (243.8)

*The estimated values of counted frequencies are given in parentheses.

Table 4 Residual Analysis

	Novice	Experienced	Supervisory
Cluster 1 Basic Activities (3 words)	-0.160 ns	0.533 ns	-0.440 ns
Cluster 2 Mentor Excellence (12 words)	-2.979 **	-0.627 ns	2.953 **
Cluster 3 Effective Mentoring (6 words)	0.007 ns	2.847 **	-3.011 **
Cluster 4 Challenging Process (28 words)	3.207 **	-2.612 **	-0.293 ns

** asterisks indicate the significant difference ($p<.01$).

This study, designed as a quantitative content analysis, intended to explore how mentors perceive mentorship as part of professional development and how they evaluate their own mentoring experiences. The author integrated qualitative data analysis with theoretical coding and quantitative content analysis using TTM, which proved efficient and valid as theorization from the relatively small-scale data of the 11 mentors whose data the authors analyzed in previous research (Kato et al., 2018; Kato, 2019).

The author focused on how mentoring experiences affect mentors' awareness of effective consultation skills. Differences among three groups of mentors, namely, novice, experienced, and supervisory were identified.

ACKNOWLEDGEMANT

This work has been partly supported by Grant-in-Aid for Scientific Research(C) (No. K17K01156). Information about this study can be found online at http://www.katoyukari.net/.

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Meta-cognitive Activities by Using KWL chart in Inquiry Learning

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Abstract: The purpose of this research is to clarify effect in inquiry learning and meta-cognitive activity by the strategy of promoting metacognition with using KWL chart. The Ministry of Education, Culture, Sports, Science and Technology in japan (MEXT) mention a need to raise abilities of solving a problem better through integrated and inquiry learning. Metacognition is important to promote abilities of solving a problem. However, measuring metacognition is difficult. The author defines metacognition as knowledge and abilities of monitoring and control. In this research, teachers set strategies of promoting metacognition by using KWL chart with two classes of fifth grades primary school students. Writing KWL chart makes learners write 1) what I Know, and 2) what I Want to know, 3) what I Learned. Therefore, KWL chart give a learner the term of monitoring and control. The author analyzes KWL chart and planning sheet, reflection sheet. Furthermore, the author will interview students with KWL chart and planning sheet. The author will make many codes and categories to clarify how students work metacognition.

Key Word: metacognition, meta-cognitive activity, KWL chart

1 Introduction

1.1 Literature Review

In Japan, one of the goals of the "Integrated Learning" is to "develop the qualities and abilities to solve problems better through cross-subject and inquiry learning." The Ministry of Education, Culture, Sports, Science and Technology in Japan (MEXT,2010) mention the need inquiry learning repeating problem-based learning. Inagaki (2018) mentions a term of qualities and abilities in inquiry learning's activities. Furthermore, Inagaki mentions the abilities are universal for changing world and important whenever.

Kato (1998) mention that the quality of problem solving dependent on metacognition. Therefore, there is need of metacognition to solve problems better.

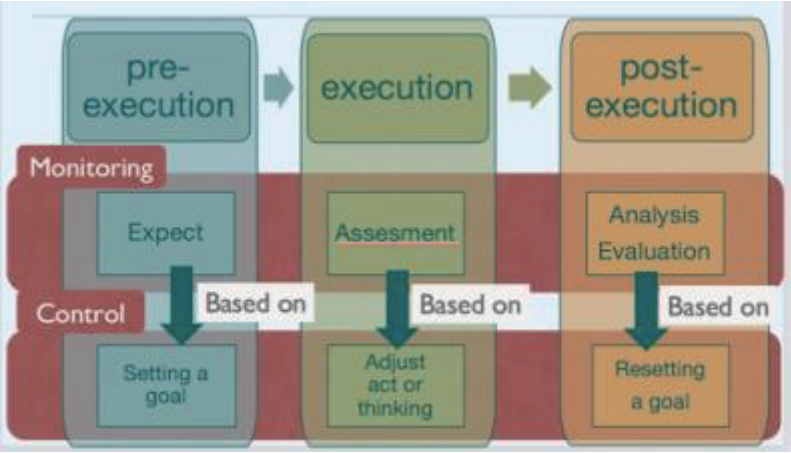
Koga & Matsumoto (2006) set a strategy for promoting metacognition through description and, self-reflection significance of self-reflection in integrated learning. As a result, Koga & Matsumoto clarified the strategy is effective for promoting meta-cognitive knowledge. this result

depends on factor dimension and students' meta-cognitive ability. Furthermore, Koga (2005) analyzes conversation in learning process. As a result of analysis, meta-cognitive experience is found Furthermore, method and goal correction tend to involve self and goal, method assessment.

However, the research clarifying how to do meta-cognitive activity in planning are few. Furthermore, the practice of using KWL chart are few. The purpose of this research is to clarify effect in inquiry learning and meta-cognitive activity by the strategy of promoting metacognition with using KWL chart.

1.2 Metacognition

Sannomiya (2008) divided metacognition into meta-cognitive activity and meta-cognitive knowledge. Meta-cognitive activity is summarized as an activity of reflecting and self-control. Furthermore, knowledge that is understood in performing meta-cognitive activity is classified as meta-cognitive knowledge. Sannomiya (2008) show a model of meta-cognitive activity, which is divided into pre-execution, execution, post-execution steps in task execution. For example, in the execution stage, there is reassessment of the degree of difficulty, and monitoring such as checking the task execution. Furthermore, control such as the revision of goals and plans to achieve these contents and changes in strategy are done (Fig. 1).



(Fig. 1)

Koga (2005) defines meta-cognitive experience as "promoting control (modification of ideas and strategies) by monitoring", taking into consideration that the time for integrated learning is targeted. Sannomiya (2008) used "meta-cognitive activity" as a more active mean of meta-cognition than meta-cognitive experience. In this research, the author defines meta-cognitive activity as "promoting control (modification of ideas and strategies) based on monitoring" based on the definition of Koga and Matsumoto (2006).

1.3 KWL chart

Ogle (1986) devised the KWL Chart that examines 1) What I know, 2) What I want to know, and 3) What I learned.(Fig.2) Monitoring is performed on thinking what the student knows, and what the student want to know. However, there are few practical cases using KWL chart, and no cases have been introduced in lessons using the process of inquiry.

K What I know 知っていること	W What I want to know 知りたいこと	L What I learned 学んだこと

(Fig.2)

2 RESEARCH DESIGN

2.1 Participants

Teachers set strategies of promoting metacognition by using KWL chart with two classes of 5th grades primary school students in May 2019. Students are planning cross-cultural communication with primary school in Cambodia since the 4th grade. Students decide way of cross-cultural communication with video call, gift and exchange of letters as" thing student wants to do." KWL chart was used in the strategy for planning " thing student wants to do." In this research, the author focuses some students by analyzing reflection sheets.

2.2 Methods

In this research, the author analyzed reflection sheets before and after using KWL chart. Furthermore, the author clarifies relation KWL chart and planning sheet. 1) the author used the set of codewords to classify on the lessons dividing before and after using the KWL chart. Codewords are made from "Monitoring" and "Control" categories referring to the research of Koga (2005). "monitoring" category is divided "what I understood or could" and "what I did not understand or could not" as cordwords. "Control" is divided "control" and "control based on monitoring" as cordwords. 2) Furthermore, the author classified whether student can control based on monitoring. 3) the author selected students by analysis of reflection sheet, KWL chart and planning sheet. The author will interview students about description KWL chart and planning sheet for 10~15 minutes.

3 Result(analysis of reflection)

After the strategy, the author found control based on monitoring. For example, student write "I think it is better to write in Khmer with translator" after "we have iPad" and" I know that we can't speak English," "I think it is better to write in Khmer with translator" is control based on monitoring. The author found that 23 students tend to do control based on monitoring Result of analysis of reflection sheet, the author summarized the number of students whether students can control based on monitoring.

(chart.1)

Tends to control based on monitoring after the strategy	23
Control based on monitoring before and after the strategy	14
Others	10

4 Future view and task

After the interview, the author will analyze where is meta-cognitive from interview description. However, interviewing was needed earlier. Interview was done July. Students will not remember all description of KWL chart and planning sheet. The result of this research, the author will clarify usefulness about using KWL chart to monitor and control. Furthermore, the author will analyze L (what I Learned) to clarify work of learning.

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Reflection on Learning Experiences with 360-degree Videos

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Abstract: We are pursuing effective use of 360-degree videos in experiential learning. When we experience 360-degree video by a head mounted display (HMD), we can feel high sense of immersion as if we were in that place. We have recorded many videos in students' fieldworks, and made our students view such videos to consider possible effects caused by 360-degree videos. The students who conducted fieldworks reflected on their experience. Through such preliminary experiments, we observed possible effects that can be obtained by 360-degree experience, including helping students detect what they missed while on site, and maintaining students' excitement and motivation after returning. Although we found such possible effects for students' learning, these effects are not conclusive. Besides, we have many challenges to overcome to use 360-degree practically. We need to identify what kind of scenes should be recorded from which viewpoints, and how we should make students reflect on their experience with 360-degree videos. It will also be important to gather more data about how to use such emerging media and how to appropriately combine it with traditional media to enrich students' experiences. We would like to critically consider such issues based on results of preliminary experiments with theories about reflection. Then, we would also like to pursue appropriate instructional design for record and use of 360-degree videos for students to learn more from experiential learning.

Key words: 360-degree Video, Experiential Learning, Higher Education

INTRODUCTION

irtual reality technologies are now popularized, and we can produce and experience immersive videos at low cost. We pursue to make experiential learning in our university more effective by using such technologies. Experiential learning is expected to promote positive attitudes and independent thinking among students, and reflection is considered to be a key feature to make experiential learning effective. Accordingly, we aim to help students reach deeper levels of reflection and posit that immersive videos would encourage students to reflect on and internalize their experiences more deeply.

We conducted the trial activities and investigated the effective use of 360-degree videos in experiential learning (Sato & Kageto, 2018). Through observations of the process of recording and watching videos, we discussed how students can record 360-degree videos more effectively.

From observation of students who viewed the 360-degree videos of their fieldwork, we observed several potential benefits. The students who viewed 360-degree videos observed details that they did not notice during on-site experience and recalled emotional details that would lead to better learning and deeper reflection. It was also implied that recalling on-site emotions helps students regain their motivation to learn after returning to the daily routine in a university. Based on these findings, we consider appropriate instructional design for record and use of 360-degree videos for students to learn more from experiential learning.

RESEARCH DESIGN & METHODS

We have recorded students' experiential learning so far, mostly focusing on fieldwork to foreign countries. The cameras we use are Ricoh Theta V. The resolution of recorded data is 3840x1920 (4K) or 1920x960, and the maximum duration of recordings is 25 minutes. We use an Oculus Go to view videos taken by Ricoh Theta V. The Oculus Go is a standalone head mounted display (HMD) that can be used to view 360-degree videos without the need for a smartphone or computer. A remote control was also available to perform screen commands such as selecting videos, start, playback, fast-forwarding, and rewinding videos.

Although we found possibility to deepen students' reflection with 360-degree videos (Sato & Kageto, 2018), these effects are not conclusive. Besides, we have many challenges to overcome to use 360-degree practically. We need to identify what kind of scenes should be recorded from which viewpoints, and how we should make students reflect on their experience with 360-degree videos. It will also be important to gather more data about how to use such emerging media and how to appropriately combine it with traditional media to enrich students' experiences. In this study, we survey previous research regarding reflection and effects of visually immersive sensation. Then, we pursue appropriate instructional design for record and use of 360-degree videos for students to learn more from experiential learning.

RESULTS AND DISCUSSION

Reflection of Learning Experience

Reflection is considered a generic skill or competency (e.g. Rogers, 2001). Hatton and Smith (1995) defined the levels of reflection as follows (in order from shallow to deep): descriptive writing, descriptive reflection, dialogic reflection, and critical reflection. To reach deeper levels of reflection, Moon (2004) proposed recording activities in learning journals. She also described that emotion is a component to be reflected on to make learning and reflection more complete, and suggested to note emotions through, for example, writing poems. There will be some ways to deal with emotions, and as our preliminary research (Sato & Kageto, 2018) showed that students recalled their emotion well, viewing 360-degree videos with an HMD can be one of them. 360-degree videos can be effectively used as a way for a student to deepen reflection on his or her experience as well as writing learning journal.

Immersion and Reflection

Immersive sensation is a key feature of virtual reality (VR) that can be effectively used in various fields (Bailenson, 2018). The capabilities of VR have advanced significantly in recent years, and the cost to implement VR has greatly decreased. These changes have led to an

increase in the use of VR technology even in education (Freina & Ott, 2015). VR is considered effective for training, learning about complicated concepts, experiencing what is impossible to experience in real-life settings, and so on (Liu, Dede, Huang, & Richards, 2017).

VR exposure to a traumatic event was effectively used for a reduction of post-traumatic stress disorder (PTSD) symptoms (Difede & Hoffman, 2002). It says that exposure helped the patient process and habituate to memories and strong emotions associated with the traumatic event. Applying this to experiential learning, this means that an immersive environment has the potential for a student to deal with their emotions to make their learning and reflection more complete if they can be exposed to their past learning experiences of 360-degree videos with an HMD. When students engage in experiential learning, they generally have both positive and negative emotions for their experience. While positive emotions should be recalled to make the students more motivated in their future learning, negative emotions should not be left as it is. It is necessary to address such negative emotions, and to digest properly or overcome them not to cause negative effects in their future learning. We consider that the feature of 360-degree videos to help us bring back our emotions can be effectively used for these purposes.

Instructional Design for the Use of 360-degree Videos

This sense of immersion is considered helpful in education if it is provided with appropriate instructional designs (Dede, 2009). Yee and Bailenson (2007) pointed out that the appearance and action of a person's self-representations affect his or her behaviors. Applying this to fieldwork, an immersive environment has the potential for a person to feel similar sensations as those felt by the person who recorded the 360-degree video at the fieldwork site. Teachers may support better for students' reflection by understanding more about what students experienced.
Appropriate instructional design to use such videos should also be considered. Richards (2017) pointed out that VR technology should be used in combination with other traditional instructional tools. Moreover, manufacturers of VR headsets provide guidelines for the potential dangers, especially for children, of using their product. It will cause positive effects for both learning and health to use a 360-degree video only when it can provide big impact by its immersive feature in a limited duration of time.

CONCLUSION

In this paper, we considered the use of 360-degree videos with an HMD to use for reflective activities of experiential learning, following our preliminary experiments to find potential effects of 360-degree videos. We surveyed literatures about reflection including a role of emotion in learning and reflective activities. We pointed out the sense of immersion may work well to deal with emotion properly in a reflection session together with a teacher. Although 360-degree videos with an HMD cause rich immersive experience, it will not be effective to use it all the time. We need to think about the appropriate combination with other media and educational ways to fully elicit the effectiveness of 360-degree videos.

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A Case Study on Adaptive Learning Method in Elementary School Mathematics

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Abstract: The purpose of the research is to clarify how individual support materials produced by learning diagnosis (recommended sheets, personal charts, and SP tables that can comprehensively grasp the state of the class) are used in the lesson, It is to clarify whether itleads to learning outcomes. And, in order for the learner to look at the diagnosis information and do self-directed learning, it is to clarify what kind of guidance and learning environment should be prepared. In addition, it is to clarify what is necessary for the teacher's team to acquire the evaluation ability. As a result, commonly thing confirmed by the six cooperativeschools were that this system operation gave the opportunities for children to oppose it, towhat extent they can "do what they can", "why do I understand vaguely", "do not know whatI do not know" . As a result of this effort, there was found a certain effect from the relation between the unit test and the final exam. The result was also numerically revealed.

Key words: Adaptive Learning, Elementary School Mathematics, A Field of Study

INTRODUCTION

In this research, we evaluate individual students' degree of accomplishment as it relates to math instruction in elementary school, and focus our efforts on providing individual guidance based on the assessment results. This research is 'a practical research using individual optimization learning system' and is centered on adaptive learning, which supports student's learning based on the learning contents and level.

The purpose of the research is to clarify how individual support materials produced by learning diagnosis (recommended sheets, personal charts, and SP tables, which can comprehensively grasp the state of the class) are used during a given lesson, and to clarify whether their use leads to learning outcomes. In order for the learner to consider the diagnosis information and engage in self-directed learning, the kind of guidance and learning environment that should be prepared must be clarified. In addition, this study will also clarify the necessary components for the teacher's team to acquire the evaluation ability.

Adaptive learning is often associated with e-learning and is characterized by the utilization of interfaces such as ICT technology and social media to optimize learning content and level. In adaptive learning, student's learning progress is recorded. Then, the system analyses the record, reflects it in the learning course, and branches the learning content. As a result, the system presents learning problems and information that is optimized for individuals. In this research, we adopt a concept similar to the Adaptive Test Style (Adaptive Testing) and provide learning materials adapted to individual students based on the results of the test diagnosis. In the adaptive test, IRT is used to estimate how the key responses of problem items are affected by error factors

(e.g. distortion, ambiguity, difficulty) and their actual abilities and characteristics. Then, based on the student's answer pattern, the system selects items with differing degrees of difficulty and performs a test. In this research, following the test, we use a system that provides evaluation information and learning materials based on the needs of each individual.

The reasons for using this system are as follows: 1) Visualize and evaluate the appearance of performance. 2) Enable self-evaluation. 3) Provide high-quality information immediately. 4) Encourage mutual dialogue between students and dialogue among teachers. 5) Motivate students and enhance self-esteem. 6) Support reducing the gap between the present and target figures. 7) Support class improvement. That is, we carry out 'the assessment of learning' using ICT. Based on that information, we identify and perform 'the assessment for learning' and offer the opportunity to perform an 'assessment as learning' to the students and teachers themselves.

We have been studying for two years starting operation evaluation after spending one year as preparatory period. We asked local governments and schools for their cooperation, organized research groups, shared information therein, and accumulated research knowledge.

Regarding the assessment method, as a direct evaluation, we gather and analyze the relationship between each student's unit arithmetic test results and the result of the term end test for the same subject for 2 years. As an indirect assessment, students' opinions (questionnaires) on the utilization of recommendation sheets and evaluation comments, the opinions of teachers concerning the operation of this system (questionnaire), teachers' opinions on the training (questionnaire), and records of class practice (records of class research) are collected and analyzed.

In this report, we report on the changes demonstrated by students and teachers from six participating schools, the kinds of effort that were effective, and the causes of problems.

RESEARCH DESIGN & METHODS

The participating schools in this study are six elementary schools in urban areas, and our study specifically focuses on the 4th and 5th grade classes. For schools in urban areas, where the number of teachers with less teaching experience is increasing, the improvement of teachers' leadership skills is an urgent issue. Therefore, faculty members have tried to clarify effective training methods that can grasp the situation of the class by utilizing the data, and encourage learning among teachers. In order to effectively and efficiently support the learning of each student, it is necessary to augment the school's organizational educational ability and assessment power using an individual optimum learning support method, as well as to examine the problem confronted by the student him or herself. Significant effort is required to identify how the ability to learn can be cultivated. Through practice, we have tried to clarify the possibilities and challenges related to how the teachers use this system in their classes and how such systems are accepted in schools.

Specifically, students provide their answers on a hard-copy unit test, which was developed to ascertain how closely students' answers matched the aim of the unit. The students' answers are automatically graded by the scan system installed at each school. The data are sent to the cloud server via the network. In connection with the data, subsequent analysis and other procedures are carried out. In each unit test, we analyze not only the incorrect answers, but also

determine whether we can fully understand the problems that were solved correctly using Item Reaction Theory (IRT) and Latent Rank Theory (LRT). We recommend assignments for student improvement according to the individual degree of understanding and points at which a given student experienced difficulty; based on this, we provide the students with comment sheets.
The average correct answer rate for each class, the average correct answer rate for each viewpoint, the ability rank distribution rate for the students, the provision of the number of recommended sheets, the provision of the SP table, and the provision of individual charts for the learning situation of each student are done to the faculty members. Using this system, we examine the following: the kind of practice that was developed in the school, the kind of instruction (such as how to operate in class, how to work during short periods of time in the morning, how to cooperate between home learning and class) that was provided in class, the kind of information between grade levels and efforts to utilize learning information to improve instruction as an organization, and the ingenuity of the shared support system..

RESULTS

The six cooperative schools shared one finding in common: the operation of the system provided opportunities for students to oppose it, to what extent they can ‘do what they can’, ‘why do I understand vaguely’, ‘do not know what I do not know’. As a result of this effort, a certain effect related to the relation between the unit test and the final exam was found. The result was also quantified.

However, with respect to the operation of the system, because the lesson time was limited, it was difficult for the teacher to provide the recommendation sheet for each student in time for he or she to use it in the lesson (securing the time to learn individually). It was said that it was difficult to think about the time to pick up the content that needs to be suppressed throughout the class.

Therefore, depending on the school, 1) using it during the time of morning learning; working on the recommendation sheet, contents that need to be suppressed in the class as a whole are taken in the course, 2) using it as a homework; there is also a way to tackle the recommendation sheet and to take up the content that needs to be suppressed in the whole class in the class.

In addition, since the content of the recommendation sheet that was returned to the students is different depending on the learning situation of a given student, in order to properly support them individually, the flow to do individually is natural. However, when some students were unable to face the problem of recommendation sheets by one person, it was necessary for the teacher to secure time to organize the students in the class. To proceed with the learning activities by connecting learning on an individual basis with the students, based on the desire of students to discuss the recommendations, some classes were seemingly developed.

In this way, depending on the policy of the school and the situation of the class, the ways the information was utilized using the individual result system as well as the ways schools utilized the recommendation sheet were diverse. Therefore, the importance of linking cases of information to changes in learning (conscious and behavioral change) for each student and response in class (idea of improving the instructional method) was given more attention. It was confirmed that the visual method is best for exemplifying variations in operation.

For each student, a recommendation sheet is sent not only to the problem sheet but also to the

student about what is done and what is the problem from the result of the unit testing. However, it became clear that it was necessary to examine the contents of the notation and method to make its handling effective. Students were worried about their scores. At the beginning, the first page was a sheet on which the scores and the problems that could not be solved were listed first. For that reason, a student whose learning situation was not favorable hid the message sheet quickly and did not read it. It seemed that students were concerned about the message being seen by others. Now, the score is written on the last page of the recommendation sheet packet, and before that, ingenuity was given to deliver a message to the students about what problems were solved and what was the issue. Finally, it was revealed that the result of the unit testing, the commentary, and the message were relieved. As a result, we were able to solve each problem related to the recommended comment sheet.

Through the operation evaluation of the individual optimum learning support system, it was getting identified through a hearing meeting regularly conducted whether the essential problem in incorporating the system into the learning activity or the transitional period at the operation trial stage.

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Support of the Students with Learning Difficulties in a Philippines' Poverty Area

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Abstract: Education is not widespread especially in poverty areas of the Philippines. In one area, only 60-70% students of the village can graduate from an elementary school. Insufficient Supports by public organizations make it hard for potential learning disordered students going to school. The goal of this study is to put an end to a vicious circle and to implement environment in which all students, including potential learning disordered students, can study in peace. As the first step of this, I support such students in a poor area of the country and aim to clarify effects and challenges of such practices by analyzing the process. As support activities, I mainly focus on two aspects: 1) improvement of the education, and 2) the support acquisition from a public organization. On educational aspect, I built a special support class within an elementary school ground and decided to give additional classes for potential learning disordered students. The students who had difficulties to learn so far in a usual class were able to learn better by getting support them individually in a special support class. We will report the results of our practice to the Department of Education, and pursue to obtain official support for such efforts. The department of Education generally give supports based on diagnostic results by a hospital; however, we pursue gaining supports by accumulating meaningful results.

Key words: Education, Poverty area, Learning disorder

INTRODUCTION

About 4 years ago, the author worked as a staff for a half year, in an orphanage located in the province of Davao Oriental, and engaged in educational field. Thanks to that, the author got some acquaintances in some schools near the orphanage. While staying at the orphanage in April, 2018, the author talked with a school principal of San Roque elementary school about 15 potential learning disordered students among 1st-6th grades. Teachers concluded themselves that those students could not follow the class however, teachers could not do anything for them. Although there is an act (RA5447, 1968) to support special education in the Philippines, supports from the government are insufficient. Since the author actually experienced working at a support facility for people with mental retardation. With this experience and one in educational field, the author thought that he might be able to do something, hence he decided to face the problem with a school principal. To begin with, the area in which San Roque elementary school located, education is not widespread. Due to that fact, only 60-70% students of the village can graduate from an elementary school. Moreover, it is not sure that all the students with disabilities can have a medical certificate or certificate of the disabled because of a lack of a hospital in their area. To make matters worse, there is no place for the disabled, and there is no public transportation. It is implied that even if they are certified that they have disorders, they cannot

acquire social work services.

METHOD

Department of Education pointed out two things. First one was that there is no environment for potential learning disordered students to study in that school, and second one was that none of student has a certificate of the disabled. Due to these points, there has been no support from Department of Education. That is why the author set up a hypothesis that if we prove that school has environment for supporting potential disordered students and we have accumulated results so far, we will be able to get support from Department of Education. As the step for potential learning disorder students, having discussion with a school principal, in this practice, we set up a special support class in school to give lectures to them

RESULTS

From other school which has a special support class for disabled students, we invited some specialists to San Roque elementary school, to assess 15 students who cannot follow the class, and we made a guidance plan afterwards. It is not certified by Department of Education, hence there is no subsidy and there is no teacher specializing in special support however, 15 students can take a lecture every day. Because of educational system of the Philippines, a lack of the number of attended days and knowledge sometimes prevent students from graduating, a 6th-year student was able to do. In interviews with a school principal and teachers, they said that "without a special class, that student could not graduate from school". As to a Christmas event and Valentine one, they were held by a special support class, and teachers reported that activities to Department of Education. After that, staffs from there visited a special support class, and they positively reacted.

DISCUSSION

We still approach Department of Education in the same way going forward. Notwithstanding if our achievement is not approved, we will have to think of the other way. Since there is a possibility that our practice might break down if a school principal changes, the author thinks that from the perspectives of school, a student's family and student, practitioners need to consider how to organize the influence and problems with establishment of a special support class, and whether they can be regarded as knowledge of research.

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ASummaryoftheResearchonAutonomous LearningbasedoncontentAnalysis

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Abstract:The subject of self-learning involves many fields, and its connotation is rich from different perspectives. In order to sort out the status quo of self-learning in China, this paper uses the content analysis method and takes 415 relevant academic journals as samples from the full text database of China Knowledge Network(CNKI) as the sample to systematically analyze and synthesize the literature quantity,source, research content, etc.

Key words: autonomous learning; content analysis methods; research review

1.INTRODUCTION

The idea of "self-regulated learning" has a long history. When discussing learning itself, more and more people agree that we should follow the objective natural law. Human knowledge or skills are not taught, which can be regarded as learning by ourselves under the condition of "teaching". [1] In today's society, which is experiencing constant changes and profound changes, technology is emerging in various "environments" that can affect students'learning. That is to say, technology is used to influence students precisely and directionally so as to achieve the ultimate goal ofeducation.

2 .Research methods andtools

2.1. Research method

Content analysis is a kind of research method that objectively and systematically quantifies and describes the researchcontent. [2] Thearticleiscompletedinfiveparts:determiningthesubject,definin gthewholeandselecting samples, selecting analysis units, designing category tables, data analysis and conclusion enlightenment. This paper systematically analyses and synthesizes the relevant literature on autonomous learning published in domestic academic journals in 1998-2018 from three aspects: the quantity of literature, the source of literature, the content of research and so on, so as to sort out and summarize the current situation, existing problems and research trends of autonomous learning.

2.2. Objects of study

This paper takes the academic journal literature retrieved on CNKI as the research source. In this paper, the search term is defined as "autonomous learning" and the initial search time is 1998. The search item is determined as "title" and the matching method is "precise". The source of literature was identified as "CSSCI". A total of 415 valid samples were obtained.

2.3. Categories and Analysis Units

Through the study of relevant literature and using the method of category analysis in similar fields for reference, the article identifies the analysis category as follows: basic research on Autonomous learning, research on autonomous learning behavior (intervention) ability (training), research on autonomous learning mode, research on application practice environment ofautonomous learning and others.

The analysis unit of this paper is an independent literature. Because literature may contain many aspects of research content,its evaluation is classified according to its research focus.

3.Research results and analysis

3.1. The quantitative analysis ofself-regulated learning literature can befound in Table 1.

Table 1

1998	1	2009	34
1999	3	2010	34
2000	6	2011	36
2001	6	2012	29
2002	8	2013	27
2003	11	2014	25
2004	14	2015	14
2005	13	2016	18
2006	29	2017	18
2007	31	2018	13
2008	45	Total	415(articles)

This paper searches CNKI to analyze the current situation of self-regulated learning in China in the past 20 years. Overall, from 1998 to 2005, the research on self-regulated learning showed a steady upward trend. At this stage, on the one hand, combing and quoting the basic theories of foreign autonomous learning has just begun. For example, Pang Weiguo (1999, 2000, 2001); on the other hand, the understanding of the connotation of autonomous learning focuses on improving teaching efficiency with curriculum reform, so that students'academic performance in school can be improved. The cultivation of students'autonomous learning ability is mostly embodied in the macro principle, that is, from the perspective of education, we should advocate the cultivation of students' autonomous learning ability. The intervention of students'autonomous learning behavior, the construction of an environment conducive to students' autonomous learning or the implementation of a teaching model based on autonomous learning laws are also just involved. It can be said that this stage is the initial stage of the study of self-regulated learning in China, and all fields have initially taken the first step of combining self-regulated learning with this major.

From 2006 to 2008, the number of self-regulated learning articles increased dramatically,

reaching a climax in 2008. The number of documents in these three years accounts for nearly a quarter of all documents. In addition to the field of education, psychological science, language learning, educational technology and other fields have carried out a lot of research on self-learning and achieved results. At this stage, the general understanding of autonomous learning and the emphasis on the concept of autonomous learning have been enhanced. As a good learning material to cultivate students'autonomous learning ability, language discipline, and in 2007, the Ministry of Education included the cultivation of autonomous learning ability as an important educational goal in the English education syllabus of our country. At this stage, more papers have been published in the English field. For the application environment of autonomous learning, it is no longer limited to classroom teaching. For network learning, distance learning, teaching of students in remote areas, teaching of different subjects and teaching research of students of different ages are deepening. The understanding of self-regulated learning is profound and micro, and the scope of application of self-regulated learning is constantly broadened. At this stage, the results of many fields are also constantly learning from each other and influencing each other, such as from the micro-perspective of meta-cognition, learning motivation, self-efficacy and the relationship between students'autonomous learning ability and gradually began [1]. Overall, the three-year research has broadened the horizon and opened up a new path for the study ofautonomous learning.

From 2009 to 2018, except for the two nodes in 2011 and 2015, the number of self-regulated learning papers is generally stable and declining. In this stage, the scientific and normative breakthroughs have been made again, except for further research. Many scholars have made empirical studies on the relationship between autonomous learning ability and micro-factors such as motivation and learning strategies (Ni Qingquan, 2010). It is worth mentioning that many achievements have been made in the field of educational technology at this stage. For example, an experimental study on the effect of teaching video presentation on autonomous learning (Wang Jian, 2014). Self-regulated learning research in distance education (Zhao Hong, 2014), self-regulated learning research in reverse classroom (Liu Zhengxi, 2015), and self-regulated learning research in the context of big data and Internet information technology show that self-regulated learning research is diversified, in-depth and advancing with the times.

3.2. Analysis ofJournals from Document Sources

According to statistics, 415 articles aredistributed in 105 CSSCI journals, as shown in table2.

table2

Various journals （64articles） （15%）	Jiangsu Higher Education	2		Educational Review	15
	Journal of Southwest University of Famous Nationalities	3		Educational Theory and Practice	24
	Journal of Capital Normal University	3		Other	6
	Journal of Ningxia University	3	Language field （62articles） （15%）	Foreign Language Research	5
	Heilongjiang Researches on Higher Education	21		Foreign Language Teaching	7
	Other	32		Chinese Foreign Language	8
Psychological field （12articles） （3%）	Psychological Science	7		Foreign Language and Foreign Language Teaching	12
	Other	5		Foreign Language Community	21
Education （101articles） （24%）	Educational Science	3		Other	9
	Modern University Education	4	Educational Technology （159articles） （38%）	Journal of Distance Education	4
	Research on Open Education	4		Modern Distance Education	9
	Higher Education in China	4		Distance Education in China	15
	Educational Research	5		E-education Research	28
	Global Education Outlook	5		Modern Educational Technology	29
	Courses, textbooks and teaching methods	5		Media in Foreign Language Instruction	30
	Educational Exploration	6		China Educational Technology	38
	University Teaching in China	7		Other	6
	Chinese Journal of Education	13	Other（5%）		17
			Total（100%）		415

Statistical results for journals with more than 10 papers areshown in table3.

table3

Source journals	Number of articles published	Percentage
Foreign Language and Foreign Language Teaching	12	2.9%
Chinese Journal of Education	13	3.1%
Distance Education in China	15	3.6%
Educational Review	15	3.6%
Heilongjiang Researches on Higher Education	21	5.0%
Foreign Language Community	21	5.0%
Educational Theory and Practice	24	5.8%
E-education Research	28	6.7%
Modern Educational Technology	29	7.0%
Media in Foreign Language Instruction	30	7.2%
China Educational Technology	38	9.2%
Total	246	59.1%

Statistics show that the literature related to autonomous learning is concentrated in the fields of psychology, education and teaching, linguistics, educational technology and other fields such as library services or modern management. More than 30 regional or university journals have published literatures on Autonomous learning. Regardless of the areas with abundant educational resources or areas in urgent need of improving educational level and resources, different studies have been made through the analysis of autonomous learning, and the research on autonomous learning has a certain degreeofattention.

Self-regulated learning falls essentially on the point of "human learning". Psychological subjects generally study self-regulated learning behavior or ability from a psychological point of view, trying to explain or explore the factors affecting self-regulated learning from this point of view, so there is a certain amount of publication in this field. It is worth noting that most of the domestic scholars mainly refer to the research results of foreign countries to sort out the psychological model ormechanism ofautonomous learning.

As one of the biggest environments for students to grow up and receive education, schools, which account for 24% of the publications in the field of education, also show that they attach enough importance to self-learning. The focus of this field is to enable students to complete their school studies more autonomously and efficiently through the cultivation of autonomous learning and the promotion of autonomous learning teaching mode. Through the teaching concept based on the idea of autonomous learning, we gradually reform the original teaching methods, and constantly approach the "student-centered" classroom construction.

In addition, due to the good classroom environment, empirical research accounts for a large proportion of the papers. Empirical studies have been carried out on many micro-factors affecting autonomous learning, such as students'meta-cognition and learning motivation. It is worth noting that whether the improvement of students'performance is directly equal to the cultivation of students' autonomous learning ability, which is worthy of in-depth study.

Educational technology is one of the most important fields of autonomous learning research institutes. Audiovisual Education in China is the most frequently published periodical on Autonomous learning. This field not only explores the connotation of self-regulated learning, intervention in students'self-regulated learning behavior and cultivation of self-regulated learning ability, but also takes self-regulated learning as a goal or a necessary means to solve some practical problems such as recognition of distance education, network education, education in special areas and people. The literature also involves the combination of autonomous learning and mobile learning, flipping classroom or cooperative inquiry learning and other new learning methods. The development and application of self-regulated learning environment, such as website development, educational services, intelligent platforms, which are beneficial to students'self-regulated learning, are studied and discussed.

Generally speaking, the research on Autonomous Learning in different fields has its own emphasis on the analysis and integration of autonomous learning from different perspectives and different situations. There are many factors involved in the study of autonomous learning, and the wide scope of the study can not represent the depth of the study. How to use the research results to guide practice, if we combine the results obtained from different entry points to guide the front-line teaching and the cultivation of students'autonomous learning consciousness, we

still need to make continuous efforts.

3.3. Content Analysis ofSelf-regulated Learning Research

The text categorizes and analyses the literature according to the basic research of autonomous learning, autonomous learning behavior (intervention) and ability (training), the construction of autonomous learning model, and the application research of autonomous learning. The specific data are shown in Table 4. Table 5 is organized according to the research object, subjects and application environment ofautonomous learning.

3.3.1. Basic Research on Autonomous Learning

Fundamentals and theories are the important cornerstones of any research. From the data point of view, the theoretical basis of autonomous learning accounts for about 13% of the search literature. There is no lack of articles of high academic value. After reading, we find that the connotation of autonomous learning is very complex and rich. From different perspectives, such as curriculum theory, pedagogy or learning theory, the analysis of autonomous learning will be different. From the perspective of human individual development, the formation of autonomous learning ability and the occurrence ofautonomous learning behavioralso have different definitions.

Generally speaking, autonomous learning is regarded as a way of learning, a common learning behavior or an ability that can be gradually developed. Pang Weiguo, a Chinese scholar, generalizes autonomous learning as "learning ability" based on the development of self-consciousness, "wanting to learn" based on students'intrinsic learning motivation, "learning ability" based on students' mastery of certain learning strategies, and "persistent learning" based on willpower and effort. And this process or nurturing path is continuously influenced by the individual's environment and interaction with the environment, self-monitoring and results.

In the theoretical research of self-regulated learning, the adaptation and combination of self-regulated learning and educational concepts account for a large proportion ofthe literature.

table4

Analysis Categories		Number of articles	Total （Proportion）
Basic Research on Autonomous Learning	Basic concepts and theories	15	54（13.0%）
	The Idea of Independent Learning and Educational Thought	16	
	Self-regulated Learning Assessment and Scale Development	14	
	A Summary of Research on Autonomous Learning	9	
Self-regulated Learning Behavior (Intervention) and Ability (Training)	A Survey of Students'Self-regulated Learning Level	9	211（50.6%）
	The Orientation and Intervention of Teachers'Role	29	
	Optimizing Self-regulated Learning Environment and Providing Resources	20	
	Micro-influencing factors of autonomous learning	55	

	Macroscopic Influencing Factors of Self-regulated Learning	18	
	Other entry points	41	
	Principle Suggestions on Cultivating Self-regulated Learning Ability	39	
Research on Teaching Model and Resources Based on Self-regulated Learning	Teaching Reform Experiments	15	91（22.1%）
	Construction of Teaching Model Based on Self-regulated Learning	27	
	Autonomous Learning and Relted Concepts	19	
	Development and Utilization of Self-regulated Learning Resources and Environment	30	
Autonomous Learning and Application Environment	Autonomous Learning in Network Environment	29	51（12.3%）
	Autonomous Learning System Based on Information Technology	10	
	Distance Education Environment	12	
Other		8	8（2.0%）
Total		415	415（100.0%）

table5

Subject		Object		Mode	
Chinese	8	children	4	Classroom	40
Mathematics	7	Primary school	6	Distance Education	28
English	130	Junior High School	12	Computer-aided	17
Physics	5	Vocational school	8	Network Teaching	60
Chemistry	2	Undergraduate	65	Information technology support	17
Biology	1	Adult	7	Special areas	10
Politics	5				
History	3				
Geography	2				

The good combination of self-regulated learning and educational concept can sufficiently adapt to the rapid changes of modern society and put forward new requirements for people. In today's information-filled society, in order to break through the maximization of personal value, autonomous learning ability has gradually become one of the basic abilities. In the evaluation and scale compilation of self-regulated learning, many scholars give the evaluation methods of self-regulated learning from the macro perspective (Pongweiguo, 2003) or the micro-factor scale compilation (Zhu Zude, 2005).

Generally speaking, this part of the literature can fully explain the concept of autonomous learning and the value and significance of autonomous learning. However, because most of the psychological mechanisms and models ofautonomous learning come from abroad, this partofthe research has been restricted to a certain extent.

3.3.2. Research on Self-regulated Learning Behavior (Intervention) and Ability (Cultivation)

The ultimate goal of autonomous learning research is to change students'behavior and cultivate their consciousness. This partis the focus ofautonomous learning research, accounting for 1/2

ofthe total literature.

This paper holds that the intervention of autonomous learning behavior and the cultivation of autonomous learning ability are two different concepts, but they do not exist independently. They are all part of their respective systems. Scholars pay more attention to four aspects: micro or macro factors, the role of teachers'involvement and positioning transformation, the construction ofautonomous learning environment and resources.

Among the micro-factors affecting self-regulated learning, they focus on meta-cognition (Zhang Li, 2009), learning motivation (Ni Qingquan, 2010), goal setting (Yang Hong, 2012), learning strategy (Liu Yuhui, 2010) (Zhang Yongsheng, 2008). It reflects the psychological state of students who want to learn, can learn, and can self-monitor in the process of self-regulated learning. Among them, a large proportion of empirical studies have proved that micro-factors can effectively affect students'autonomous learning behavior. In addition to the above factors, some scholars mentioned that individual psychological states such as personal will, self-efficacy, feedback ability to results, experience, sense of belonging to the environment, self-esteem and so on all affect the effect of autonomous learning to a certain extent. Macroscopically, cultivating students'autonomous learning refers to creating a suitable environment and teaching methods for autonomous learning at the classroom level by using different teaching modes. Take students as the center, fully mobilize the enthusiasm of students, guide students to enter the situation and mobilize their initiative to solve problems, and complete independent learning.

Apart from the shaping of classroom environment and the improvement of traditional teaching mode, it is also one of the focuses of researchers to provide suitable environment and high quality teaching resources for autonomous learning. The use of computer-aided, mobile phone and media, teaching media based on information technology provide an opportunity for cultivating self-learning; library services, digital game learning, personalized learning recommendation system, the integration of the network environment, the diversified provision of network courses, etc. to a certain extent, meet the needs of self-access and self-learning resources. Prerequisites for successful autonomous learning. In the process of training, other entry points, such as the presentation mode of video and courseware, the change of students'psychological state, small class teaching, the design of learning materials, teaching monitoring and special teaching methods, also provide a model for the combination of theory and practice.

In this part, besides the environment, resources and the status of students themselves, teachers'positioning and role transformation also have sufficient amount of publication. It should be acknowledged that although "student-centered" is advocated, the responsibilities and roles of teachers can not be replaced by autonomous learning, but the orientation ofteachers should also be adapted to change [4].

3.3.3. Research on Teaching Environment and Resources Based on Self-regulated Learning

In cultivating self-regulated learning ability, we need to pay attention to many factors, and pay attention to the construction of learning environment and the provision of resources. What kind of resources can be provided, what kind of learning environment can be constructed, and what kind of teaching mode can be designed to continuously promote the cultivation of self-regulated learning scientifically? This part of the article can give the answer. The research on

teaching environment and resources based on autonomous learning accounted for 22.1% of the total literature. Combining the psychological mechanism of self-regulated learning with the cultivation path of self-regulated learning ability, this paper studies and designs "self-regulated classroom" which is different from traditional teaching mode, self-regulated learning model based on personal learning environment (Yu Xiaohua, Zhu Zhiting, 2013), self-regulated learning platform based on Web (Pan Qinghong, 2011), and personalized learning push clothing. Intelligent tools and platforms such as business and intelligent network course platform.
Self-regulated learning, as an ability, is not used by students independently. Faced with different situations, students should also be able to transfer or combine their autonomous learning ability. Research shows that critical thinking, mobile learning, innovative cooperation and collaboration, inquiry learning should be combined with autonomous learning ability, which can better enable students to build comprehensive ability application and core literacy.[5]

3.3.4. Research on Autonomous Learning and Application Environment

The study of this plate accounts for 12.3% of the total literature. In addition to the traditional classroom research on students'autonomous learning behavior or ability, most of them focus on the network environment of autonomous learning and distance education environment. Because autonomous learning emphasizes students'autonomy and mastery of autonomous learning ability. In the network environment and distance learning environment, that is, the learning environment lacking guidance and needing autonomous learning ability most, the students who do not have autonomous learning ability are the ones who use these environments to study. Only by coordinating this contradiction can we make self-regulated learning not only conform to the idea of learning law in the classroom, but also solve more practicalproblems in self-regulated learning research.

Combined with Table 5, it is not difficult to see that autonomous learning research is more focused on the subjects of English and undergraduate education. Individual development and the development of self-regulated learning ability is not overnight.It's a gradual process.In order to cultivate students'autonomous learning ability, we must take into account all the influencing factors. Moreover, in the face of different students'baselines and training objectives, make practical adaptation.

4.Summary andEnlightenment

Through the analysis of self-regulated learning in China, it is found that in the first 10 years of self-regulated learning research in the past 20 years, it has been growing, but it has been slowly decreasing since 2008. The research of autonomous learning has been deepening and the research and practice environment has been expanding. From the point of view of the source journals, autonomous learning is still a research topic involving many fields, and its research direction is in accordance with the characteristics of the field. In the field of education, most of them focus on the teaching and classroom reform based on the concept of autonomous learning; in the field of English, most of them are empirical studies through English classroom practice; in the field of educational technology, most of them are based on Autonomous learning. The concept of resource design and environment construction, special teaching environment ofself-learning research.

From the content of the study, although the cultivation of self-regulated learning ability accounts

for half of the total literature. However, in terms of the results of the study, most of them are macro-opinions with strong reference and principle. The completion of students'autonomous learning behavior is not equal to the improvement of their autonomous learning ability, and how to evaluate the changes of students' behavior and ability should be paid more attention. In the process of resource design and environment construction, the current achievements can meet the external environment conditions required by students'autonomous learning to a certain extent, but whether the cultivation of students' autonomous learning ability is a dynamic process of change, and how resources and environment affect the interaction between students and students deserves further mention. Rise. The combination of school education and self-regulated learning accounts for a large proportion, but the research on self-regulated learning in network environment, distance teaching environment and information technology media environment is a hot topic in recent years, which deserves sustained attention.

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Visualizing Students' Emotional ExperienceofLearning: Based on Large Data of Artificial Intelligence in Classroom

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Abstract: The "artificial intelligence assistant in classroom"(AIAC), which was developed by Hangzhou No.11 High School of Zhejiang Province and Hikvision, is a prominent case of artificial intelligence education practice in China. The AIAC could record the big data of 7 kinds of every students' expressions during the learning process in classroom. With the analysis of classroom videos, we combines three kind of expressions (disgust, anger and fear) to be one simply kind of disturbance, which could be easier for teachers' understanding and visualizing to students' emotional experience. Therefore, a five-dimensional analysis framework for students' emotional experience in classroom, including surprise, happiness, neutrality, sadness, and disturbance, is constructed by us. This framework could be used to visualizing students' emotional experience of learning with large data through AIAC, and we also found the difference between boys and girls' emotional experience of learning.

Key words:Emotional experience, Student learning,Visualization,Big data, Classroom

INTRODUCTION

In recent years, the integration of international artificial intelligence and education has emerged in an endless stream. Countries have formulated corresponding policies, advocated for forward-looking research related to education and artificial intelligence, and accelerated education reform and innovation in the intelligent era. In October 2016, the White House released an important report entitled "Preparing for the Future of Artificial Intelligence" and "National Artificial

Intelligence Research and Development Strategic Plan" . In 2018, the Ministry of Education issued the "Innovative Action Plan for Artificial Intelligence in universities" to promote the development of artificial intelligence from the field of higher education. In February 2019, "China Education Modernization 2035" was released, and proposed to acceleratethe education reform in the information age and build intelligent campuses.

Under the guidance of policies, many regions and schools have tried and explored intelligent education to promote the overall development of students, and to establish a human-machine collaborative teaching model, learning environment and monitoring system. Using the intelligent system to obtain a large amount of teaching data, through the data collection and mining, the teaching behavior, emotional experience, language feedback and even the test situation of the teachers and students in the classroom are visualized. Based on the integration and analysis of data, the strategy of teaching is optimized, the burden on teachers is reduced, the enthusiasm of students is stimulated, and the rational allocation ofeducational resources is realized.

RESEARCH REVIEW

Emotionalexperience of Learning

In the process of learning, emotion is an important factor to stimulate students' motivation and promote learning cognition. Emotion is closely related to learning cognition, which affects learning behavior, mainly in the following two aspects: First, emotion directly affects personal cognition Improve learning behavior and embody the promotion function of emotion; Second, emotion indirectly affects cognition and behavior by means of learning motivation, and expresses the enhancement function of emotion (Xu Lili, 2018). Emotional depth determines the intensity of emotions. The two can be mutually common in one-way dimensions. For example, happy emotions can express positive emotions, while sad emotions reflect reverse emotions. Among them, emotional classification generally adopts discrete and continuous methods. Discrete type has six basic types of emotions: anger, disgust, fear, happiness, sadness and surprise (Ekman & Power, 1999), while continuous type produces various types in different time series.

Based on the discrete emotion classification, this study combines the student's actual emotional data to set up a five-dimensional sentiment analysis framework, and handles the positive and negative emotional changes ofstudents in different time periods.

Large Data of Artificial Intelligence in Classroom

In the late 1950s, the Dartmouth Society proposed the new technical science of artificial intelligence to simulate, research, develop, and expand human intelligent behavior and thinking processes. Artificial intelligence is driven by cloud computing, using big data as a raw material for deep learning, and using a series of neural network models to solve complex problems (Wu Zhengshuai, 2019), and gradually applied to various fields. In school, teachers can use a variety of digital devices and software to collect students' behaviors, language and expressions in real time, and to understand the specific conditions of students through the calculation and judgment of artificial intelligence, such as the concentration, enthusiasm, and effectiveness ofhomework.

Through artificial intelligence teaching, education methods can be diversified, individualized learning methods can be developed for students, effective learning patterns of students at different levels can be analyzed, space constraints can be broken, and effective links between

teachers and students can bestrengthened.

RESEARCH DESIGN

In this section, we will introduce how we designed our research. This section describes our research questions, data processing, and how we use datato analyze student emotional changes.

Study question andassumptions

The study analyzes the immediate expressions of students in classroom teaching. We mainly study the following issues:

1. How can we classify the level of students' emotional experience of learning, based on Large Data of Artificial Intelligence in Classroom?
2. What are the features and categories of the students' emotional experience of learning in a lesson, after they arevisualized?
3. What are the differences between boys' and girls' emotional experience of learning in a lesson, after they arevisualized?

This study is a descriptive study that focuses on the study of student emotional changes in the teaching process supported by classroom artificial intelligence. It is undeniable that the limited dimension of the case inevitably affects the representativeness, and the results of the survey are not comprehensive enough,indicating that more research is needed.

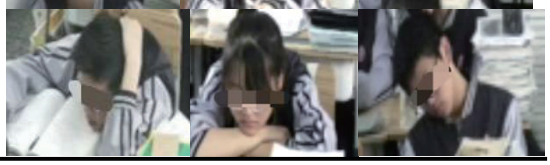
- Analysis of students' emotional experience in classroom teaching is based on the following assumptions: .Students' emotional experience oflearning can be classified for several levels.
- Students' emotional experience oflearning in a lesson can beclassified for different categories.
- Boys' and girls' emotional experience oflearning are different to each other.

Emotionalvalue of learning

With the gradual application of educational technology at home and abroad, a large number of resources have been rationally organized, and the relationship between teachers and students has been paid more attention. The emotional experience of students directly affects learning efficiency, learning outcomes, educational concepts and educational models. (Pu Tianjiao,2018) The expansion of theoretical hypotheses in multimedia learning has initiated research including emotional measurement (Moreno, 2006; Moreno & Mayer, 2007) internationally recognized theory: The emotions-as-suppressor-of-learning hypothesis postulates, which assumes Emotions can jeopardize learning, while emotion-learning facilitators assume that emotions can lead to better learning outcomes (Lisa Knorzer, Roland Brünken, Babette Park, 2016).

The validity of the hypothesis is supported by further theoretical considerations. These considerations explain How emotions affect cognitive processes and learning outcomes (eg, Pekrun, 2006) Visualize the emotional experience of students during class, quantify the expression of students so that they can draw sums on the timeline, we assign each expression, as shown in Table 1.

Table 1. Emotional value framework of learning.

Score	Description	Example of students' expressions
2 Surprise	The astonishment you feel when something totally unexpected happens to you.	
1 Happiness	Emotions experienced when in a state of well-being.	
0 Neutrality	Neither too great nor too little.	
-1 Sadness	Emotions experienced when not in a state of well-being.	
-2 Disturbance	An unhappy and worried mental state.	

Artificial in telligence equipment in classroom

The artificial intelligence assistant conducts real-time statistics on the emotions of the students during the classroom learning process, and classifies all the expressions of the students into the following seven categories: surprise, happy, neutral, sad, angry, disgusted, and afraid. Considering the error of the emotion in the single dimension of the expression, the study combines the classroom video discourse to accurately analyze the emotions. We combine three kind of expressions (disgust, anger and fear) to be one simply kind of disturbance. Thus, we construct a five-dimensional analysis framework for students' emotional experience in classroom, including surprise, happiness, neutrality, sadness, and disturbance. Among them, the study set surprise, happiness for the positive expression, score 2 points, 1 point; sadness, disturbance for the negative expression, score -1 point, -2 points; and neutral expression is 0 points. Then, count the captured student's expression, and calculate the total score and the mean value, and analyze the overall trend of the student's emotions and the positive and negative trend of the emotions. In addition, for the three students with the most expressions in one class, the expression total score and the mean value werecalculated and analyzed.

Taking into account the accuracy of the data, we calculate the similarity of all the data, based on the cosine similarity method, using the following formula to calculate:

$$cos\theta_{A_C} = \frac{\sum F_A \times F_C}{\sqrt{\sum F_A \times \sum F_C}}$$

Among them, F_A is the expression captured by the camera, and $.F_C$ is the expression standard set by the system.

After calculating the similarity ofeach expression, the datawith the similarity of 80%or more is selected as valid data, and further quantitative analysis is performed as a raw material.

The AI intelligent teaching assistant system consists of panoramic camera and cruise camera. The panoramic camera can record the whole situation of the whole class. The camera is installed in the center of the front of the classroom, and the problems such as offset of the key monitoring area or uneven image restoration are eliminated. Instantly update the student's classroom learning, understand the student's feedback on the teacher's lectures, and the overall student's state changes as the classroom time changes, as shown in Figure 1.The cruise camera will capture the expression of each student in the class in one minute, transfer the expression to the background for micro-expression analysis, and classify the expression according to the program, as shown in Figure 2.

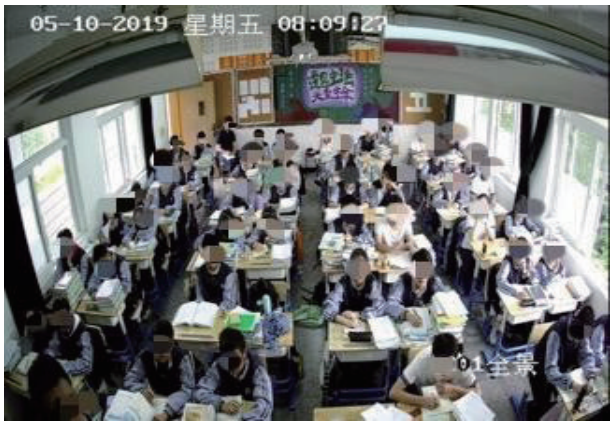


Figure 1. The platform ofall the class



Figure 2. The platform of1/8 class

PS: “星期五 ”, “全景 ” and “抓拍 ” are chinese words, which mean Friday, overall view and catch (1/8 class).

Participants

1.On May 10th, the students of the 201 classroom in Hangzhou No.11 High School of Zhejiang Province, 8:06:03-8:47:34.Theoretically, the expression of 43.4≈ 43 students can be detected in one minute. Almost the whole class can be photographed in one minute. Some students bow their heads and their expressions areinvalid.

2. 12 experts from relevant fields were selected to participatein the questionnaire survey. And the Delphi expert survey method was used to conduct three rounds of opinions and validity collection. Determine the coordination coefficient ofexpert opinions W=0.7, repeatthe questionnaire survey process until the consensus level of expert opinions reaches the coordination coefficient.

Lesson samples

The expressions of the students who attended class between 8:06:03-8:47:34. The expression data is segmented. Due to various factors such as technology and data, it is time-sampling. The amount of data is relatively large and scientific. We screened the collected expression data and selected data with similarity ofmore than 80% as valid data for visual analysis.

RESULTS

We processed the student expression data to get the overall expression statistics for the class:

Table 1. Student Expression Summary

Expression	Score	Number	Total score
Surprise	2	83	166
Happiness	1	362	362
Neutrality	0	1236	0
Sadness	-1	181	-181
Disturbance	-2	121	-242
Sum	-	1983	105

According to the time series of the class students, the expressions are changed, and the overall trend of students' classroom learning emotions and the trend of boy and girl students' classroom learning emotions areobtained.

Theoverall trend analysisof student emotions

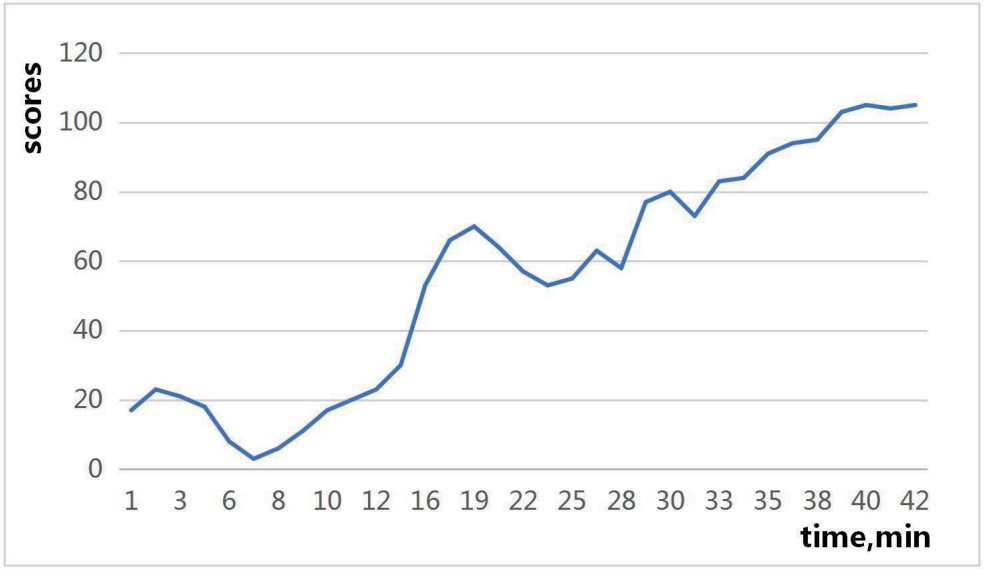


Figure 3. Overall trend ofstudents' classroom learning emotions

In the overall trend of Figure 3, we classify the trends into the following four categories: emotional increase, first increase and then decrease, first decrease and then increase, and emotional decrease, and indicate the corresponding time period.

2-8 minutes after class, we clearly see a very obvious emotional decrease from Figure 3. Combined with video and voice recording, we found that the students just returned to the classroom after the morning exercise, and did not have the feeling of learning. In addition, the math teacher reviewed the previous knowledge quickly and accidentally made amistake, which led to the result.

8-17 minutes after class, the overall student sentiment increased. During this time, the teacher gave a new method of summing up the summation: the divisional summation method, and firstly gave examples for students to think and explore. The new method has attracted the attention of students. In the process, the teacher also adopted a two-person collaboration method to give students the opportunity to discover and analyze problems.

17-26 minutes after class, from Figure 3 we can see that the whole class has more mood swings, and the overall situation is first decrease and then increase. In this process, the teacher firstly conducts a guided exploration of the examples of the divisional summation method, giving students the opportunity to discover problems and think about problems. This knowledge is difficult for most students, so students are less motivated in class, especially in the self-exploration stage, and the mood is low. Then, in the process of the teacher explaining the example, the students have a certain understanding of the knowledge, and the emotion is slightly Increased. After the teacher started the teaching of the dislocation subtraction method, many students have a certain impression on this method. The discussion and exploration are relatively smooth, and the method is easier to understand and remember. The students' enthusiasm is generally higher, and the emotional trend is upward.

26-33 minutes after class, we can see from the picture that there are two small " first increase and then decrease ". During this period of time, when the teacher taught the dislocation subtraction method, two questions were put forward: 1. why did the second item of the new series formed by the subtraction of the misalignment begin to use "[(primary + tail phase)] * phase number / 2"? 2.ask the students to summarize the dislocation subtraction method? The two thought questions caused the students to have a short-term emotional decrease, but because the two thinking questions are not difficult, and the students have the basis for learning the method, the students quickly answered, and the teacher quickly gave feedback, and the emotions increase rapidly. Therefore, two small paragraphs of “first increase and then decrease” are formed.

33-42 minutes after class, the teacher explained the examples of the dislocation subtraction method. The students' attention was concentrated stably, and the overall mood is increasing steadily. Moreover, the examples were closely related to the previous knowledge. The students understood easily. Many students also responded positively. After the example is explained, the teacher gave similar exercises for the students to practiceimmediately. At this time, the students are in astate ofserious problem-solving. Trendanalysisof boys' emotions

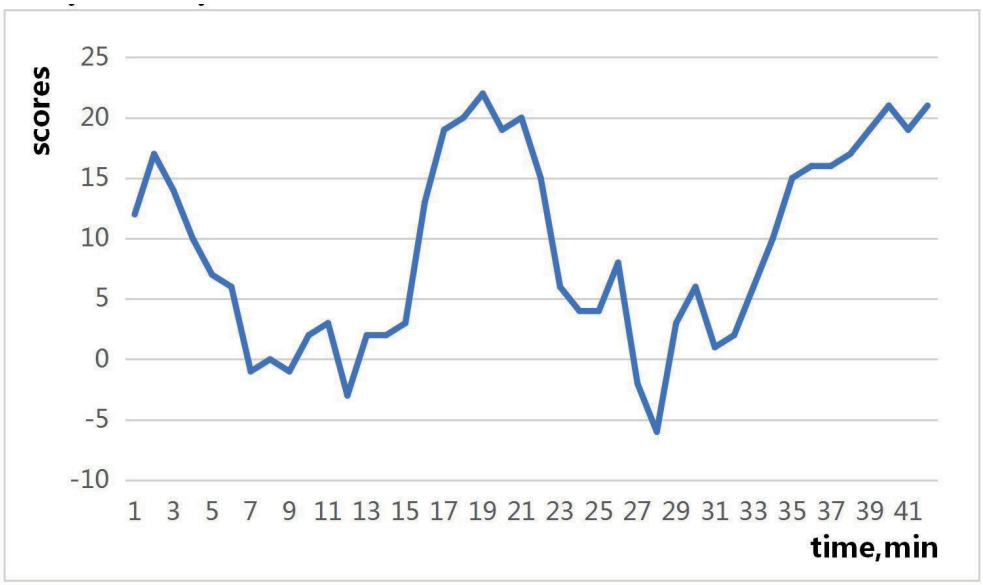


Figure 4. Trend ofboys' classroom learning emotions

From Figure 4, we can see that the overall emotional experience of boys is not high, the range of emotional scores only fluctuates between -10 and 25, but there is a trend of greater fluctuations.

Through communication and observation in the teaching process, we found that boys are not stupider than girls, but they don't like mathematics, and even can't sit still, and are easily interfered by the outside world, that is, boys' ability to resist temptation is not as good as that of girls. This coincides with the mathematical learning emotional problems we have studied. We found that the three emotional peaks of boys were between 2-4 minutes, 17-21 minutes, and 39-41 minutes. Between 2-4 minutes, the students just finished the morning exercise, most of the boys are still in the mood of excitement, just started to have a fresh sense of class, the mood increased slightly, and reached the first peak, but since the teacher Quickly entered the review stage, and inadvertently said a wrong topic, making the boys' class mood drop. Between 17 and 21 minutes, the teacher gave a simple thinking question and let the students learn collaboratively. Compared to the girl, the boy seems to prefer the activity and quickly answer the teacher's question. Some boys have answered. Regardless of boys and girls, success is closely related to their mathematics achievements. High school students enjoy the joy of solving math problems, and boys prefer to express their sense of success, while girls are relatively restrained (Li Lingyu , 2016). Between 39 and 41 minutes, the teacher gave a simple feedback on the dislocation subtraction method. Most of the students have mastered this method basically. The answer is quick, the effect of the problem in the class is better, and considering the reason for the class, Students have higher emotions. In Figure 4, we can also find two low peaks of emotion, between 11-13 minutes and 27-29 minutes. In these two time periods, the teacher is commenting, and two harder thinking questions are given during the commentary. Compared with girls, boys are more likely to have feelings of inferiority and anxiety.

Trendanalysisof girls' emotions

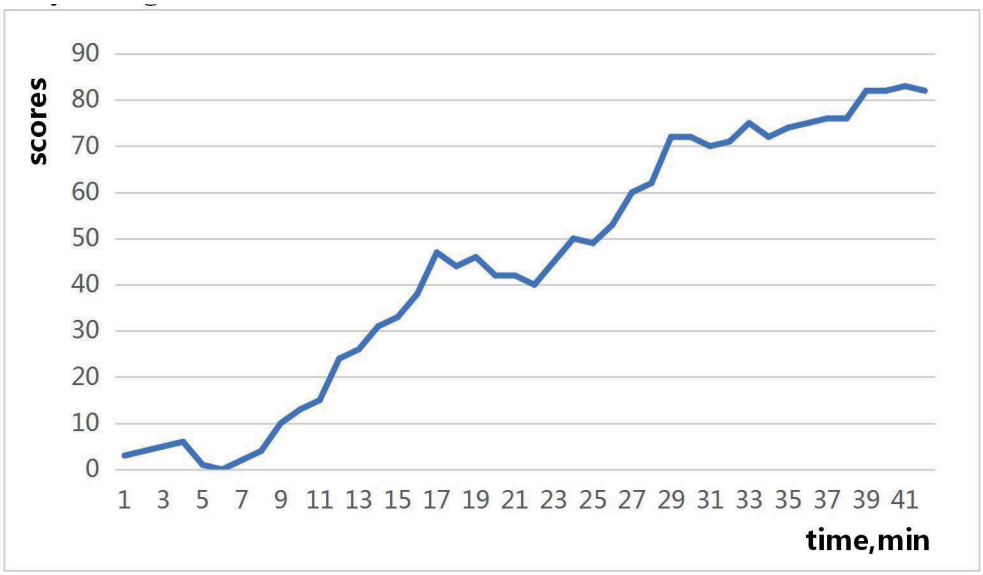


Figure 5. Trend ofgirls' classroom learning emotions

From Figure 5, we can see that the emotional value of girls is larger, and the overall mood is increasing. Compared with the emotional value of boys, it is higher, and the emotional fluctuation of girls is less in a short time. In the figure, we can see that the three periods of obvious emotional growth are between 7-17 minutes, 22-29 minutes, and 34-42. In 7-17 minutes, the teacher explored the distribution summation method, and gave examples to let the students think. In the face of a new problem, the girls apparently focused more and quickly entered the state of exploration. As the guidance of teachers their emotions continues to rise. In 17-22

minutes, girls' emotions generally declined. During this period, students are in the collaborative learning process. It shows that girls' ability to collaborate and interest in collaboration seems to be inferior to that of boys. Between 22 and 29 minutes, the teacher explained the dislocation subtraction method. The students have a certain relevant foundation. This part of the study is easier and the mood rises. Between 34 and 42 minutes, in the process of explaining the topic, the teacher intentionally guides the students to take the initiative to explain the steps and methods of solving the problem. The girl's speech ability is generally better than that of the boy, and they are more excited when they are expressed, and their organization is clearer. This is consistent with the 2003 International Student Assessment Program, where girls generally achieve higher scores in reading and writing tests, which may be related to a feminine educational environment and different learning expectations for boys and girls. (Lian Rong, 2019). Overall, the willpower ofgirls in class is generally stronger than that ofboys.

DISCUSSION

We divide students' expressions into five kinds of surprise, happiness, neutrality, sadness, and disturbance, and analyze and summarize the emotional time series of students based on the five-dimensional analysis framework. Further, we can refine the expression more refinement, define the boundary standard, divide the pleasant emotion into several degrees, and the sad emotions are divided into several degrees in the same way, so we can understand the micro-change of the student's expression more carefully. At the same time, we will delve into the causes of students' micro-changes and form a teaching model that is more suitable for students.

The students' mood in class is generally increasing, but in the middle and late stages of the class, most students are tired of learning and emotional fluctuations, and the teaching methods of teachers also greatly affect students' emotions, such as collaborative learning in this class. A simple change in teacher teaching style has made students' emotions rise significantly. Research can further explore a variety of teaching methods, through the analysis of students' emotional experience changes, to understand the advantages and disadvantages ofdifferent teaching methods.

In this study, we found that the emotional changes of boys and girls are completely different. The overall emotional experience of boys is not high, and the fluctuations are more, while the girls' mood swings are less, and the overall situation is increasing. This is directly related to gender differences, and research can be further categorized into different emotional changes in boys and girls in different types of math classes.

CONCLUSION

According to the expression big data, we form a five-dimensional analysis framework, which divides all expressions into five categories. Through data processing, we find that the emotional experience of students shows different fluctuations with time series. The general mood of boys is not high, and the fluctuation is obvious. The girls generally showed an increasing mood. Throughout the classroom teaching process, students' expressions are in a neutral state most of the time. In the overall trend of students' classroom learning emotions, we can see that students have lower expression scores after the start of the class, and it is difficult to enter the classroom state quickly. Teachers can design interesting classroom activities to attract students' attention to make it quickly enter the learning mode, complete the transformation from driving to immersion.

With the change of teachers' teaching design, students' emotions are prone to fluctuations, especially the activity type design, which is easy to attract students' attention. For the teacher to explain the link, the student's emotion has a great correlation with the difficulty of explaining the content. When the students have a certain relevant foundation for the new knowledge, and the understanding is not difficult, the students' emotions are generally higher, and the boys often have the answer. The teaching atmosphere is strong, which is related to the fact that boys prefer to express their own sense of success, while girls are relatively restrained. It is worth mentioning that the emotional value of girls in the class is generally higher, the willpower is better, the boys are fluctuating, and they are prone to emotional peaks and low peaks, and the overall emotional score is not high.

Acknowledgements

We would like to thank the students, teachers, and staff of Hangzhou No.11 High School and Hangzhou Hikvision Digital Technology CO., LTD for their invaluable support ofthis project.

Disclosure statement

No potential con.ict ofinterest was reported by the authors.

Funding

This research was conducted with the Key Projects funding scheme (2018CCTTA04) provided by the Adream Foundationin Shanghai, China, financial support of the Hangzhou No.11 High School and Hangzhou Hikvision Digital Technology CO., LTD.

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Experiential Learning in Blended Environments: Exploring Activities that Develop Cultural Intelligence (CQ)

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Abstract: Technological evolution that supports learning remain a central concern for instructional designers. Practitioners continue to rely on existing learning theories, such as experience-based learning, to explore the utilization of new technologies, applications and tools. Simultaneously, relevant research suggests that an integrated and comprehensive pedagogy for the development of intercultural competence remains underdeveloped. As part of a larger project that applies instructional design theory to the development of cultural intelligence (CQ), this theoretical paper explores the rationale for, and utilization of experiential learning in a blended environment at a Japanese university. Following a focused discussion of the relevant theoretical underpinnings, we present preliminary data to support the current conjecture. The purpose of this paper is to consider the rationale for using experiential learning in blended environments and the consequent instructional considerations for the application of suitable technologies that can enhance intercultural competence or CQ.

Key words: cultural intelligence; experiential learning; blended learning; instructional design; Japanese higher education

INTRODUCTION

Advances in the application of technology to human learning continues to impact educational systems and institutions everywhere. The rapid and comprehensive nature of these developments pose a significant challenge to every level of the educational establishment, with indications that traditional pedagogies and learning methods are under strain to support or accompany the profusion of technological features (Alonso, López, Manrique & Viñes, 2005; 2008). While these trends perhaps call for a reconsideration of pedagogical practices, they have also reiterated the role of instructional designers in the facilitation of effective learning in this technologically bountiful era (Roux et. al., 2019). Computer assisted learning and the development of

concomitant online technologies – such as adaptive learning – have been hailed as a "savior" of the education system, given its potential to personalize and optimize the learning path for the individual learner (Alonso et. al., 2008). Given the plethora of learning technologies available however, some researchers have pointed to an accompanying relative loss of focus on the learning process itself (Pazos, Azpiazu, Silva & Rodriguez-Paton, 2002). This observation therefore also indicates that a renewed focus on pedagogies that incorporate learning with technology might be necessary.

Simultaneously, partially due to governmental requirements and international student migrations, competitive pressures on higher education systems have increased (Suharti, Handoko & Haruta, 2019). Accompanying these pressures are an expectation for universities to produce graduates with a so-called global mindset. This notion is generally understood to include a skillset comprising of digital literacy, a flexible, broad-minded disposition and intercultural competence or cultural intelligence (CQ) (Lovvorn & Chen, 2011; Roux, 2018). Although CQ and a global mindset have been recognized as an important capacity in the graduate skillset, the means to nurture and grow these complex set of skills is less clear (Fischer, 2011; Roux 2018). Studies from a number of disciplines have suggested a broad variety of learning interventions (lectures, skills-training workshops, human resource development, etc.) to cultivate such a skillset, but an overarching framework for a consolidated approach to this area remains absent (Fischer, 2011; Ang, Van Dyne & Rockstuhl, 2012). The present study forms part of a project that centralizes pedagogical considerations for developing CQ. Earlier research linking CQ development through applications of ID theory (Roux et. al., 2017, 2018, 2019) have pointed to a relative neglect in the application of culturally informed ID in the design of instructional systems and e-learning (Rogers, Graham & Mayes, 2007, Parrish & Linder-VanBerschot, 2010; Henderson, 2007; Clem, 2004; Thomas, Mitchell & Joseph, 2002).

Taken together, these introductory observations reiterate a refocused attention on the learning principles for intercultural competence development and the concomitant implications for an effective instructional approach. For this paper, we are therefore concerned mostly with the theoretical aspects of an approach that centralizes the learning that needs to take place in the development of CQ. We present and discuss (1) the features of, and rationale for choosing the experience-based (or experiential) learning (EBL) model, (2) how it links with CQ theory, and (3) how these are utilized in a blended environment that hosted an intercultural communication course for students at a Japanese university. Limited data is presented to explicate our methods, approach and findings. The purpose of this paper is to consider the rationale for using experiential learning in blended environments and the consequent instructional considerations for the application of suitable technologies that can enhance intercultural competence or CQ.

Experiential learning

The roots of experience-based learning (EBL) are traced back as far as Aristotle and have been shaped over centuries by many notable educational thinkers and philosophers (Andresen, Boud & Cohen, 1995). The ongoing interest in EBL for adult educators lies in the fact that it encompasses such a broad range of learning: formal and informal types of learning, as well as incidental, lifelong and workplace learning (Andresen et. al., 1995). These authors further draw attention to the set of underlying assumptions that inform learning from experience (p. 225):

(1)Experience is the foundation of, and the stimulus for, learning;

(2) Learners actively construct their experience;
(3) Learning is a holistic process;
(4) Learning is socially and culturally constructed;
(5) Learning is influenced by the socio-emotional context in which it occurs.

At its most succinct, learning was defined by Kolb (1984, p. 38) as: "… the process whereby knowledge is created through the transformation of experience." Despite the brevity of this statement, there is a recognition that learning is not easily reducible to a single set of methods, strategies or formulas. Instead, as highlighted by Andresen et. al. (1995, p. 226), three underlying and complex distinctions mark EBL as a unique approach:

(1) An involvement of the whole person – intellect, emotions and senses (such as in role-plays, games, etc.);
(2) A recognition and active use of all the learner's relevant life experiences, which, when included through new learning, is likely to be much more meaningfully and effectively integrated into the learners' values and understanding;
(3) A continued process of reflection upon earlier experiences that can deepen understanding.

Ultimately, EBL therefore aims to foster the integration of learning material in such a way that it becomes personally meaningful. Designing a learning experience that envisages this as an outcome therefore requires the cognizance of a few essential elements that should be present in the instructional process: (i) learners' personal engagement; (ii) debriefing and reflection as required stages; (iii) learning involves the whole person (affect, cognition, senses, etc.); (iv) a recognition of what the learner brings to the learning process; (v) a basic ethical stance toward the learner that includes values of respect, validation, trust, etc. (Andresen et. al., 1995).

Despite the laudable features of EBL, a review of research studies in the areas of experiential methods and computer-based simulations (Gosen & Washbush, 2004), points to an essentially complex finding in consideration of its effectiveness as a learning approach. In essence, learning remains an intensely personal and internal mental process; and, to create an instrument that is capable of capturing this unique complexity is easier said than done (Gosen & Washbush, 2004). Their findings highlight that it is very difficult (based on their research review) to prove the effectiveness of these approaches. However, the established level of acceptance that the methods enjoy in various fields, as well as the agreement amongst practitioners that supports its satisfactory utilization, points to a verified credibility for continued use in education.

Cultural Intelligence (CQ)

The need for a continued comprehension of cultural diversity and intercultural competence in recent years saw the introduction of the notion of CQ. This concept is defined as 'an individual's capability to function effectively in culturally diverse settings' (Ang, Dyne & Tan, 2011). Exponential growth in this area has assisted in the integration of the somewhat fragmented field of intercultural studies and helped clarify the type of personal capacities that would be necessary to bridge cultural differences (Ang, Van Dyne & Rockstuhl, 2012). According to the Cultural Intelligence Center, four CQ capabilities characterize the intercultural capacity of a person: (1) CQ drive, which is related to a person's motivation, interest and confidence in settings with cultural diversity; (2) CQ knowledge, which implies sets of knowledge about how cultures are similar or different; (3) CQ strategy, which describes how a person makes sense of culturally

diverse experiences and social situations; and, (4) CQ action, which signifies a person's capability to adapt their verbal and non-verbal cultural behavior to appropriately suit a particular context.

CQ is therefore similar to, but distinctive from, IQ (general mental ability) and EQ (emotional intelligence) in that it signifies a set of capabilities necessary for personal and professional success in multicultural contexts. CQ has been demonstrated to predict adjustment, well-being, cultural judgment and decision-making, as well as task performance in culturally diverse settings (Ang et. al., 2012). Research suggests that CQ retains predictive validity regardless of demographic characteristics, personality, general mental ability, emotional intelligence, cross-cultural adaptability inventory, rhetorical sensitivity, cross-cultural experience, and social desirability (Ang et. al., 2012). CQ as an encapsulating construct for intercultural training and competence development is thus very appealing, since it is a practically useful understanding that explicates the capacities required to be successful in culturally diverse situations, regardless of their domestic or international locality.

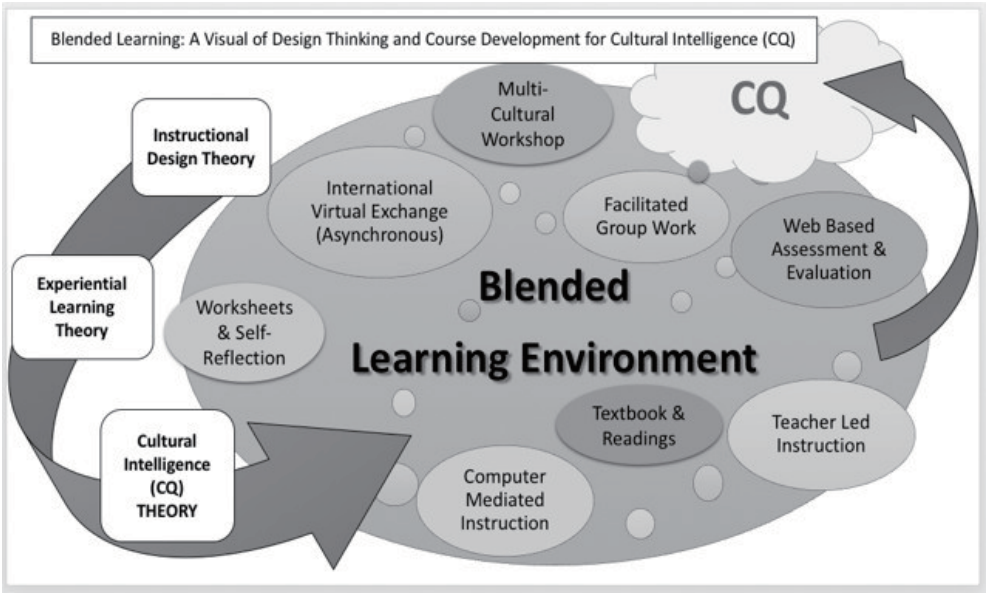


Figure 1. A blended learning model for developing cultural intelligence (CQ) (Roux et al., 2018)

EBL, CQ development and Blended Learning

In essence, CQ theorists therefore adopt the position that individuals can be educated and trained to develop their intercultural competence over time, and that this growth is a mental process encompassing knowledge, personal competencies and actionable behaviors. Returning to earlier discussions involving suitable approaches to learning, it should be clear that there is considerable potential for EBL to employed as an instructional practice to achieve the desired CQ education. Both EBL and CQ education is primarily concerned with the learner as a whole person at the centre of learning, while allowing the learning to enfold through an active and engaged process, culminating in an integrative and transformative experience for the individual. In terms of methodology, structured learning and training are seen as essential components in the development of intercultural skill (Kedia & Mukherji, 1999) and is employed in our project at the center of instruction in conjunction with educational technology to support the blended learning format. Blended learning is a method that mixes various event- or experience-based activities and may include live e-learning (synchronous), self-paced learning (asynchronous)

and face-to-face classrooms (Alonso et. al., 2005; Watson, 2008). Defined as "a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically advanced possibilities of the online environment…" (Dziuban et. al., p. 3), it has potential for bringing together advantages of both worlds, as learners and instructors grow new roles in the learning process.

As an increasingly popular instructional format, blended learning offers alternative possibilities to traditional ways of learning and is well suited to accommodate the variable influences brought about through the continuous introduction of new technologies (Dziuban, Hartman & Moskal, 2004). Earlier research using a blended model (Roux et. al., 2018) indicated that this format was particularly useful in conjunction with EBL, since it allowed for a facilitated, variable and alternately focused manner of instruction in a F2F classroom context. If CQ education is considered from an instructional design perspective, EBL offers clear benefits through its focus on learner development. The theoretical and instructional support of EBL is very considerate: the learner is placed in a central position through the emphasis on the whole personhood, i.e. experiences, knowledge, capacities, emotionality, etc. – all which ties very well with the notional factors that underly the CQ construct. Utilizing a blended model as a general tool within the instructional framework of a CQ educational course, the tripartite arrangement of these three constituents would be a formidable combination to realize the desired CQ outcomes. Similar to EBL, blended learning thus has potential capacity to impact higher education in a positive way, since it hosts the foundation of a transformative model that can change the expectations and practice of all the relevant learning participants: students, faculty and administrators (Dziuban et. al., 2004).

DESIGN, METHODS & PROCEDURES

The design of our framework is cognizant of the research contention that intercultural training needs a pedagogy that can support the development of CQ (Roux et. al., 2017, 2018; Fischer, 2011). Our framework (Roux & Suzuki, 2017) therefore integrated ID principles and models, EBL and CQ theory, aiming to ensure effective learning, track and evaluate the learning process (in summative and formative ways), and to deliver sufficiently rich research data for a learning analysis. The framework was activated through an undergraduate, intercultural learning course to foster a CQ education that would support the formation of a global mindset.

The course contained three broad organizing elements: 1) learning content; 2) assessment and evaluation; and 3) research. These domains were further divided into segments, to indicate and realize the relevant learning considerations for CQ development. Learning content included the following: (a) textbook studies; (b) classroom worksheets; (c) a series of mini-lectures; (d) experience-based classroom activities (in groups/pairs); (e) online media (videos, audio, readings, public lectures); (f) one multi-cultural workshop; (g) a Moodle-based international virtual exchange with students in a foreign setting; and (h) homework, based on a flipped model of instruction (Roux et. al., 2018). Figure 1 displays our model.

Procedures

Thirty undergraduates (2nd and 3rd year) participated in the 15-week course. The course typically prepares students for a short- and/or long-term study abroad experience, but often include students who maintain an active interest in developing their English literacy. The gender

balance was 63% female and 37% male and except for one Taiwanese student, all participants were Japanese. The majority of the group (64%) reported limited to moderate prior intercultural experience. Figure 1. A blended learning model for CQ (Roux et al., 2018)

Classes were conducted weekly in a F2F blended environment and instructional methods included variations of facilitated group- and/or pair work, engaging with online media (on PC or smart devices) and lectures. A further component included an online Moodle-based, asynchronous exchange with a group of Colombian college students. Weekly learning reflections designed to track course engagement were recorded online through Google forms. These learning reflections included structured feedback and 'free comments' sections to gather both structured and non-structured learner feedback, on the premise that these would invite targeted and unsolicited learning observations and self-reflections that could link to the goals of our investigation. A selection from these datasets form the basis of the learning analysis that is the focus of the current paper.

RESULTS

We present limited results from the learning feedback for this group. Analysis were based on four staggered reviews that were conducted during the course to assess learning progress and the results presented here include learning insights from the structured formative assessments. Summative results from this course indicated a generally positive learner uptake and were presented elsewhere (Roux et. al., 2018). The focus here is to glean learning insights pertaining to the impact of cultural, experience-based learning that constituted the main form of in-class instruction.

Assessing learning impact

Four self-assessed structured learning reflections were utilized to gain insights into participant learning (Figure 2).

- Review 1: What is culture? Hidden culture & differences;
- Review 2: Conflict & identifying conflict;
- Review 3: Values and belief systems – role in conflict;
- Review 4: Perception & stereotypes.

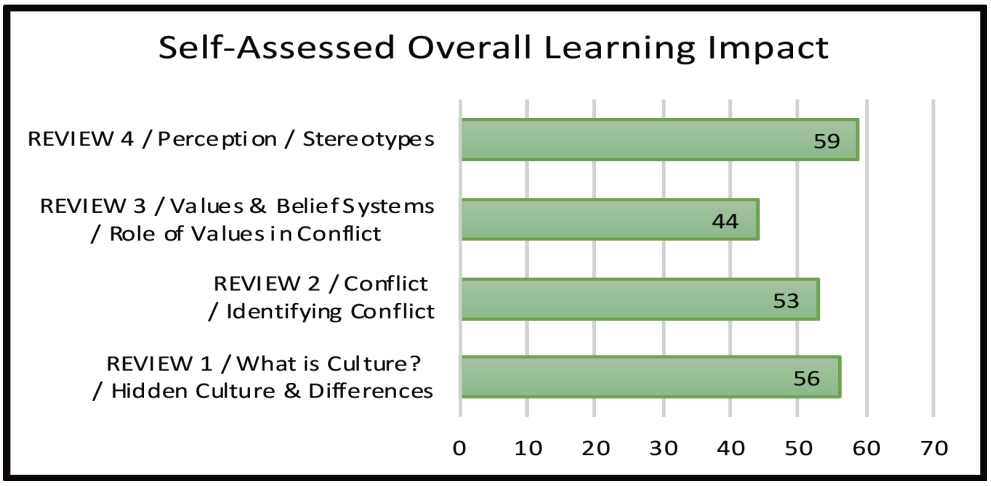


Figure 2. Self-assessed overall learning impact

This analysis presents a broad impact of learning based upon a single question in each learning reflection conducted at the end of a module. It shows the variable self-assessed impact that learning had on students and indicate (in %) a self-ascribed value. A further breakdown of the learning impact, as reflected through each separate learning review is presented below in figures 3, 4, 5 and 6. Students reflected on, and gave a self-assessed indication of their engagement with each course module. Selection choices to measure the impact were arranged on a sliding scale range: a little – somewhat – large extent – definitely. The structured reflection questions were:

- I got new insights and it made me think deeply;
- I will change my actions and behaviour towards other people;
- I will change my thinking and behaviour in the future;
- It made me question my identity.

(i) I got new insights and it made me think deeply; (ii) I will change my actions and behaviour towards other people; (iii) I will change my thinking and behaviour in the future; and (iv) It made me question my identity.These questions were broadly designed as reflective moments to assist understanding of student learning regarding the knowledge and content of the course, to gain insights about student thinking and behaviours, and a self-estimated impact of the learning on their future behaviours.

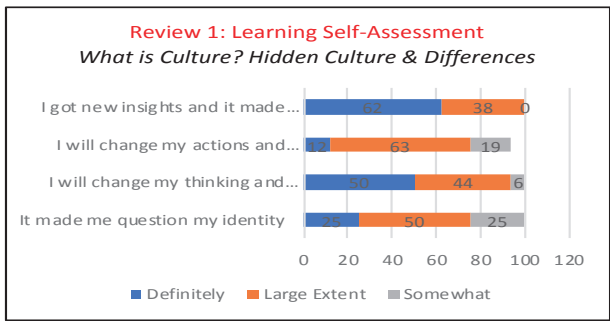


Figure 3. Learning self-assessment for review 1.



Figure 4. Learning self-assessment for review 2.

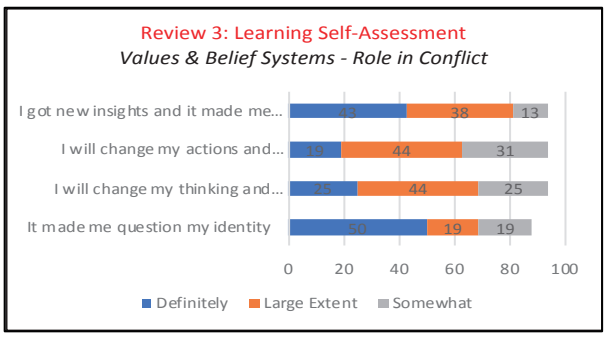


Figure 5. Learning self-assessment for review 3.

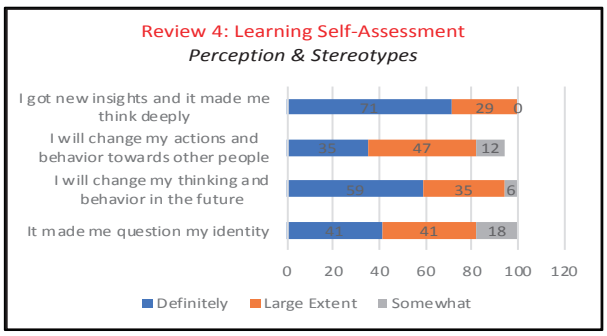


Figure 6. Learning self-assessment for review 4.

Review 1, perhaps as expected given the theoretical nature of the module contents, show an accentuated element that links to knowledge building, critical thinking and consequent future behaviour (Figure 3). Review 2 indicates an emphasis on the student thinking and future behaviours, and to a lesser extent, the realization of new insights and potential actions toward others in the future (Figure 4). Review 3 shows clear impact on the self-assessed impact on learner identity and insights, as well as reflections on the possibility for future altered future

actions (Figure 5). Review 4 shows a clear impact on students' consideration of their identity, and also a potential impact on thoughts and behaviours in the future (Figure 6).

SUMMARY OF FINDINGS & DISCUSSION

Our current investigation aimed to broadly understand how EBL in a blended environment can support the development of CQ, and closely related, investigated what underlying pedagogical support might be necessary for a CQ education. A theoretical discussion indicated that the philosophical underpinnings of EBL and blended learning overlap in many ways, paving the way for a learning approach which, infused with ID theory, made it possible to construct an instructional framework. In fact, earlier results from our larger project (Roux et. al., 2017, 2018, 2019) indicated that CQ theory could be integrated with these learning approaches, allowing for the creation of a CQ pedagogy. The current set of preliminary results indicate an impactful learning experience as self-assessed by our participants. Moreover, these results could be broadly connected to the CQ concept, (in terms of knowledge, strategy, behaviour and motivation). Although it is difficult to assess the true impact of EBL since learning is such a personal endeavour (Gosen & Washbush, 2004), results from the self-assessments show a very engaged effect from our participants. We were able to discern this effect along four main themes gleaned from participants' reflective feedback: (1) insightful understanding and integration of new cultural knowledge; (2) a perceived potential impact on actions and behaviours toward other people as a result of the classroom learning experiences; (3) a forecasted impact on future thinking (strategies) and action with regard to new experiences; and (4) a clear and intense engagement with the classroom experience to the extent that participants felt they could relate it to their (personal/cultural) identity. Connecting these themes with the CQ seems appropriate at the current (relatively superficial) level of analysis, and they are encouraging enough to continue with further investigations in this line.

CONCLUSION

As part of a larger project that applies instructional design theory to the development of cultural intelligence (CQ), this paper explored the rationale for, and utilization of EBL in a blended environment. Research in this field have suggested that an integrated and comprehensive pedagogy for the development of intercultural competence remains underdeveloped. The current paper aimed to contribute towards a deeper understanding of the educational development of CQ instruction by considering two foundational instructional design elements: (1) the rationale for, and application of EBL in a blended environment to support our project goals; and (2) a limited and preliminary analysis of the self-assessed learning impact/outcomes of the course that sought to develop the intercultural competence of participants. Findings from the self-assessed learning reflection analysis indicate that's participants engaged with course content and instruction in a consistent and impactful manner. Measurements show that aspects of participants' perceived identity, their cognitive development, values and belief systems, as well as their behaviour towards others and potential future behaviours were impacted upon by the course. These findings could be linked to the underlying theoretical structure of CQ, and although preliminary at this stage, we conclude that the instructional design and methods applied, in particular EBL in a blended setting, were successful in meeting our stated project goals. We aim to continue with a more comprehensive analyses of the learning behaviours and outcomes, with a view towards deepening the pedagogical considerations for furthering a CQ education through an application

of instructional design theory.

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Reviewofthe researchstatus and progressof learning analysisin China

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Abstract: Learning analysis is a research hotspot and focus in the field of education in recent years. Especially with the continuous deepening and popularization of the Internet and big data technology, learning analysis has been rapidly developed. In order to gain a more in-depth understanding of the current research situation of China's learning analysis, this study analyzes relevant research literatures from the past years based on the perspective of literature analysis, and distributes them from the literature (time/author/institution/topic, etc.) and research content. (Conceptual connotation/feature/system and framework/privacy security and protection/ application, etc.) The two levels are specifically analyzed to clarify the research status and recent research progress of learning analysis technology in China, and the possible problems in the research. Describe and clarify, in order to provide some reference and inspiration for future study and analysis.

Key words:Learning analysis; research progress; review

INTRODUCTION

With the development of information technology such as the Internet, digitization has been greatly applied to students' daily learning. In the process of digital learning, massive and diversifi ed data will be generated, which can record and reflect students' learning track, behavior, learnin g tendency and even thinking process. Faced with such vast and valuable data, how should peopl e deal with it and how to better develop and utilize such data? The emergence of learning analy sis has provided us with very beneficial help. Learning analysis is "a technique for understanding and optimizing learning and the environment in which it occurs by measuring, collecting, analys ing and reporting data about students and their learning environments" (LAK, 2011).By learning analytical techniques, the value of educational big data is better reflected. In recent years, Chines e scholars have paid more attention to learning analysis and produced many research results. In t erms of the development of learning analysis, in the existing studies, some scholars attempt to a nalyze the research status of learning analysis, such as Huang Zhinan (2016)using visualization te chnology to analyze the authors, institutions, themes, knowledge base of learning analysis, Wu Qi ng and others (2015)combed the formation process of learning analysis from four dimensions: sta keholders, research objectives, research objects and technical methods.Cao Shuai and others (2016) took the papers of the LAK as the analysis objects, and summarized the research status, challen ges and trends of learning analysis technology. However, the above

studies focus on the study of learning analysis abroad, and less on the study of learning analysis in China. Li Menglei et al. (2018) analyzed the research status of learning analysis in China with domestic core journals as t he research object. However, it mainly adopts bibliometric and visualization methods, focusing on some external manifestations such as research types of learning analysis, high-frequency keyword s, researchers and institutions, research technologies and tools, research topics, etc., while the spe cific research contents are not deeply explored. Therefore, it is necessary to timely and systemati cally sort out and analyze the research results of learning analysis, in order to grasp the current research status of learning analysis in China and provide certain references and directions for the
future research of learning analysis.

RESEARCHDESIGN & METHODS

Research purpose

The purpose of this study is to analyze and sort out the existing research literature on learni ng analysis. On the one hand, it tries to understand the research progress and current situation of learning analysis in China; on the other hand, it also tries to clarify the existing problems and deficiencies in existing studies, so as to provide some references and enlightenment for future stu dy on learning analysis.

Research methods

This study mainly uses text analysis method to analyze and sort out the existing literature o f learning analysis. The text analysis is mainly carried out from two levels: the first is the analy sis of title, author, institution, abstract and keywords, etc., so as to get a preliminary understandi ng of the research field and distribution of learning analysis; the second is to analyze the conten t of the body of the literature, and further grasp the research theme and specific content of learn ing analysis.

Data sources

In order to comprehensively and systematically grasp the overall research situation of learnin g analysis in China, this study took CNKI database as the retrieval source and "learning analysis "and "learning analysis technology" as the key words for basic retrieval, and the search time is u ntil June 20, 2019. After preliminary search, a total of 834 research papers were obtained, and i n order to more accurately grasp the specific research of learning analysis, the 834 preliminary s earch results were consolidated, and the irrelevant literature was manually removed. Learn and an alyze 335 related literatures, with 335 documents as data sources and research objects.

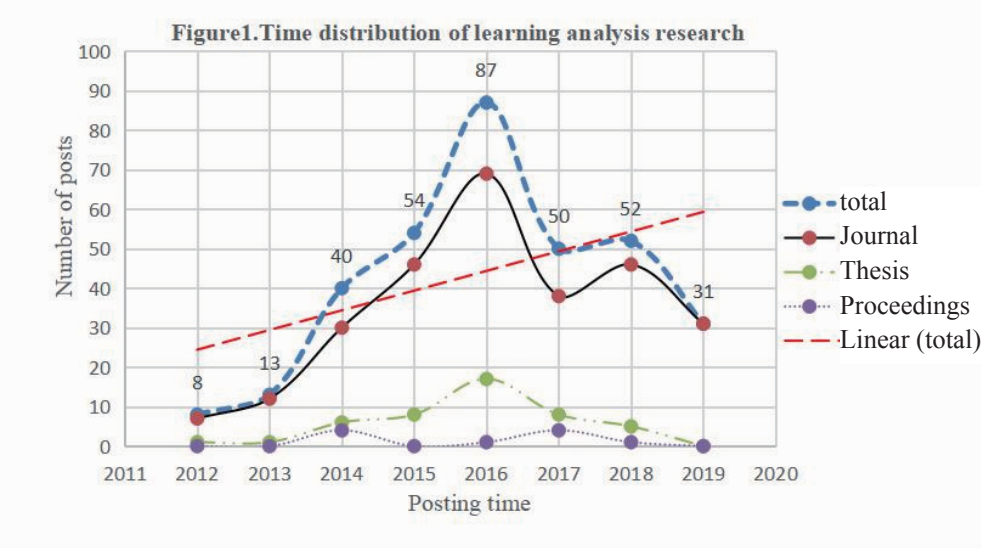
RESULTS

Literature distribution of learning analysis

- Time distribution of learning analysis

From the perspective of time distribution, the research on learning analysis in China started relatively late. According to CNKI literature search, the research on "learning analysis" started

in 2012. Subsequently, more and more people pay attention to learning analysis, and the number of research results increases gradually. Figure 1 shows the time distribution of various research results of learning analysis in China over the years. It can be clearly seen from the figure that the number of research results of learning analysis in China has been gradually increasing since 2012, reaching a peak of 87 in 2016. From the perspective ofdevelopment trend, research results will continue to increase, learning analysis will continue to be concerned. [1]



- Distribution of Authors and Institutions in Learning Analysis

From the distribution of learning analysis analysts, Zhao Wei, Gu Xiaoqing, Wei Shunping, Jiang Qiang, Wu Yonghe and others have made great contributions, with more than 8 articles published per capita. They are active and representative scholars of learning analysis. Taking Zhao Wei and Gu Xiaoqing as examples, Zhao Wei's research on learning analysis totals 17 articles, with 593 quotations and 40548 downloads, with a download citation ratio of 68.38%. Gu Xiaoqi ng has conducted a total of 15 studies on learning analysis, with a total citation number of 939 and a total download number of 35,694 times, and a download citation ratio of 38.01%.1 In add ition, Wei Shunping, Jiang Qiang, Wu Yonghe, Zheng Qinhua, Wu Fadi and other scholars also made great contributions. In terms of the distribution of learning analysis institutions, East China Normal University, Northeast Normal University, Beijing Normal University and other institution s contribute the most, with the cumulative number of published articles being 57, 41 and 40 res pectively, accounting for more than 1/3 of the total number of published articles, which is the most important research structure of learning analysis at present. In addition, Central China Normal University, Shaanxi Normal University, National Open University, Beijing University Of Posts and Telecommunications, Zhejiang Normal University, Jiangnan University, South China Normal University, Liaoning Normal University and other units have also made significant contributions, with a total of more than 9 articles. The study analysis also gave greater attention (see Table 1 fordetails).

[1] Note: the data are all from CNKI data statistics, and the statistics date is June 28, 2019.

Table 1: Distribution of Authors and Institutions in Learning Analysis (Top 10)

Authors / Number of Posts	Institutions / Number of Posts
Zhao Wei 17 Gu Xiaoqing 15 Wei Shunping 13 Jiang Qqiang 11 Wu Yonghe 8 Zheng Qinhua,Wu Fati 7 Yu Xiaohua,Li Yanyan,Chen Li,Hu Yiling,Sun Hongtao 6 Zhao Yan,Liu Zhi,MaXiaoling,LiuQingtang, WangQiong,Mou Zhijia 5 Liu Dongliang,Xu Peng,Dai Xinlai,Mou Zhijia,Liu Sanya, Han Xibin,Li Shiping et al. 4	East China Normal University 57 Northeast Normal University 41 Beijing Normal University 40 Central China Normal University 37 Shaanxi Normal University 15 National Open University 15 Beijing University Of Posts and Tel ecommunications 10 Zhejiang Normal University 10 Jiangnan University 10 South China Normal University &Li aoning Normal University 9

- Distribution of research topics in learning analysis

The evolution of learning analysis experience from single to multip. Initially, the related research of learning analysis was mainly manifested in the introduction of a new technology, the analysis of the value of learning analysis, and the practical application of learning analysis in a certain discipline. Subsequently, the research themes of learning analysis are gradually diversified. Learni ng analysis gradually pays attention to online learning, big data, data mining, personalized learnin g, learning analysis system, machine learning, applied research, education informationization, onlin e learning behavior, MOOC, flip classroom and so on. For example, the combination of learning analysis and big data is mainly based on big data as a research background or basis, focusing on the support of big data for learning analysis, the application of learning analysis technology i n big data background, and so on. Especially in recent years, the research topic of learning anal ysis is more diversified.

The Research Content of Learning Analysis

- Clarification of the Connotation of Learning Analysis

Learning analysis is a very complex concept, there is no unified discussion about the connot ation of learning analysis at present. Based on the sorting and analysis of various research literat ures, from the perspective of purpose and means, the concepts and connotations of learning analy sis can be mainly classified into the following categories, as shown in table 2 below. Although t he researchers to study analysis of the definition of different, but can be simplified as "data + u se" mode, namely through the use of the environment or learning related data to achieve a certai n purpose, such as optimizing the learning environment, promote individualized learning, monitor learners' behavior, to predict or evaluate the results of learning behavior, and so on.

Table 2: The Conceptual Connotation of Learning Analysis

Conceptual core	Representatives / Institutions
Using data and models to predict stu dent progress and performance	EDUCAUSE(2011)

Using data to optimize students'learni ng and environment and to improve l earning and teaching efficiency	LAK11;Wang Liangzhou et al.,2015; Verbert et a l.,2011;Li Yanyan et al.,2012;Yu Xiaohua et al.,20 13;Liu Qingtang et al.,2017
Using data and models to evaluate le arners'learning behavior and provide a daptive feedback; discover learning ru les and promote effective learning	Enhancing Teaching and Learning through Educational Data Mining and Le arning Analytics(2012);Gu Xiaoqing et al.,2012; Hu Shuixing,2015;He Kekang, 2016;Wang Ziqin e t al.,2017
Using data to diagnose and evaluate l earners'learning; predicting learning ou tcomes and performance	Li Fengqing et al.,2012;Li Qing,2012;Gao Jian et al.,2013;Ma Hongliang et al.,2014;Majie et al., 20 14;Zheng Xiaowei et al.,2016;Wang Ziqin et al.,20 17;Ma Junchen;2017;Liu Hongxia,2017;
Using Data to promote students' indiv idualized learning	Jiang Huifeng,2016, Gu Xiaoqing et al.,2012; Zheng Xiaowei et al.,2016
Using data to evaluate curriculum an d teaching	NMC(2014)
Quantitativing analysis of student lear ning, teacher teaching and manageme nt	Mao Gang,2018

- Research of the characteristics of learning analysis

Based on the analysis of the connotation of the concept of learning analysis, many researche rs have proposed the characteristics of learning analysis, which will help to further deepen the understanding and grasp of learning analysis. After analyzing and arranging the literature, the learn ing analysis has the following characteristics: (1)Diversified theoretical basis (Gu Xiaoqing et a l,2012); (2) The data come from a wide variety of sources (Mou Zhijia etc., 2016); (3) Mod ern analytical tools and methods are available(Li Qing, Wang Tao, 2012); (4) The analysis proc ess is complete, including the capture and storage of data, analysis and reporting, prediction, acti on intervention, adjustment and other stages(Mou Zhijia etc., 2016); (5) Providing visual analy sis results(Gu Xiaoqing et al,2012); (6) The service target is mainly for students, teachers an d educational administrators(Li Yanyan et al, 2012);(7)Focus on timeliness, that is to provi de real-time data information(Li Yanyan et al,2012);(8)Objectivity, the generation, collection and processing of data has certain objectivity(Li Shiping et al,2017), etc.

- The System and Framework of Learning Analysis

Learning analysis is a set of systematic data analysis technology. Through learning analysis, we can build an analysis framework or analysis system for different objects and tasks. Table 3 s ummarizes the learning analysis system mentioned in the existing literature.

Table 3: Learning Analysis System Example

Researchers	Structural elements
Wei Shunping (2013)	It includes three parts: learning analysis process, tools and algorithms, data and information.
Wu Yonghe et al.(2013)	Including: functional modules, report visualization, data multi-source and other technical features. Learning analysis system can be divided into four layers: data layer, analysis layer, report layer, intervention and adaptation layer.
Zhu Ke et al. (2013)	Including: learning content component, learner learning status database component, prediction engine component, information panel component, adaptive engine com ponent and intervention engine component.

Feng Xiang et a l.(2014)	With Hadoop as the core, it has the functions and services of massive log record ing and analysis, massive storage and analysis of educational resources, multi-user dashboard service, learning intervention, learning and analysis open service, etc.
Chen Lei (2016)	Including: big data technology analysis process, mining analysis tools, data inform ation integration three major parts.
Liu Qingtang et al.(2017)	It focuses on data collection, data analysis, evaluation, prediction and intervention of learning and analysis.
Yu Xiaohua et al.(2018)	"Open learning analysis system" (OIMOLAS) consists of five core components: d ata management, data mapping, analysis engine, analysis algorithm and visual pre sentation.

- Techniques and tools of learning and analysis

At present, the more mature key technologies that can be applied to learning analysis include: network analysis, discourse analysis, content analysis, context analysis, website analysis, system modeling, and statistical analysis and visualization, clustering, prediction, A series of data mining methods such as relationship mining and text mining. Table 4 shows several common analytical methods, techniques, and analytical tools.

Table 4: Methods and Tools ofLearning Analysis

Analysis method	Application case	Analyzing tool
Social network analysis method	Li Yanyan et al., 2012; Liu Sanniu et al., 2017	Mzinga, SNAPP, Gephi, JUNG, Prefuse, Guess, Pajek, UCIet, NetDraw, NodeXL, Netminer, etc.
Discourse analysis	Li Qing et al., 2012	Cohere, WMarix, etc.
Content Analysis	Li Qing et al., 2012; Li Haifeng et al., 2018	Nvivo, Atlas.ti, Google Image Search, VINCA, CAT-PAC, LIWC, Wordle, LOCO-Analyst, etc.
Context analysis	Li Fengqing et al., 2012	
Visual analysis	Li Fengqing et al., 2012	KBS-T visualization tool; learning analysis dashboard
"dot line surface" visual representation	Sun Tianlinzi et al., 2015	
Text mining	Liu Sanniu, etc., 2016	LIWC, Cohere, Sobek, etc.
Data mining		
Biological data mining	Zhang Qi et al., 2016; Han Ying et al., 2018	SSAS, Weka, SPSS, etc.
Lag sequence analysis	Yang Xianmin et al., 2016	
Multimodal data	Zhong Wei et al., 2018	
Feature engineering	Ouyang Jiayu et al., 2018	
SensingTechnology	Li Qingetal.,2018	

- Security Privacy and Protection of Learning Analysis

In recent years, research on security, privacy and protection of learning analysis has received increasing attention. We need to find a balance between privacy and learning analysis technology, and rationally integrate teaching and ethical issues in the process of learning analysis (Gu Xiaoqing et al., 2012). Wang Ping believes that the original data should be processed

through anonymized privacy protection technology before sharing and public release (Wang Ping, 2015). In addition, we must also strictly control the data transmission and filtering process, clearly define access rights; data analysis It is necessary to abandon the inherent prejudice and promote the participation of learners (Zhang Wenqing et al., 2015). Zhao Huiqiong and others believe that researchers need to abide by the principle of transparency and improve the transparency of learner data; improve the quality of data from authenticity and integrity (Zhao Huiqiong et al., 2016). Wang Nan et al. focused on how to deal with learning from policy perspectives. The resulting ethical issues of privacy. (Wang Nan et al., 2019). In the future, researchers are urgently required to pay attention to research in this field and to help analyze and analyze privacy security.

- Application of learning analysis techniques

Based on the analysis of existing literature, the application of learning analysis technology can be understood from four perspectives: a theoretical framework, research perspective, analytical methods, and technical tools, as shown in Table 5 below.

Table 5: Application classification of learninganalysis techniques

category	Example
As a theoretical framework	Based on the learning analysis framework, developingprimary and secondary school teachers' continuingeducation management system (Xiao Lizhi, 2018), using learning analysis to establish a self-adjusting,reflecting and evaluating intelligentguidance system for learners (Han Jianhua et al.,2016),or as a learner Metacognition reflects the scaffold and explores the internalmechanism of learning analysis to promote learning (Mao Gang, 2018).
As a research perspective	As a research perspective, exploring thefactors thataffect student satisfaction,learning outcomes, and learninginputin online learning (Shu Zhongmei,XuXiaodong,2014), and analyzing the relationship between onlinelearning behaviorand cognitive level (FengXiaoying et al., 2016).
As an analytical methods	As an analytical method,analyzing therelationship between teacher teachingbehavior and studentlearning behaviorin the network teaching environment (ma jinget al., 2014), exploring thecognitive characteristics oflearners and the interactive characteristics of teachers' network learning behavior(Dai xinlai etal., 2015)and so on.
As a technical tools	As a technicaltool, a comprehensive evaluationmodel ofacademic quality was constructed (YUN Minxia et al.,2014) to explore personalized adaptive learning in a smart learning environment (CuiHuiping,2014), and to build an onlinelearning automatic evaluation model (Wei Shunping, 2015)and so on.

CONCLUSION

Through theanalysis andcombing of the existing literature onlearning analysis, we can find that theresearch onlearning analysis in China has made certain achievements. It is mainly reflected in: (1)The overall researchtrend is gradually increasing. Since 2012, Chineseschola rs have given greater attention to learning analysis. On the onehand,the results of learninganalysis are increasing, andonthe other hand,researchers andresearchinstitutions are also increasing. (2) Diversification andrefinement of research topics. The initial researchtheme of learninganalysis is relatively simple, mainlyfocusing onthe introduction oflearninganalysis techniques, thepractical application of learninganalysis techniques, etc.,and thenthe researchon learninganalysis is more andmore diversified, suchasbeing aresearch perspective or tool. Use,combined with specific disciplines, system design forlearning analysis, integration with big data/mooc/flip

classroom/etc. (3) Research methods andtechniquesare diverse. Statistical analysis anddata miningare widely used learning analysis methods. Withthe development of information technology,social networkanalysis and discourseanalysis aregradually beingusedby researchers. Especially with theintegration of disciplines, emergingtechnologies and methods suchas sensing technology,biometrics, multimodal data,andwearable technology have also beenused.

At the same time, existing researchalsohas certain problems anddeficiencies,which are mainlyreflected in: (1) thelack ofinfluential researchersandresearch results. Because theresearch oflearning analysis starts relatively late, it is difficult to achieve a better effectin a short periodof time in terms of the number of studies,the depthof research,and thesystematic natureof research, which directly leads to the influence of researchers and research results. The aspect is rather weak. (2) Insufficient practice. Dueto the complexity of learninganalysis, various analytical techniquesand models lack generality in terms ofoverall generalization andinterpretation. Therefore, few scholars applyit to the analysis andapplication ofcapabilities beyondacademic performance. (3)The scope ofresearch is limited. The current studyanalysis is mainly basedonhigher education, forexample, improving teachers'online learningability,college students'deeplearning, independent learning, personalizedlearning, etc.,but less attention is paidto the researchin the primary andsecondary schools.

In the future, we shouldcontinueto strengthenthe study oflearning analysis, and we should alsodeal with the following face-to-face issues:(1)From focusingontechnology to focusingon learnersthemselves.Learning analysis is essentially a collectionof technologies. In the past,learning analysis mostly favored thedevelopment anddesign of technology. It wasmore obsessedwith the useof new technologies andnew methods, butignored the ultimate goal of researchis to serve people. Leading to deviationsfrom real educational issues (HanXibin et al.,2017). From the definition oflearning analysis, theproblem of technicalknowledge means,andthe service of human development is the ultimate goal of learning analysis.As some researchershave called,the algorithms for learninganalytical development andthe models to beconstructedmust start from the level of learner activities and learning needs,becausethese technologies canonly reflect their true value whenthey have a positive impact on solving practicalproblems in education. It is necessaryto gradually realize the process from focusingontechnology to paying attention to people themselves.(2) Focus ondata diversification, multi-modality andquality.At present,the data source oflearning analysis is relatively single, mainly the dataof the networklearning platform andsystem. Thesesingle-source, shallow-level behavioral data arenot sufficient to achieve a comprehensive understandingandmonitoring of students. Withthe rise anduse of emergingtechnologies and methods suchas biometric data mining technology,sensing technology,wearabletechnology,and featureengineering, the boundaries oflearning analysis will becontinuously expanded. In addition, dueto thecomprehensive communication andresource sharingof various learning systems, learning platforms,and learning scenarios, thedata collected bylearning analysis andanalysis also exhibits diversification andmultimodality.At the same time, the quality ofdata shouldbe paidmore attention to. The quality ofdata is directly related to the realization of the ultimate goal of learning analysis. Therefore,future researchshould paysufficientattention to the diversification, multimodality and qualityof data.(3)Break throughthe boundariesof disciplines andachieve interdisciplinary cooperation.Learning analysis is basedonthe comprehensive use ofmultidisciplinary theories such asinformation science, sociology,computer science,psychology,educational theory,and engineering. Researchers of futurelearning analysis techniqueswill presenta diversified background ofthe subject. Learningand analytical researchwill also facemore complex

andcomplex educational andteachingproblems. The diversity of dataand thediversity of questions determine the perspectives andresearch methods oflearning analysis. change. Therefore,we canfully drawon the analytical theories, methods andtechniquesof otherdisciplines such asbrain cognitive science, learningscience,and sociology,andproposeappropriate theoretical framework systems for different analysis scenarios andobjects, andinterpret teachingandlearning through cross-cooperation. The problemthat forms the learninganalysis ecosystem.(4)Focus onethics anddatasecurity privacy.Protecting users'privacy and ethics is aprerequisite for conducting learninganalysis. In the eraof big data,people's online dataimplies alarge amount of privateinformation, whichalso brings more moral requirements andchallenges to the useof data. Some phenomena that ignore the use of dataare notonly basicethical requirements, but also along-term development of the technology itself. Future learning analysis shouldfocus more onethical issues andprotect dataprivacy and security.This requiresnot onlyan ethical agreement, butalso a solid guarantee through policy laws whennecessary.

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A Case Study of Education Data Mining Based on WEKA

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Abstract: This paper selects research cases from Journals and tries to improve the research of predecessors through WEKA data mining. Based on the research of Godwin, K.E., this research generates simulation data which corresponding to the key variables in the case, and using WEKAto impliment data mining and data analysis to predict the off-task behavior of students. Through feature screening, model training and evaluation, and visual analysis of results, the final model yielded the best model accuracy of 69.71%. The results show that WEKA data mining can verify the relationship between gender, the types of teaching activities, the transformation of teaching activities, the duration of teaching activities and the ontask behavior of students, and with this approach, teachers can predict the ontask behavior and also improve their instructional design.

Key words: Educational data; Data mining; Learning Analysis; Prediction Analysis

1.INTRODUCTION

Under the guidance of new technologies, education informatization is moving towards the 2.0 era. Artificial intelligence, big data, and the Internet of Things have enabled education to lead from fusion application to innovative application, and the application of “Internet + Education” such as smart classrooms, smart campuses, and online learning has made the vast amount of information, for example, the learner's learning process, learning behavior and results can be efficiently recorded and stored in the computers. Through data mining and analysis, the teaching environment can be improved and it gradually become a new breakthrough in education and teaching reform. Using verities of tools and methods to deal with educational data and making full use of education data is of significance for the improvement of teaching and learning in big data era.

2.RESEARCH DESIGN & METHODS

2.1 Concept explanation

There are two important concepts must be illustrated in this research. If the child turns his attention to the teacher, teaching activities or appropriate teaching materials, such behavior is classified as on-task behavior; if the child is looking elsewhere, they are classified as off-task activities.

2.2 Research problem

A variety of feature combinations such as the type of teaching activity, the duration of the teaching method, and the number of times of each activity in each class are used as classifiers, and a predictive model is constructed to predict whether the student will have an ontask behavior.

2.3 Research methods

Ontask behavior belongs to the category variable, so the research problem belongs to the classification problem in the prediction, and the common data mining algorithm used to solve this problem is the decision tree. Modeling is performed by using the classification algorithm integrated in WEKA software.

2.4 Data source

This data was adapted from Godwin, K.E. (2013) et al., and the data sample has 18 features. To perform the experiment, this research automatically generating and populating 27,731 analog data records.

2.5 Data Mining Analysis Process

2.5.1 Introduction of WEKA

WEKA is an open source machine learning and data mining software developed by the University of Waikato in New Zealand and is widely used in academia. This software supports almost all operating systems such as Linux, Windows, Macintosh, etc. It provides a graphical user interface for ordinary users, and also provide Java programming for advanced users. WEKA integrates a very comprehensive data mining algorithm, covering data preprocessing, classification, regression, clustering, correlation analysis and other models. The process of data mining using WEKA includes three steps: data preprocessing, model training, and model verification: (1) data preprocessing, including feature selection, eigenvalue processing (such as normalization), sample selection, etc.; (2) training includes algorithm selection, parameter adjustment, model training; (3) verification, means verification of the model results. The software Explorer interface is shown in Figure 1.

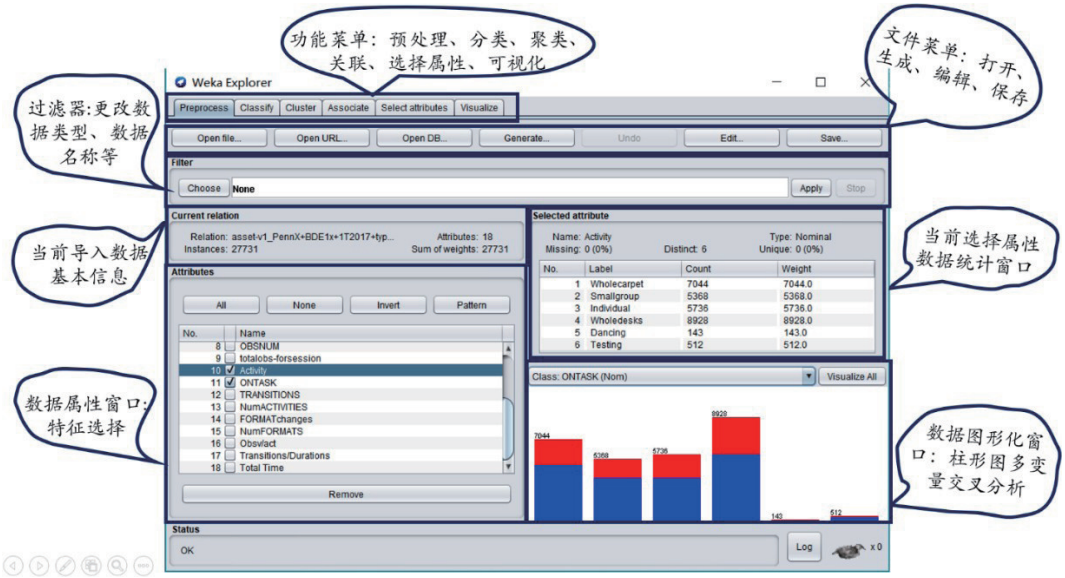


Fig.1 WEKA Explorer main interface introduction

2.5.2 Feature selection

Fig.2 shows the 18 features in the data sample. Some features make the model too limited to the current data set, that is to say, the prediction model constructed by these 18 features will not be applicable to other schools, classes, and students. Therefore, before the construction and training the model, it is necessary to determine the appropriate characteristics. So, UNIQUEID, SCHOOL, Class, and Coder should not be used as predictors. In determining whether an attribute or feature is suitable as a classifier for training the model, it can also be determined according to the change of the Kappa coefficient. The Kappa coefficient is used to measure the accuracy of the binary classifier. The value is between -1 and 1. The value closer to 1, means the higher consistency of the model classification result with the actual data classification result. Kappa>0.1, the model reluctantly established, Kappa>0.8, the model is better. For example, after removing feature “OBSNUM”, the model Kappa value is reduced from 0.346 to 0.317 (as shown in Fig.3), which means that "OBSNUM" has little effect on the model construction, and the "OBSNUM" attribute can be removed when building the model. Using the same method, you can test other attributes separately to determine which attributes can be used to train the classification model and achieve prediction. After testing, the final removed features are UNIQUEID, SCHOOL, Class, CODER, OBSNUM, totalobs-forsession, Obsv/act, and the retained 10 features are grade (GRADE), student number (STUDENTID), gender (Gender), and teaching activity type (Activity), the number of student activity changes (TRANSITIONS), the number of activities per class (NumACTIVITIES), the number of activity types per class (NumFORMATS), the number of student conversions (FORMATchanges), the duration of the teaching method (Transitions/Durations), total time (Total Time).

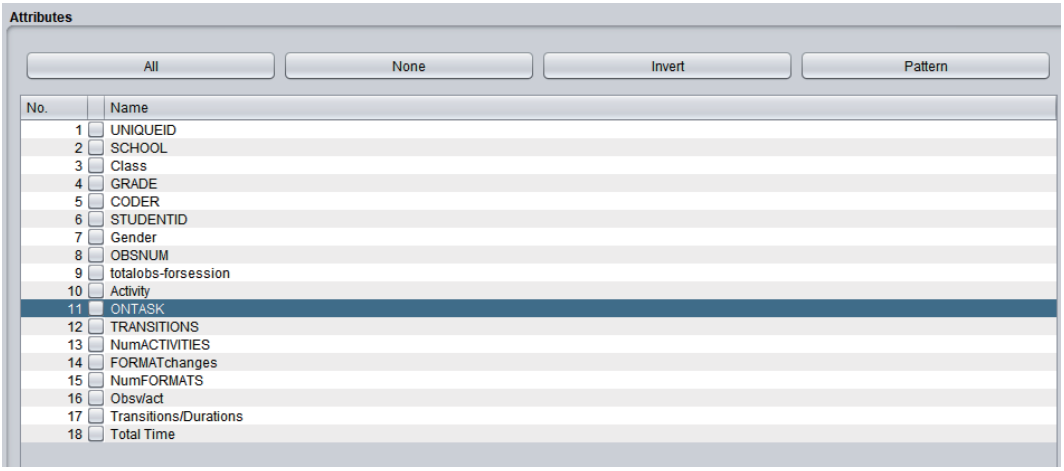


Fig.2 18 feature attributes

```
=== Summary ===

Correctly Classified Instances       20610               74.3212 %
Incorrectly Classified Instances      7121               25.6788 %
Kappa statistic                          0.3179
Mean absolute error                      0.3638

=== Summary ===

Correctly Classified Instances       20827               75.1037 %
Incorrectly Classified Instances      6904               24.8963 %
Kappa statistic                          0.3465
Mean absolute error                      0.3556
Root mean squared error                  0.4217
Relative absolute error                 80.6635 %
Root relative squared error             89.8133 %
Total Number of Instances            27731
```

Fig.3 Comparison of Kappa values before and after removing "OBNUM"

2.5.3 Model training and evaluation

With the selection feature, we try to build the model with different algorithms, compare the accuracy of the models under different algorithms, and find the optimal algorithm. The choice of algorithm follows the principle from simple to complex. The accuracy of the model obtained by the simplest algorithm is the baseline accuracy. The accuracy of different algorithms is compared with the baseline accuracy to judge whether the algorithm is applicable. The classification algorithms commonly used in Weka are ZeroR, J48, JRip, Na.ve Bayes, and K-NN (IBK). The ZeroR classifier is the simplest classifier. This method only selects a category with the highest probability as the classification result of the unknown sample based on the statistical rules of historical data. That is to say, for any unknown sample, the ZeraR classification result is the same. Although this kind of classifier does not have any predictive power, it can be used as a comparison classifier with other classifiers. The accuracy of training the model using this algorithm is the baseline accuracy above. In the Classify option, select the ZeroR algorithm and train with a single data sample set. The model results are shown in Figure 4. Therefore, the

baseline accuracy of the model should be 67.2%. A Kappa value of 0 means that the result of the model classification is equivalent to artificial random guess.

In fact, cross-validation is the standard method for evaluating the performance of machine learning algorithms. Cross-validation refers to randomly dividing data samples into several parts, one of which is test data and the rest is training data, so as to evaluate the prediction accuracy of the model for new data. For training binary classifiers, a 10-layer cross-validation evaluation method is required when the data sample size is below 1000, and a percentage division evaluation method can be used for a sample size of 10,000 or more. Since there is no test data set in this experiment, and the data record reaches 27,731. Therefore, the model is evaluated by the percentage division method, and 96% of the data is used as training data, and 4% of data is used as test data (more than 1000). In order to find the most suitable algorithm, the experiment used 96% of the data as the training set and 4% of the data as the test set. The four models were trained by J48, JRip, Na.ve Bayes and K-NN respectively, and the different model results with different algorithms were compared.

Using a single dataset to self-assess the model is not the best way to evaluate the model. This tends to result in overly optimistic results. In order to reduce the error of the model results, it is necessary to train the model repeatedly when using 10-layer cross-validation verify and percentage division evaluation method. In other words, by setting random numbers, different training data samples and test data samples are divided. In this experiment, the random numbers are respectively set to 1-10 to divide 10 different training sets and test set data. And get 10 different model accuracy, and finally take the average value, which is the accuracy of the model under the algorithm. As shown in Figure 5, you can see the random number setting by clicking the "More option" option. After the model training and the accuracy value calculation, the results are as Tab.1. It can be seen from the results that modeling with the J48 algorithm has the highest average accuracy of 69.71%, that means the model correctly predicts 69.71% of students' behavior in the test data set. The result modeling with Na.ve Bayes and K-NN algorithm have low average accuracy which below the baseline accuracy, that means these two algorithms are not suitable for modeling in this problem.

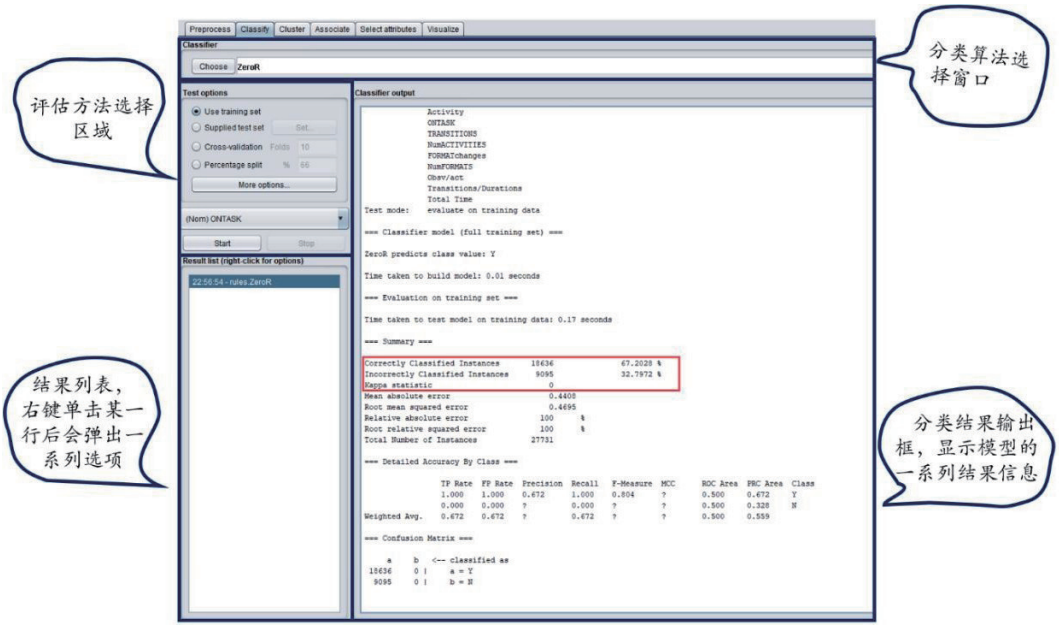


Fig.4 classification function interface and ZeroR algorithm training results

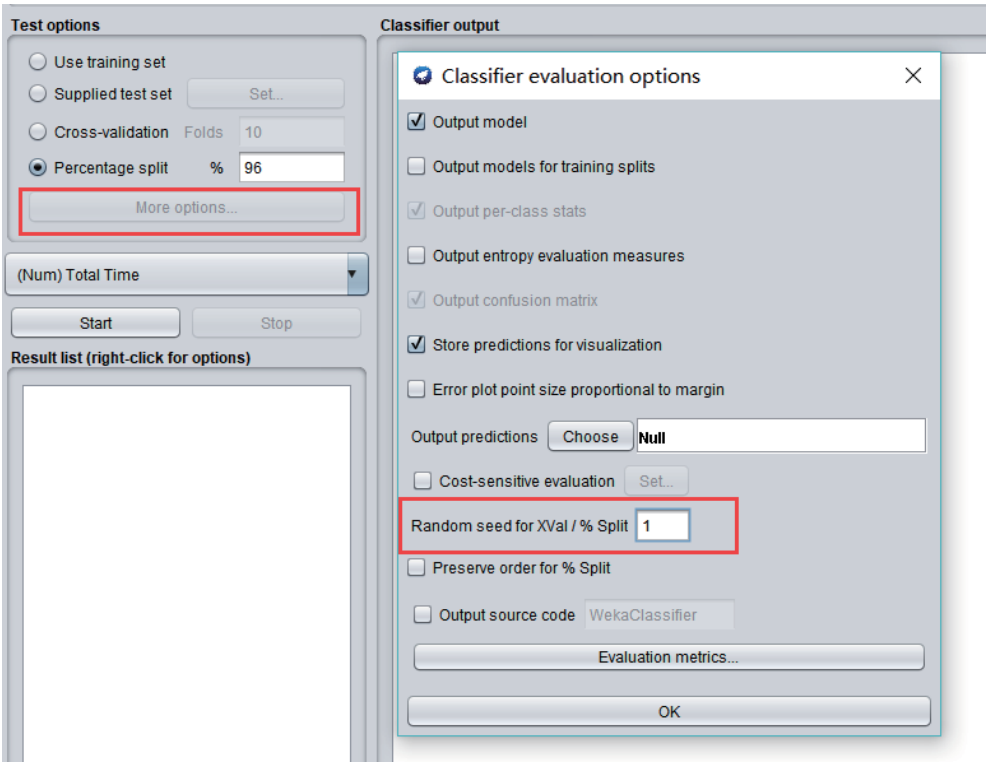


Fig.5 Random number setting

Tab.1 Average accuracy and standard deviation of different algorithms

Accuracy / RN / Algorithm	1	2	3	4	5	6	7	8	9	10	Average accuracy	Standard deviation of accuracy value	Baseline accuracy
J48	69.68	67.51	68.23	67.51	69.68	73.65	68.21	73.29	68.59	70.76	69.71	2.23	67.20
Jrip	67.87	66.43	68.23	64.62	68.95	71.84	67.51	69.31	65.70	69.31	67.98	2.07	
Naïve Bayes	69.67	64.26	65.70	63.90	67.15	71.12	67.15	67.87	63.54	68.23	66.86	2.52	
K-NN	59.21	55.96	61.73	61.01	66.07	58.12	56.32	59.57	59.57	64.98	60.25	3.32	

2.5.4 Visualization analysis of results

Due to the lack of new data sets for testing, the experiment uses the percentage partitioning method to use 1% of the training data as the data to verify the accuracy of the model. The most accurate result of the model is the result from J48 algorithm. In WEKA, the classifier output is as follows:

```
=== Run information ===
Scheme:       weka. classifiers. trees. J48 -C 0.25 -M 2
Relation:     asset-v1_PennX+BDE1x+1T2017+type@asset+block@BDEPennW1-weka.filters.unsupervised.
attribute.Remove-R1-5,8-9,16
Instances:    27731
Attributes:   10
              STUDENTID
              Gender
              Activity
              ONTASK
```

This part shows the basic information about the model's operation, including algorithms, data files, sample sizes, sample attributes, and methods for evaluating models.

TRANSITIONS
NumACTIVITIES
FORMATchanges
NumFORMATS
Transitions/Durations
Total Time
Test mode: split 96.0% train, remainder test

=== Classifier model (full training set) ===

J48 pruned tree

TRANSITIONS <= 3
| Gender <= 0
| | STUDENTID <= 983109
| | | Activity = Wholecarpet
| | | | FORMATchanges <= 0
| | | | | STUDENTID <= 915279
| | | | | | Transitions/Durations <= 0.000729
| | | | | | | STUDENTID <= 173286
…… ……
…… ……

This part shows the process of classification judgment and the construction result of classification model.

Number of Leaves : 517
Size of the tree : 1009
Time taken to build model: 0.86 seconds

This part shows the number of decision tree nodes, and time required for model construction.

=== Evaluation on test split ===

Time taken to test model on test split: 0 seconds

=== Summary ===

Correctly Classified Instances	757	68.2597 %
Incorrectly Classified Instances	352	31.7403 %
Kappa statistic	0.0975	
Mean absolute error	0.4105	
Root mean squared error	0.4737	
Relative absolute error	94.9553 %	
Root relative squared error	102.994 %	
Total Number of Instances	1109	

This part shows the evaluation results of the model prediction, include the number of instances of correct classification, model accuracy, Kappa values, etc.

=== Detailed Accuracy By Class ===

	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
	0.899	0.818	0.718	0.899	0.798	0.113	0.564	0.728	Y
	0.182	0.101	0.439	0.182	0.257	0.113	0.564	0.369	N
Weighted Avg.	0.683	0.601	0.633	0.683	0.635	0.113	0.564	0.619	

=== Confusion Matrix ===

a	b	<-- classified as
696	78 |	a = Y
274	61 |	b = N

Fuzzy matrix: In the original data set of "ONTASK" instance, there are 696 instances that are correctly predicted to be YES, 78 are incorrectly predicted to be NO. In the original data set of "OFF-TASK" instance, 274 instances are incorrectly predicted to be YES, and 61 are correctly predicted to be NO. The higher number on the corner, means the better the prediction of the model.

So as to observe the classification of the model more clearly, we can right-click the record in the result list and select "Visualize tree" to view the decision tree visualization graph of the model construction. With 10 attributes and large sample size, the decision tree is complicated in this experiment, and the decision tree graph is shown in Fig. 6.

To understand the prediction more clearly, you can view the visual image of the classification error. Right-click the corresponding record in the "Result lists" and select "Visualize predict error" to view the cross-analysis diagram as shown in Fig .7, the X axis represents the ONTASK data in the original sample, the Y axis represents the ONTASK data predicted by the model, the lower left indicates that the model correctly predicted ONTASK behaviors, the lower right indicates that the model incorrectly predicted ONTASK behaviors, and the upper left indicates that the model incorrectly predicted ONTASK behaviors, upper right Indicates that the model correctly predicted OFF-TASK behaviors , and the lower left part and upper right part reflect the correct number of model predictions.

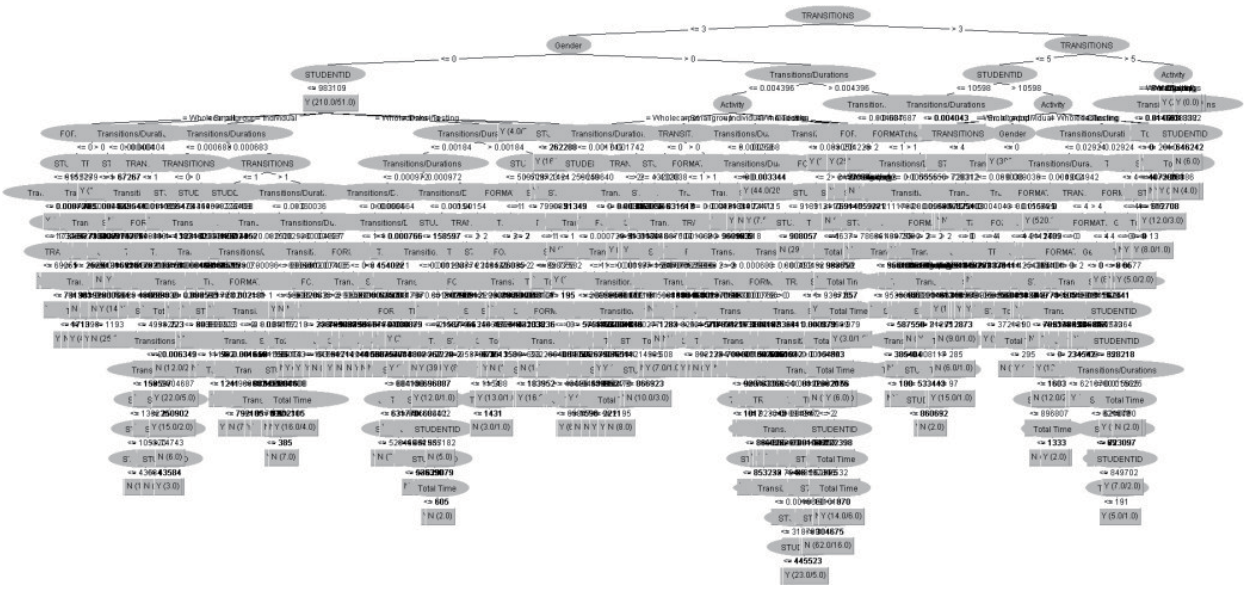


Fig.6 Model-generated decision tree

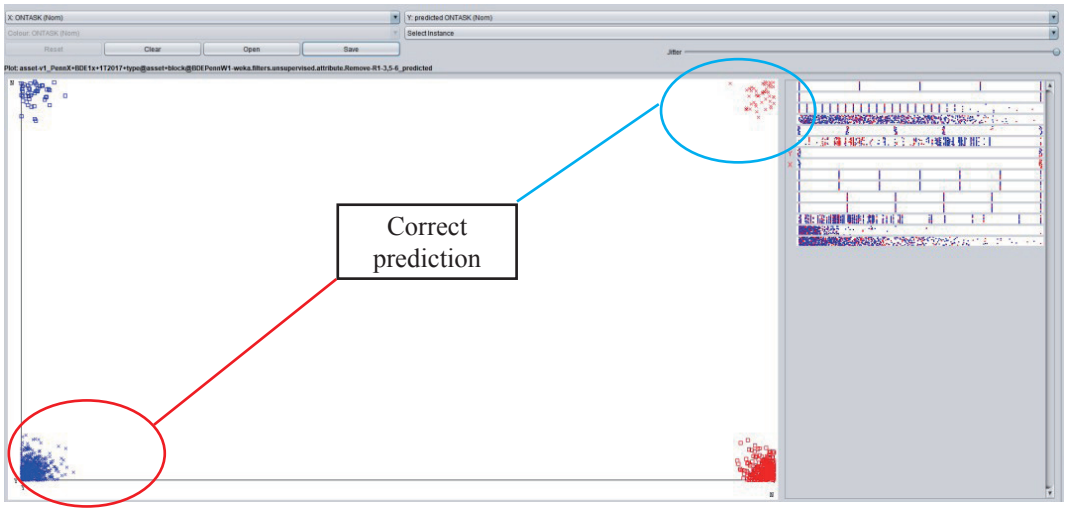


Fig.7 Model prediction error visualization

3.RESULTS

In this research, "ONTASK" behavior is a predictive category variable. Therefore, the prediction method of decision tree algorithm is used. The model obtained a better precision modeling with the J48 algorithm, but the predicted accuracy of 69.71% is relatively low for education problem. There should be other algorithms and methods to improve the accuracy for further studies.

The function of the model is to try to predict whether students will have off-task behaviors from the combination of easy-to-observe variables such as the type of teaching activities, the transformation of teaching activities, and the duration of teaching activities. The significance of this model is to confirm that teachers should design teaching activities reasonably, with which teachers can reduce the off-task behavior of students and improve the classroom teaching effect.

In addition, this paper describes the details of the process of data mining with WEKA, which providing reference for applying WEKA to do research in the field of educational data mining and learning analysis.

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Research on Educational Practice Guided by the Spirit of Maker

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Abstract: Maker is a kind of expression of Western DIY culture. It is the core spirit of design, innovation, freedom, and "learning by doing". In the field of education, Maker has long since ceased to be fresh and has become a sought-after new-style educational trend. This is because in the "Internet" + era, the development of network innovation and information technology has become a realistic possibility for the survival of Maker in education, and has been continuously valued. The encounter between artificial intelligence and maker education is not accidental, and the two complement each other on the road of development. Under the guidance of the spirit of makers, this paper introduces the development status of China's maker education: starting from the integration of the educational concepts of comprehensive practical activities in various disciplines, based on the "design sense" of the new thinking maker course practice, diverse and expressive Evaluation of these three aspects introduced. It has created a suitable new model for educational practice and is a beneficial way to cultivate innovative talents.

Key words: maker course, artificial intelligence, maker spirit, maker education

INTRODUCTION

The spirit of makers has always been active in our vision of life. We can understand the spirit of makers in this way: learning to read and write from a young age, but this does not mean that you have to be a writer when you grow up, but only to cultivate our understanding and Language ability; when I was young, everyone studied mathematics, and was not training on the path to mathematicians, but was exercising our analytical and logical thinking skills. The same is true for makers. Not everyone develops products and becomes a professional creator, but from Maker education, we can exercise the ability to develop and adapt to the individual, such as hands-on ability, design thinking, teamwork, Craftsmanship, sharing of knowledge, etc. Therefore, having a maker spirit is not necessarily a professional creator, but you can have the quality of makers and the ability to create a good person to become a good person from all walks of life, like painters, lawyers, doctors, managers, actors...

RESEARCH DESIGN

Chapter 1
First, the concept of maker education: starting from the comprehensive practice of engineering in various disciplines

The development of Maker Education shows that the education sector has begun to focus on the innovation behavior and innovation process to the development and growth of innovative talents. Creativity education focuses on creativity and implementation, cooperation and

sharing. However, our only vision of maker education is far from perfect. It should be rooted in the implementation of the curriculum so that our ideals and goals will shine into reality. The development of Maker Education is constantly promoting the development of the Maker Course. The Maker course requires students to apply the basic knowledge and basic skills of each subject in a comprehensive way, and cultivate the core practice of "problem-oriented problem solving" through digital design and manufacturing practice. Therefore, the Maker course presents more of the attributes of the "Comprehensive Practice Courses for Engineering" and adheres to the unique curriculum concept that is different from the traditional "sub-discipline". [1]

1. Advocating students' physical sense

In the traditional concept of most of us, the course is to teach subject knowledge, let us learn with the prescriptive and predecessors' summing experience, which directly leads to the students accepting ready-made knowledge, without self-exploration and spending time. To generate knowledge. How the knowledge in the book is defined, then follow the well-defined criteria. Obviously, such learning is not exploratory, and the process of learning lacks a lot of interest and participation. Students' learning is passive and inefficient. What Maker emphasizes is a kind of behavior and spirit of "hands-on, sharing, problem-solving", which is mapped to education. Maker education is guided by the spirit of makers, and the space of makers is the place. Modern information technology is scaffolding, breaking the singularity of traditional education and focusing only on the solidification of "knowledge", and integrating new educational concepts and models of multidisciplinary, interdisciplinary, creative and design sense. Cultivate students' knowledge and practice, use their hands and brains together, and use "learning by doing" as the core concept to encourage students to gain experience and knowledge from real life, focusing on personal experience and actual perception. "Doing middle school" is based on the interaction between students' subjective cognition and objective things in a suitable learning environment, so that they can grasp the specific knowledge and use methods through practice to practice the educational concept of knowing and doing together [2]. It also inspires students to think, to question the imagination, and to cultivate students' creativity and willingness to share the quality of the maker. Obviously, for the traditional, maker education is a more three-dimensional and richer educational process model, and the maker spirit always runs through the entire maker process.

2. The process of makers can't live without the real world.

Maker is a group of people who love technology and are passionate about practice. They not only have ideas, but also shaped works, which are loyal practitioners of "knowing oneself and creating one." Enthusiastic about pursuing the origin of things, willing to explore the principle of truth, pay attention to learning new things in practice, and use them creatively. Every Maker has a different beginning. In education, every child and teacher is also a Maker. As long as an idea is generated from the heart, this idea must be triggered by real problems. And drive you how to make, how to find the material to solve it, and finally the necessary knowledge and necessary skills to learn spontaneously. When a student encounters a problem to solve, he will further understand and explore on the basis of the original indirect experience, to learn and acquire the knowledge and methods to solve the problem, so that he has the ability to master new skills and reserve new information. This is the process of a "Zero to maker". In this process, learning content, learning methods and learning outcomes are of practical significance. Students' daily observation, closeness to nature, integration into society and self-improvement are full of the interest and state of "life education".

3. Multidisciplinary engineering comprehensive practice activities

The Ministry of Education's "Opinions on Comprehensively Deepening the Curriculum Reform and Implementing the Fundamental Tasks of Lide Shuren" proposes to integrate relevant educational content through interdisciplinary educational activities, and improve the comprehensive analytical ability and solving ability of students' problems [3]. The traditional teaching organization "class teaching system" is often to transfer knowledge efficiently in a fixed time unit. Basically, the teacher teaches a certain subject knowledge, but it also brings certain drawbacks. It is lacking in cultivating students' interest, creativity, exerting students' subjectivity, initiative, independence, and adapting to individual differences among students. Maker education is based on the actual life of human beings. It has a multi-disciplinary, interdisciplinary comprehensive and engineering-like comprehensive practical cognitive model. Maker Education requires students to take the initiative to use multidisciplinary knowledge to participate in the problem-solving process. This is an engineering practice process based on the comprehensive use of various knowledge, with digital manufacturing as the main technical means to achieve the "learning to use".

Chapter 2
Second, the educational research of maker design

2.1 The connotation of maker design learning

2.1.1 From the perspective of inquiry

In actual teaching, it is often a Scripted Inquiry rather than an Authentic Inquiry. In script-based inquiry, the teacher sets the learning objectives, proposes the learning themes, provides learning materials, stipulates the learning process, and the “correct” answers and conclusions of the study [4]. Different from script-based inquiry, inquiry is the basis for solving problems. Inquiry activities usually include: observation, problem-solving, planning, conducting investigation, forming conclusions, exchange discussion, and evaluating perfection. [5]

2.1.2 From a design perspective

From the design perspective, design-based learning is a design challenge for teachers. Students complete challenges through multiple design activities and form certain design results [6] [7]. Design usually consists of three core elements: an iterative learning process, effective teamwork, and materialized learning outcomes. Design is a problem-solving process for real-world situations. This process has never been done overnight and requires multiple iterations. Iteration can not only achieve the refinement of the design works, but also promote the knowledge and mastery of the knowledge. [8] In addition, the design is inseparable from effective teamwork. West & Hannafin found in the study of the key elements that affect the success of student design activities. Collaboration activities and group-based views and consensus are listed before the elements. Two [9], Krajcik believes that teamwork provides the possibility for learners to exchange ideas, share ideas, and learn from each other [10], which helps to promote learners to build a common learning experience [11]. In the early research of design-based learning, researchers pay great attention to the production of artifacts. Students in the process of completing the real design of the product, materialize the creative point of view, in order to enhance the ability of knowledge practice and critical thinking ability [12].

2.2 Characteristics of design-oriented maker learning

2.2.1 Problem guide

Taking the problem as the starting point of Maker education, it guides students to analyze problems, solve problems and reflect on problems, so as to promote the development of students' problem-solving ability. The problem is generated in real life or in a situation. Encourage students to pay more attention to life around them, to be close to nature, and to experience life more. Use life to find and solve problems. Cultivate the acuity of learners' discovery, insight, and the ability to explore the mind and hands.

2.2.2 Technical tool support

Maker Education promotes multidisciplinary integration and interactive sharing. The connection between different disciplines needs to be completed by a solid academic background and a substantial knowledge reserve. However, most learners are the target of Maker education. Their existing abilities and foundations are uneven. They are creating the guest process requires communication, discussion, publication, refutation and reflection. Therefore, it is very necessary to build scaffolding between disciplines as technical support. Resources search tools and data processing tools play a very convenient role in exploring and solving Non-constructive problems. Time communication tools and online network platforms can effectively support learners to exchange ideas and ideas and promote collaboration and knowledge sharing. Because there is no predetermined standard for maker education, it is a personal and diversified learning process that begins with the exploration of students' problems. This learning trajectory is like an adventure, free and fun, full of accidents and dangers. Therefore, there is a need to find a balance between the guidance of the teacher and the independent inquiry of the students. Building scaffolding is a solution to balance.

2.2.3 Interconnected value

In design-oriented learning for Maker Education, the value of interconnection is consistent in design learning. Learners are guided by real problems. In the process of understanding and solving problems, they need to use information tools and professionals to provide information and collaborate with peers. When producing physicalized learning products, everyone needs to go on the communication platform. Show and share to learn from each other and improve. George Simmons proposed Connectivism and proposed that "learning is the process of establishing connections with specific nodes and information resources" [13].

2.2.4 Iterative design

In addition, the biggest feature of design learning is iterative looping. Klodner once said: "Before knowledge is applied to practice, it usually requires repeated loop design to achieve" [14]. Iteration can help learners to realize knowledge transfer, better understand and master knowledge, Apedoe et al. The learning cycle [15], the learning cycle divides the teaching into the design skill area and the scientific knowledge area, and the two merge to form an iterative learning process. The learning process includes not only the iterative process from design to evaluation to practical application, but also the iterative process. Multiple class discussions, group activities, and individual events. In the maker course, each link has instant feedback,

which plays a certain role in ensuring the psychological safety of the learner and the smooth progress of the entire maker process. When the learner loses the problem, it will not cause the problem to stagnate because of the psychological loss, because the timely feedback link can help the scholar adjust the strategy or re-plan, which will enable the learner to regain confidence and find the motivation to continue.

In the design-oriented learning for maker education, in addition to the characteristics of the above-mentioned problem-oriented, technical tool support, interconnection and iteration, there are also features such as cross-border integration, practice-oriented, results-driven, and education-oriented.

Chapter 3
Third, the course evaluation of maker education

The evaluation of Maker Education is the result of an overall perception of the Maker class. The maker course is a direct way to practice maker education, while teachers and students are the dual subjects of the maker course. Based on the dual perspectives of inquiry perspective and design perspective, the maker course based on design thinking proposes an integrated discipline under the barrier of breaking the sub-curricular curriculum. From the practical experience, different students have different knowledge backgrounds and problem-solving abilities. The launched action strategies are also different. The problems and coping challenges present a diversified and personalized character in the learning process and learning outcomes, which fully reflects the ability of students in all aspects. The evaluation of this expressive maker problem is the “performance evaluation”.

3.1 Teacher's evaluation

The teacher's evaluation is expressed from the two aspects of the teacher's subject and object of evaluation. The role of the teacher in the maker's design learning is the leader, supporter, observer and so on.

The Maker course is different from the overall “ladder-type” course. The “goal-result-evaluation” is the basic course mode process, but the “climbing type” of “theme-exploration-evaluation” is the basic course mode process. This “mountain-type” course focuses on the participation of students and develops different learning paths in the maker course due to different ways of thinking and action plans. This poses new challenges for teachers to grasp the whole learning process, guide, support and evaluate students' learning behaviors; [16] but teachers can guide and analyze students' learning status and individual literacy from the students' problems. It helps to diagnose students' interest inclinations and places that are not good at them, so as to better help them grow up; and this provides a reflective strategy and adjustment guidance for teachers' teaching work.

3.2 Student evaluation

Students are participants, inquirers, collaborators, etc. in the maker course. The student's evaluation is introduced from the dimensions of the characteristics of the maker design course, the performance of the students and the attitude of the teacher:

3.2.1 Because the maker course is iterative, there will be timely feedback on different links. Students can reflect on their own problems in the feedback process, and the “climbing” creator course is an inquiry-based collaborative learning. The cooperation, discussion and sharing between students and peers will produce certain effects. Observation, evaluation and expression will make them aware of their own problems, and will continue to promote the repair to achieve the purpose of improving their own purposes;

3.2.2 The teacher's guidance and guidance for each classmate will be of great help to the students' self-awareness and reflection;

3.2.3 The evaluation of students has many dimensions, which can be evaluated in terms of knowledge level, information literacy, technical ability, collaboration ability, emotional attitude, and learning experience.

3.3 Evaluation of the group group

In the Maker class, due to the comprehensiveness and complexity of the Maker project, students generally complete the Maker event through group cooperation. That is to say, the individual's individual performance and behavioral performance constitute the performance of the entire group, and ultimately expressed in the form of the results of the work. For example, evaluations can be made from the group members' responsibility assignments, cooperation mechanisms, participation levels, interactions, and mutual respect. [17]

SUMMARY

The educational inquiry led by the spirit of makers is practiced in the context of artificial intelligence. The spirit of makers is the spiritual support of the makers based on the background of artificial intelligence. Under the driving of the spirit of makers, the positive instinct and willingness of cooperation, innovation and practice are obvious to the development and creation of the artificial intelligence era, such as: 3D modeling, Procssing capabilities, Ardunio, Raspberry Pi, etc. At the same time, the advent of the artificial intelligence era has brought many opportunities to the makers, such as the environment and resources such as the artificial era, and of course, it has brought many challenges to the makers. It is precisely under the guidance of the maker spirit that these challenges are not difficult for the makers to solve, and today's challenges will be turned into any kind of resources in the artificial era. Please do things with the spirit of makers, please continue to uphold the spirit of makers.

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An Empirical Study to Promote Deep Active Learning through ICTs

- by Improving the Process of Internalization and Externalization of Reading Circles Learning-

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Abstract: In order to promote deep active learning, Internalization (acquiring and constructing knowledge) out of class, Externalization (applying and reconstructing knowledge) in class, and the Circulation of Internalization and Externalization in and out of class are essential according to previous research. Hence, this research was intended to explore how to use ICTs to promote Internalization out of class, Externalization in class, and the Circulation of them. ICTs were practically implemented in Reading Circles Learning to improve the process of Internalization and Externalization in undergraduate and graduate courses. The results indicated that the use of ICTs out of class need transform from a tool of learning material to self-learning and reflection, and the transformation can be achieved by equal participation and visualization of thinking in group learning.

Key words: ICTs, Reading Circles Learning, Deep Active learning, Internalization, Externalization

INTRODUCTION

In the era of knowledge economy, higher-order thinking skills and abilities such as problem-solving ability and critical thinking have become the target for education. Learners are required to deeply process information and construct a personalized contextualized knowledge system to solve complex problems, which calls for Deep Learning.

Different from deep learning in machine learning, the study of deep learning comes from many subject areas, being researched and developed from different perspectives. Marton and Säljö (1976) initially described the distinction which they found among students reading an academic article as deep and surface levels of processing. Since then, many scholars have begun to study and develop it, such as Biggs, J. and Entwistle, N.. Based on previous research, I conclude that it is a process of construction of knowledge and new meanings, and a result of higher-order thinking skills and abilities.

Deep Learning (DL) has been developed into Deep Active Learning (DAL) in the perspective of Active Learning in Japan, which can be described as student-centered deep learning. In order to realize DAL, Matsushita (2015) put forward the concept of internalization and

externalization, explaining internalization as "acquiring necessary knowledge", externalization as "attempting to resolve conflicts by actually applying the knowledge", and pointed out "Once internalized knowledge is reconstructed through externalization activities such as discussing and writing activities for problem-solving, it can promote deeper understanding (deepening of internalization) ".

In addition, out of class learning is also a vital part of DAL. Good learning strategies, such as problem-based learning, consist of a learning system including in and out of class learning. In the concept of active learning, the in-class activities are mainly for the use of knowledge, so if learners do not take time to learn before class, surface learning could happen in class (Jiang & Mizokami 2014). Learners engaging in internalization activities-acquiring necessary knowledge-out of class is necessary for DAL.

Hence, the Model of Deep Active Learning can be depicted as Figure1, including three key points, ①Internalization out of class, ②Externalization in class, ③the Circulation of them. As “Flipped Learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter(Network, F.L. 2014), Flipped Learning is based on this model to some extent. These three points mean the process of DAL, and need be achieved with information and communication technologies (ICTs). Hence, how to use ICTs to promote these three points should be researched.

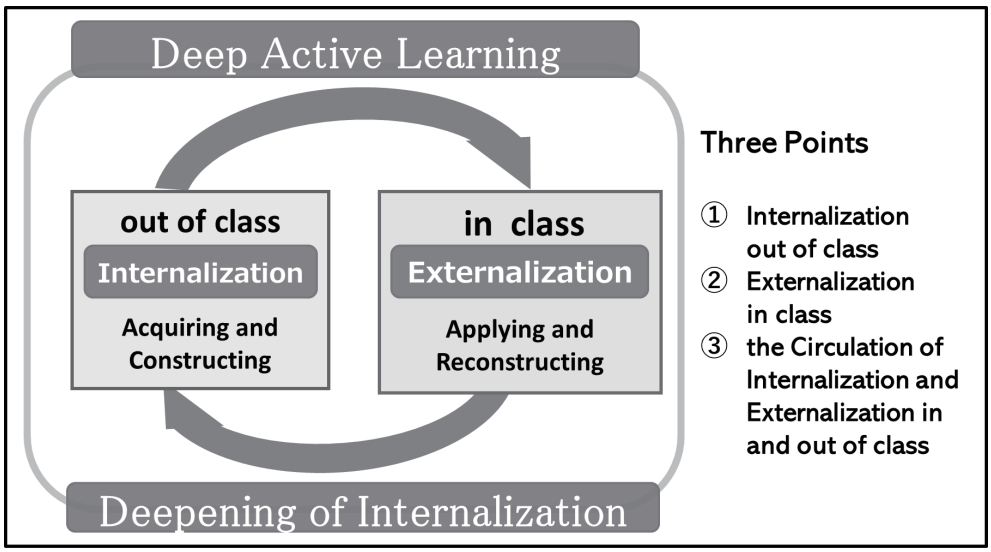


Figure 1. the Model of Deep Active Learning

Reading Circles Learning (RCL), which conforms to the model above and is a student-centered learning form (Hu & Nonaka 2017a), is appropriate to practice this model. In order to promote DAL, the traditional Face-to-Face Reading (FTFR) has been improved into Flipped Reading (FR), which ICTs (e.g, audio presentations) are used to fulfill the Internalization and Externalization. Through questionnaires, objective examinations and other survey methods, the effect of knowledge understanding out of class has been clarified. At the same time, we find that ICTs will become a tool for learners' self-study and reflection in deep learning (Hu & Nonaka 2017b, 2018a, 2018b). But how to promote the transformation is still a problem need to be solved.

RESEARCH DESIGN & METHODS

In previous studies, we have confirmed its effect on out of class learning. This paper is mainly to verify the relationship between ICTs and DAL model by analyzing its effect on discussion in class. The practice was conducted at Y University in the "Lesson Design Exercise I" in 2017, and the participants were 7 graduate students. The first circle (Circle One) was FTFR, the second circle (Circle Two)was Flipped Reading Ⅰ (FRⅠ), the third and fourth circles (Circle Three and Four) were Flipped Reading Ⅱ (FRⅡ). Questionnaires were conducted to collect data. In FRⅡ, visualization support was introduced into Externalization, all participants need to write their ideas on the whiteboard to visualize their thinking before the group discussion begins. The structure and schedule are shown in Table1. and Table 2..

Table 1. The structure of Face-to-Face Reading and Flipped Reading Ⅰ & Ⅱ

		Out of class (Before) class	In the class
Face-to-Face Reading	Responsible	Reading Writing a summary (including a question)	Presentation Discussion
	Non-responsible	(self-reading)	Listening to the presentation, Reading the summary, Discussion
Flipped Reading Ⅰ	Responsible	Reading, Writing a summary Recording the presentation	Discussion
	Non-responsible	Listening to the audio presentation, Reading the summary	Discussion
Flipped Reading Ⅱ	Responsible	Reading, Writing a summary Recording the presentation	Visualizing thinking Discussion
	Non-responsible	Listening to the audio presentation, Reading the summary	Visualizing thinking Discussion

Table 2. the schedule and contents of practice

Date	Schedule and Contents
April 11,18	Guidance, Division of reading, reading of Chapters 1 and 2
April 25, May 9	Circle One FTFR(Chapters 3)Q1(questionnaire 1 about FTFR)
May 16,23,30	Circle Two FRⅠ(the front half of Chapters 4)Q2(questionnaire 2 about FRⅠ)
June 6	Mid-term summary
June 13,20,27	Circle Three FRⅡ(the latter half of Chapters 4)Q3(questionnaire 3 about FRⅡ)
July 4,11,18	Circle Four FRⅡ(Chapters 5 and 6)
December18th	Summary Q4(questionnaire after class)

RESULTS

1. the effect on Discussion (Externalization)

Discussion is a form of Externalization, whether the knowledge is reconstructed, or critical and comprehensive understanding is promoted or not in Externalization is the sign of DL. As a result, all participants' description of discussion was collected and analyzed. 7 students in FTFR

and FRⅡ, 6 students in FRⅠ regarded discussion as the activity of knowledge construction. The following Table.3 records the reasons why learners think discussion is an activity of deep learning.

As shown in Table.3, students have the same opinion about the two parts (Responsible part and Non-responsible part). According to the underlined sentences in Table.3, In FTFR listening to others help them get new perspectives and discoveries, and their thinking became richer and more comprehensive. FRⅠ was the same as FTFR, New perspectives and discoveries made their thinking more comprehensive and deepened understanding. But in FRⅡ, addition to the new perspectives and discoveries (underlined sentences), comparison and organization of thoughts (shading sentence) were also mentioned.

Table.3 the reasons why discussion is an activity of deep learning in FTFR, FRⅠ & Ⅱ

	Responsible part	Non-responsible part
Face-to-face Reading (FTFR)		
P	It was interesting to hear how incumbent teachers actually think and how they explained in the field.	It was interesting just to hear that you can't imagine and keep up.
Q	Incumbent teachers' experiences deepened my understanding.	I deepened my understanding by referring to others' ideas
R	Because I can get new perspectives and awareness	Same as Responsible part
N	By verbalizing my thoughts, I often understood more than I initially understood. Also, I was able to think in ·different perspectives by listening to the opinions of others.	Same as Responsible part
T	Because my knowledge has been reconstructed	I can gain new knowledge to reconstruct my own knowledge
S	Based on my summary, I got some understanding from discussion.	When I talk with others, I can get something I can't image and notice.
O	My understanding was deepened by listening to various opinions about the questions I set.	Rather than thinking alone, understanding is deepened by listening to the opinions of other students
Flipped Reading Ⅰ (FRⅠ)		
P	By discussing the areas that I didn't know, I could imagine it and felt some new understanding.	It makes it easier to imagine the area I don't know, and the part I don't understand, which help me understand.
Q		My vision was broadened and understanding was deepened about A broad view of this book
R	To notice different points of view	Because I can think further by receiving diverse opinions
N		
T	I can get new perspectives and ideas, and my ideas spread and become stronger.	Because I get some new way of thinking from others
S	I made new discoveries by listening to other people's ideas or asking questions	Because there are some new discoveries.
O	Discussing the questions can lead not only to the solution of the questions, but also to the different thinking perspectives.	I am able to think about the questions from various viewpoints

Flipped Reading Ⅱ (FRⅡ)		
P	It became possible to compare and relate one's thoughts to the others' thoughts.	All the ideas were visible, and thanks to the whiteboard that listening helps in meeting the ideas of members and make me feel relieved when I find the same understanding.
Q	I can see the question from multiple perspectives	I can think more deeply about the text.
R	Because new awareness was obtained	Because new awareness was obtained
N	It was exciting to compare one's understanding with the other's thoughts and find differences and similarities, and I felt that I had become more understood.	Same as responsible part
T	The act of writing and drawing contribute the recognition of my own thoughts and the restructure of existing knowledge.	Organize thoughts and reconstruct knowledge through discussion
S	Because I can touch ideas and ideas beyond my own boundaries and deepen my thinking	The discussions from the answers to the questions deepen my understanding.
O	I think that my understanding has been deepened and my vision has broadened by various opinions about the questions.	By using the whiteboard to visually understand other people's opinions and ideas, I feel that it become easier to understand other people's thoughts and deepened my understanding

2.the effect of visualization support

There were some good changes in discussion from FRⅠ to FRⅡ. As shown in Table 1., the difference between FRⅠ and FRⅡ is the use of visualization support in Externalization. In order to clarify the effect of visualization support on preview and discussion, we collected and analyzed learners' descriptions of visualization support. As shown in Table.4, the introduction of visualization support led to the increase in autonomous learning out of class (underlined sentences), and the comparison, organization of ideas in class (shading sentence).

Table.4 the effect of visualization support on preview and discussion

P	As it is necessary to present my own ideas, time to think about question before class increases. I came to read books more consciously for understanding.
Q	By visualizing my ideas, I was able to organize my opinions. Discussion became more active and easier to see the associations among opinions. By writing on the board, I would think about how to better describe my thinking. I would set up the question in anticipation of the flow of discussion.
R	As listening to the opinions of others while seeing the visual information, my understanding was deepened, easy to compare and consider. Discussions became deeper and better. I began to think more carefully so I could write the answer to the question immediately.
N	Verbalizing and visualizing the thinking and comparing the ideas of others deepen my understanding. I started thinking about how to write the solution on the whiteboard in advance in response to the question.
T	Organize my thoughts by writing and drawing. I thought about the composition in my head in advance because I knew that I would write and draw in class.
S	I was able to organize my thoughts and speak based on them, and I could see others' opinion based on the figure, and it led to a deep understanding. I became more aware of questions than before because I had to write answers to questions in whiteboard. I came to put more effort on self-study.
O	The depth of thinking about the question has changed. Furthermore, Because it became more easier to conduct discussion. In order to understand the content of the part in charge more deeply, I came to think about what kind of questions should be asked (preliminary study)

CONCLUSION

Through descriptive analysis, the difference between FR Ⅰ and FR Ⅱ has been found. With the help of visualization support, students tended to use higher-order thinking skills in their discussions and preview autonomously. That means, the introduction of visualization support not only improves the quality of Externalization (② in Figure.1), but also promotes the deepening of Internalization and the Circulation between Internalization and Externalization (① and ③ in Figure.1).

We can see that Deep Active Learning starts from Internalization, but the main emphasis is Externalization. Externalization determines the Circulation of Internalization and Externalization-whether learners can become autonomous learners or not. As Mizokami (2014) has said, out of class learning is necessary to become "Individual learning time and space", where students learn contents positively to improve the quality of understanding, which means not just previewing, reviewing, or completing assignments, but checking your own understanding, connecting with existing knowledge and experience, and examining unrecognized knowledge that have appeared in class.

Out of class learning is for students to learn independently and think deeply, more about reflection than passive knowledge acquisition. Externalization is the key to transformation from compulsory learning to autonomous learning. When students learn to study independently out of class, they will achieve the real goal of DAL and become lifelong learners. Because in DAL, students will learn the target world deeply, while interacting with others, linking to their pervious knowledge and experience as well as their future life (Matsushita 2015).

ICTs are actually a tool for self-regulated learners, but it is always difficult for learners to learn independently and continuously. For example, MOOCs (massive open online courses) are open and free, but few learners have the motivation to continue. The combination of ICTs and student-centered learning is to make students become active learners through individual learning and cooperative learning. In this practice, we find that the potential reason for learners to change their behavior is actually the equal participation and visualization of thinking, meaning the opportunity of performance in face-to-face learning is important, and Externalization need construct a learning community with equal opportunities.

However, the practice scale is small and the experimental subjects are also high-level master students, so the results need to be verified anyway. And equal opportunities to perform for everyone is not necessarily possible in today's education.

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Exploring the Relationship between Students' Feelings in Class and Their Final Scores

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Abstract: Learning data plays a very important role in teaching. Using learning analysis, valuable information can be extracted from the classroom learning data, and the application of the information to the classroom teaching can achieve the purpose of optimizing the teaching effect. This study collected the 17-week students' classroom feelings data and the final exam score data of the three courses of the classmates. It explored the relationship between different types of classroom feelings and test scores. The study found that the average score of the students with unique feeling is higher than the average score of the student with general feeling. The average score of the student with general feeling is not significantly different from the average score of the whole class. The average score of the student with no feeling is lower than the whole class. This study provides a basis for how to improve the teaching effect from the process management.

Key words: Students' feelings, Learning data, Text mining, Learning analysis

INTRODUCTION

Text is a special type of education big data. It truly and directly reflects the learner's motivation, cognitive development, emotional attitude, and learning experience. To get valuable information in the text, it is necessary to use text mining. Text mining is a cross-cutting field combining data mining with natural language processing. In recent years, it has become a new learning analysis method to measure learners' psychology and behavior through text mining.

By mining the text of the learning process, the key information hidden in the learner's text expression can be extracted, which helps the educator to predict and timely intervene the student's learning effect and achieve the goal of improving teaching. At the University of Queensland, Australia, researchers used the SNAPP tool to analyze learner-discussion interactions in order to identify learners at high risk and guide educators to implement

interventions in time (Bakharia et al., 2009). In a study by Carnegie Mellon University on emotional analysis predicting learner withdrawal behavior, it was found that learners' collective emotional ratios in the course discussion area were significantly correlated with their rate of withdrawal (Wen et al., 2014). At the University of Texas, researchers used 363 college students' self-introduction briefs as data sources and analyzed them using LIWC tool to predict learners' course effectiveness. The experimental results indicate that the use of the word construction in some special language categories can be used as an important indicator to predict the effectiveness of the learner's curriculum (Robinson et al., 2013).

Although the use of text mining technology plays an important role in predicting students' learning effects, scholars pay more attention to the mining of online and summative texts, and the text mining of students' classroom feelings in the offline teaching process is rarely mentioned.

This study collected the students' classroom feelings data of 17 lessons in one semester and the final exam scores of the three courses at the end of the class. Using text mining technology to extract valuable information from students' classroom feelings data, to explore the relationship between students' classroom feelings and final scores.

RESEARCH DESIGN & METHODS

In order to explore the relationship between students' classroom feelings and their test scores, this study used 40 sophomores as research subjects, and collected students' classroom feelings data of 17 lessons and final grades of the "Multimedia Picture Art Design" course. Final exam scores for the other two courses of the same semester of these students were also collected.

A questionnaire containing two open questions was designed to obtain the students' classroom feelings data. Students were asked to answer the questionnaire with their real names, but they were not forced to answer questions. The two questions in the questionnaire are "What are you most impressed in this lesson?" and "What are you most interested in about this lesson?".

This study used NLPIR (Natural Language Processing and Information Retrieval Sharing Platform) software to segment the text of the classroom feelings, and then classified the students according to the results of the word segmentation. The specific method is as follows:

1. Perform word segmentation and obtain a set of words from a student's class feelings, a set of words from total student's class feelings and a unique word set. Using the function of "New Word Discovery/Keyword Extraction" of NLPIR software, the students' classroom feelings data is processed, and meaningful words and their word frequency that do not include meaningless monosyllabic words such as "yes", "is" and "to" are obtained.

Several concepts are defined here. The collection of words that are meaningful and have no repeating words in a classroom feelings of a student' s class is called the Set of Words from a Students' Classroom Feelings, and also called as the Student's Word Set (StWS) for short. The collection of meaningful words and their word frequencies in the whole classroom feelings of a class is called the Set of Words from Total Students' Classroom Feelings, and also called as the Total Word Set (TWS) for short. A word whose frequency is less than or equal to the threshold k is called the Unique Word (UW). A word whose frequency is greater than the threshold k is called the General Word (GW). A set of words containing only UWs is called the Unique Word

Set (UWS), and a set of words excluding the UWs is called the General Word Set (GWS).
2. Calculate the number of words in a SWS. In this paper, the number of words in SWS is called the Total Number of Words (TNW). For example, the classroom feeling of a student is “a classmate's example of multimedia.”, the SWS obtained by using NLPIR software is “classmate, multimedia, example”. Therefore, the TNW is 3.

3. Classify students' feelings based on SWS, UWS and GWS. In this paper, the students' feelings corresponding to SWS with TNW of 0 are called the No Feeling (NF). The number of words coexisting between SWS whose TNW is not 0 and UWS of the same lesson is called the Matching Number of Unique Word (MNUW) of the SWS. Divide MNUW by the TNW in the same class to get the Unique Rate (UR) of SWS. The students' feelings corresponding to the SWS of which the UR is greater than or equals to 0.5 is called the Unique Feeling (UF); the students' feelings corresponding to the SWS of which the UR is 0 is called the General Feeling (GF); the students' feelings corresponding to the SWS of which the UR is greater than 0 and less than 0.5 is called the Atypical Feeling (AF).

4. Classify students according to the types of feelings. The classification of each student's 17 classroom feelings is separately counted. If the no feeling times of a student is greater than one quarter of the total number of times, this kind of students is called the Student with No Feeling (StNF). For non StNF, if the number of times of his/her classroom feelings belonging to UF is greater than that belongs to GF and AF, then this kind of student is classified as the Student with Unique Feeling (StUF); if the number of times of his/her classroom feelings belonging to GF is greater than that belongs to UF and AF, then this kind of student is classified as the Student with General Feeling (StGF). Students in other situations are classified as a kind of Student with Atypical Feeling (StAF).

If the classroom feelings and the final scores are belonging to the same students, studying the relationship between students with a kind of classroom feelings and their final scores is to study the relationship between this kind of classroom feelings and final scores.

ANALYZE PROCESS & RESULTS

According to the above definition and the collected student classroom feelings data, 40 students were classified when the threshold k is taken as 1. The result was that there were 3 students with unique feeling (StUF), 9 students with general feeling (StGF), 5 students with no feeling (StNF), and 23 students with atypical feeling (StAF). Table 1 shows the student identifier (ID) and final scores of StUF, StGF, and StNF.

Table 1

Final scores of "Multimedia Picture Art Design" of three types of students.

Student's types	Students' ID and their final scores									
StUF	ID	8	26	32						
	final scores	84	82	86						
StGF	ID	4	6	24	28	30	33	34	35	37
	final scores	78	76	78	78	88	72	75	72	76
StNF	ID	1	5	12	15	27				
	final scores	63	65	61	69	67				

Using the SPSS data analysis software, the scores of the three types of students in Table 1 were compared with the results of the whole class, and the comparison between them was performed. The results are shown in Table 2.

Table 2

Analysis of differences in final results of " Multimedia Picture Art Design " of three kinds of students.

No.	Student's types	Min	Max	X	S	T	Sig.
1	StUF	82	86	84.000	2.000	2.059	0.046*
	the whole class	60	90	74.725	7.703		
2	StGF	72	88	77.000	4.743	0.847	0.402
	the whole class	60	90	74.725	7.703		
3	StNF	61	69	65.000	3.162	-2.771	0.008**
	the whole class	60	90	74.725	7.703		
4	StUF	82	86	84.000	2.000	2.422	0.036*
	StGF	72	88	77.000	4.743		
5	StUF	82	86	84.000	2.000	9.198	0.000***
	StNF	61	69	65.000	3.162		
6	StGF	72	88	77.000	4.743	5.025	0.000***
	StNF	61	69	65.000	3.162		

*p<.05 **p<0.01 ***p<.001

From the results of the number 1 in Table 2, it can be found that the average final score of StUF is significantly higher than the average final score of the whole class (p=0.046,). From the results of Table 2, number 2, it can be found that the final average score of StGF is higher than the average final score of the whole class, but the difference does not reach a significant level (p=0.402). From the results of Table 2, number 3, it can be found that the average final score of StNF is significantly lower than the average final score of the whole class (p=0.008).

From the results of No. 4, No.5, and No.6 in Table 2, it can be found that the differences among the final scores of three types of students have reached a significant level (p=0.036, 0, 0), and the average score of StUF is the highest (X=84), the average score of StGF is middle (X=77), and StNF have the lowest score (X=65). This shows that the three typical students' classroom feelings data are related to the final scores.

In order to verify the universality of the results of Table 2, the study collected the final exam scores of the other two courses of these students in the same semester, and analyzed the scores. The results are shown in Table 3 and Table 4.

Table 3

Analysis of differences in final results of "Network Database Application System Development Technology" of three kinds of students.

No.	Student's types	Min	Max	X	S	T	Sig.
1	StUF	80	83	81.667	1.528	3.927	0.001**
	the whole class	43	92	73.900	11.195		

No.	Student's types	Min	Max	X	S	T	Sig.
2	StGF	63	78	72.444	4.978	-0.600	0.553
	the whole class	43	92	73.900	11.195		
3	StNF	43	65	55.200	8.497	-3.593	0.001**
	the whole class	43	92	73.900	11.195		
4	StUF	80	83	81.666	1.528	3.071	0.012*
	StGF	63	78	72.444	4.978		
5	StUF	80	83	81.667	1.528	5.182	0.002**
	StNF	43	65	55.200	8.497		
6	StGF	63	78	72.444	4.978	4.853	0.000***
	StNF	43	65	55.200	8.497		

*p<.05 **p<0.01 ***p<.001

Table 4

Analysis of differences in final results of "Educational TV Programs Director and Production " of three types of students.

No.	Student's types	Min	Max	X	S	T	Sig.
1	StUF	81	89	85.000	4.000	2.366	0.023*
	the whole class	60	89	73.800	8.058		
2	StGF	66	81	76.222	4.684	1.202	0.243
	the whole class	60	89	73.800	8.058		
3	StNF	60	68	64.400	2.966	-5.110	0.000***
	the whole class	60	89	73.800	8.058		
4	StUF	81	89	85.000	4.000	2.890	0.016*
	StGF	66	81	76.222	4.684		
5	StUF	81	89	85.000	4.000	8.429	0.000***
	StNF	60	68	64.400	2.966		
6	StGF	66	81	76.222	4.684	5.058	0.000***
	StNF	60	68	64.400	2.966		

*p<.05 ***p<.001

From the results of Table 3 and Table 4, the final performance of the three types of students in the "Network Database Application System Development Technology" and "Educational TV Programs Director and Production" courses is very similar to that in the "Multimedia Picture Art Design" course.

That is to say, the average score of StUF is the highest among the three types, and is significantly higher than the average score of the class; the average score of StGF is comparable to the average score of the class, sometimes slightly higher than the average grade of the class, sometimes slightly lower than the average grade of the class; the average score of StNF is the lowest among the three types, and is significantly lower than the average score of the class.

CONCLUSION

By analyzing students' classroom feelings data and their test data, it is found that students' classroom feelings have a certain relationship with their final scores. Therefore, teachers can find problems and intervene in time from the expression of students' classroom feelings. This paper provides ideas for improving teaching effects based on the students' classroom feelings data.

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Big-data-based Learning Intervention and Learning Analysis

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Abstract: More and more colleges and universities adopt the hybrid education method as the main teaching method. Blended learning combines traditional face-to-face and online teaching for students, increasing the interactivity of the course content and the diversity of teaching. However, how to provide students with effective course resources and effective interaction methods, is more targeted. It requires the usage of big data analysis to find a solution. Through my empirical study of 363 sophomore accounting students in my Tax-law course, finding shows two evidences; one is that key factor which has a direct impact on student learning mood; the other is without adequate supervision, students will still try to cheat on the LMS. My conclusion includes three points; at first, we can use a big data mining to create a multidimensional analysis of the stereoscopic analysis including background factors; secondly, we should increase the cost of cheating by improving the LMS and a reasonable evaluation system; lastly, under collaborative learning, in order to improve learning quality we need to increase effective team integration to fulfill some task and internal assessment and interaction.

Key words: Blended learning, LMS, Interaction, Impact factor, Multi-dimensional analysis, Prediction, Collaboration

INTRODUCTION

Higher education institutions across the globe are increasing the extent to which they teach in a blended mode. Blended learning is defined as "any formal education program in which a student learns at least in part through online learning, with some element of student control over time, place, path, and/or pace" (Horn & Staker, 2014, p.34). With the advent of new technologies, blended learning is generally achieved through networks and smart tools (e.g. Handy). Clayton Christensen 's research divided the majority of blended programs in four models: rotation, Flex, A La Carte, and/or Enriched Virtual . The form of flipping classrooms (one of rotation model) is widely used in schools in Asia. With the promotion of the hybrid learning method, the advantages and disadvantages of the hybrid education method are regarded as the main research topics. In my paper, I will try to explore the relationship between some influential factors and blended learning efficiency with academic achievement.

Positive: Advantage of Blended Learning

The advantage of hybrid learning for traditional learning is the increase in learning freedom and the diversity of teaching methods. This view is currently widely accepted, such as the following.

" [There are] three foundational changes influencing online education: a philosophical shift from

objectivism towards constructivism; a theoretical shift from behaviorism towards socio-cognitive views of education; and a pedagogical shift from direct instruction to collaborative learning ."(Shea, P 2006) "Blended learning should be viewed as a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment, rather than a ratio of delivery modalities. In other words, blended learning should be approached not merely as a temporal construct, but rather as a fundamental redesign of the instructional model. " (Dziuban, C., Hartman, J., Moskal, P. 2004)

Many studies compare the effect on students' learning outcome generated by respectively F2F teaching and/or blended learning. In Bernard et al.'s (2014) meta -study of blended learning in higher education, students in blended programs have turned out to achieve slightly better than students following traditional classroom instruction programs. Similar findings have been made by other studies – e.g., Israel (2015), Northey et al. (2015), Southard, Meddaug and Harris (2015), González -Gómez et al. (2016) and Ryan et al. (2016). (Anne-Mette Nortvig et al. 2018) Negative:

Disadvantage of Blended Learning

Despite the successes of these blended learning, there are still some disturbing points to concern: firstly, student attrition (Tait & Gore, 2015), secondly, the fact that efforts to increase student engagement remain generally unsuccessful, and thirdly, cost benefit drivers being questionable (Hülsmann, 2016). Those who are skeptical about the hybrid education approach believe that there is a lack of adequate face-to-face communication and that students are unable to invest in emotional motivation. Meanwhile, some studies have also found problems through their own observations as follows.

Adams, Randall and Traustadóttir (2015) found that university students following a hybrid introductory course in microbiology were less successful than their peers following the same course in a F2F version. Less interaction with the material or a sense of isolation arising from less class attendance are counted among potential reasons for the hybrid students' lower success. Similar findings are mentioned in Powers et al.'s study (2016) of students' performance in respectively hybrid and traditional sections of an introductory psychology course where a significant decrease in exam grades throughout the semester was observed for students in the hybrid section. A suggested reason for this negative difference in achievement for students following the hybrid program is that these students had to deal with difficult concepts independently and without sufficient explicit F2F teaching. In contrast, another study reaches the opposite conclusion and points to similar circumstances as a way of explaining. (Northey et al., 2015)

In response to the above points, and to explore the role and relationship of various factors under blended learning, an independent study was undertaken in my Tax-law course.

In this empirical study, I divided the impact factors contributed to academic achievement into three categories; the students' learning emotions under the blended learning, the teacher's effect, and the learning atmosphere of other partners.

RESEARCH DESIGN & METHODS

My research object consists of seven classes I taught in the second semester of 2018-2019. The duration is one semester, 16 weeks. All students are undergraduate students admitted to the college entrance examination. The Tax-law courses I taught were blended learning course. It included three combined classes and a single class, each combined-class was around 105. The total number of participants was 363, of which 102 were male students, accounting for 28.1%, and 261 were female students, accounting for 71.9%. Graham (2012) distinguishes between enhancing, enabling, and transformative models. To achieve the transformative goal, two means approach was adopted in my research design. The usage of intelligent network platform "MOSOTECH" to manage students' usual grades and instant messenger software "RAINCLASS" as a means of hybrid teaching played the role of teacher assistant in class. Both the "RAINCLASS" and the "MOSOTECH" can work on the Android system of the smart-phone and desktop. "MOSOTECH" works as APP in Handy, but "RAINCLASS" just as part of ecology only in WECHAT (instant messenger). "MOSOTECH" is used as a learning management system (LMS) platform to manage students' usual grades. Its function includes storing short videos on the MOSOTECH platform, various troubleshooting explanations for courseware content, group assignments, QUIZ and brainstorming, survey. "RAINCLASS" is a software which links the teacher's computer to the student's Handy; all Quiz on class could be showed the result and percentage of right or wrong for each question; it provided interactional Message on screen and instant communication with the teacher.

The online activities and online resources were provided by me. The hybrid teaching method consist of two parts. One is course resource, the other is activities. These were updated twice per week. when a new resource or new event is released, the student will be reminded to notice it.

Table 1. Study-Resource &Activity

Resource on-line		After-school teaching activities			
Other material	Short video learning	Quiz	Other material	Brain Storm	Discussion
45	10	12	45	2	6

Data were gathered from three sources: (1) Score of LMS; (2) interviews with some students marked with low participation; (3) a survey of students. Students in my Tax-law course were surveyed about their perceptions of blended learning, using an online instrument. The survey inquired about student's opinion to blended learning. Questions covered the importance of teacher guidance, the mood of learning using electronic devices, the influence of the learning attitude of the surrounding students on themselves, and the length of learning time per week. A 3-item scale measuring was undertaken based on the definition used in this study.

About 30 students who click for less times in E-learning-Resource and participate in very few activities were asked to provide any feedback related to their experience with blended learning and whether they had suggestions for improving blended learning. Data from the survey were descriptively analyzed with Multi-factor cross-analysis and regression analysis.

RESULTS

We should divide factors affecting learning efficiency into three categories. Students' mood

under Blended learning, the influence of the partner's learning attitude, and the teacher's guiding role were considered as three factors of analyses of a model. Firstly, we need to know the association between the three sets of factors, how exactly they interact with each other. The Data of 363 students' investigations were cleaned and removed the invalid values. The next step is to cross-check each other (e.g. Blended learning emotions, the influence of the partner's learning attitude, and the teacher's effect) to find correlation. In the following Table 2., for the convenience of expression, I use environment to denote the influence of Partner's study attitude in blended learning, T-effect to denote Teacher's effects on students, and BL mood to denote the student's mood in blended learning. After comparison and verification, I found an interesting situation that the influence of the teacher has the greatest impact on the student's learning mood. And the relationship between learning emotions and partner learning attitudes is the lowest. From the data of 7 classes, the three factors: the correlation between environment, the correlation between teacher's effect and environment is 0.325, and the correlation between teacher's influence and student's mood is 0.7. The correlation between mood and environment is 0.314. The following analysis is the Multi-factor cross-check by Version of SPSS17.0

Table 2. Multi-factor interaction

Correlation Matrix[a]

		environment	T-effect	BL mood
Correlation	Environment	1.000	.325	.314
	T-effect	.325	1.000	.700
	BL mood	.314	.700	1.000
Sig. (1-tailed)	Environment		.000	.000
	T-effect	.000		.000
	BL mood	.000	.000	

a. Determinant = .449

Table 3. KMO and Bartlett

	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.690
Bartlett's Test of Sphericity	Approx. Chi-Square	245.932
	Df	3
	Sig.	.000

The above Table proved teacher's effect among these three factors is the most important of the three variables and plays a large role for the other two groups of factors. The KMO and Bartlett tests are a test method that tests the degree of correlation between variables. Bartlett's spherical test is usually performed before factor analysis to determine whether the variable is suitable for factor analysis. The Kaiser-Meyer-Olkin metric for this sample is a value of 0.690, greater than 0.6, which is suitable for factor analysis. The Sig. value is 0.000, indicating that the significance is optimal.

In the second stage, it is necessary to investigate which factors are closely related to the academic achieve and participation of blended learning. For all six outcome variables, multiple regression models are estimated using gender and student's Psychological factors as explanatory variables, with the first regression playing the role of benchmark. Table 1 contains the beta's (in

bold: beta's significant at 5% level) or standardized regression coefficients of these models, with in the last row the percentage of explained variation (R2).

It can be seen from the Table 4. that the fitness of model 1 is R2 =0.097, and the test of the model itself is F=9.642, P<0.001, indicating that the model is statistically significant. The results of the regression analysis showed that gender (β=0.305, P<0.001) had a positive predictive effect on the final grade. The values of models 2, 3, 4, 5 and 6 are 0.002, 0.004, 0.002, 0.007, and 0.009, respectively; and the F values are 0.181, 0.346, 0.168, 0.597, and 0.794, respectively. The P values are all higher than 0.05, indicating that the model does not have Statistical significance. Gender, learning motivation, learning mood, and learning environment are not relate to significant effects on QUIZ, video viewing, non-video learning, assignment, and Q&A. (P>0.05)

Table 4. Beta's, standardized regression coefficients, of five regression models

Variable	Final Exam	Quiz Score	Short-Video	Non-video learning	Brain-storm	Q & A
Gender	0.305***	0.033	-0.010	-0.019	-0.018	0.054
Learning motivation	-0.052	0.024	-0.041	-0.022	0.086	0.001
Learning emotions	0.028	-0.030	0.008	-0.008	-0.086	0.033
learning environment	-0.044	0.014	0.050	0.026	-0.030	-0.069
R^2	0.097	0.002	0.004	0.002	0.007	0.009
F	9.642***	0.181	0.346	0.168	0.597	0.794

Note: *p<0.05; **p<0.01; ***p<0.001

An independent sample T-test was used to further analyze the differences between man and woman in the final grades. The results are as follows:

Table 5. Gender differences in Final Exam

		Gender N	Mean	Standard deviation		P
Final grade	Male	102	45.0245	15.09612	-6.096	0.000
	Female	261	55.6054	14.77483		

It can be seen from the above table that there is a significant difference in the final grades of different genders (p<0.05). Further combined with the mean, findings showed that the female (m=55.6054) final-Exam- score is higher than the male's score (m=45.0245).

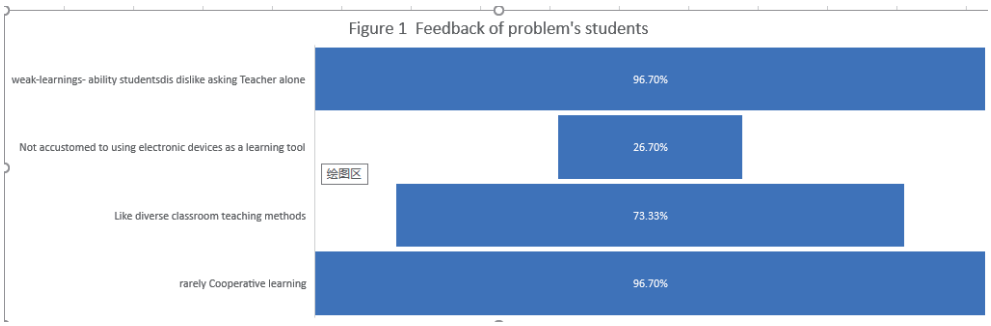
This statistical finding is so surprising, because the Quiz score and video-learning and non-video learning in the usual score composition are not related to learning motivation, learning mood, and learning environment. By checking their clicks on video counts and Quiz scores and the length of videos viewing, they all be found by a higher completion rate and accuracy. And these do not match their learning time, by survey data, and classroom performance.

One potential explanation is that after knowing the composition of the usual grades, the students correct or supplement their shortcomings in several aspects at the last time. If there are no more specific group task scores, there is a possibility of electronic cheating in the performance of a single individual.

In order to understand the students' experience and feelings about blended learning, I deliberately grouped one-on-one interviews with some participant (not actively participating in E-learning activities). The feedback from 30 students' interview indicated that students really liked some aspects of the blended learning design studio, and really disliked others. Key points of the student feedback were as follows:

In response to the blended learning;

- Students dislike asking question with teachers alone, especially boys;
- Not accustomed to learning with a mobile phone, because there are many situations that are disturbed and interrupted;
- Students like activities that improve classroom efficiency and attract attention, and dislike self-managed learning after school. Their main points are to improve learning efficiency on classroom;
- Students rarely meet after class for their assignment;



From figure 1 we have an impression that these students are not ready to adapt to a new teaching environment and independent self-driven learning model. Students who are not actively involved in E-learning have several characteristics to be noticed; first, the complexity of the use of E-learning tools poses an obstacle to users; second, students with weak learning ability are less likely to receive help from their peers; the weakness of understanding and communication skills leads to their lack of interaction with teachers and tutors.

This study allows us to understand three points. The first point is that the appropriate assessment is very important. The second point of the teacher's guidance and the detailed help of the teacher play an important role in the student's learning mood. The third point is that the teacher's professional guidance and classroom performance will have an impact on the enthusiasm of students after class. Not using cooperative assessment when it is appropriate (i.e. when using cooperative learning) may have detrimental effects on student learning (Boud et al., 1999). Boudet al. (1999) also state that "inappropriate forms of assessment appear to encourage students to take a surface approach to learning". It means that we need some more effective and accurate technology approaches to improve our teaching quality under blended learning environment.

Big-data-based Learning Analysis

Big data and Analytics are two terms in our decision action. The definition of big data is a quantitative and real record of a comprehensive and large-scale life behavior. Through data-mining, it expresses and records life in digital mode. The generic definition of analytics is similar

to data-driven decision making (Anthony G. Picciano, 2014). Essentially Data-Analytics is the basis for providing decision support for decision making through model analysis of quantitative data. Analytics software is evolving to assist in this analysis. After big data mining and effective data-analysis, a fuzzy possibility is expressed in a digital model with trending. As being student in accounting majors, they have some very important Exams, such as CPA, ACCA. If we have enough data of candidates for the first half to three months of the exam, such as learning time continuity, time interval and start time point, then that means we have a more successful trajectory analysis. The mining of big data lies in the fact that we want to make scattered and fragmented data into a multi-dimensional information system on the LMS.

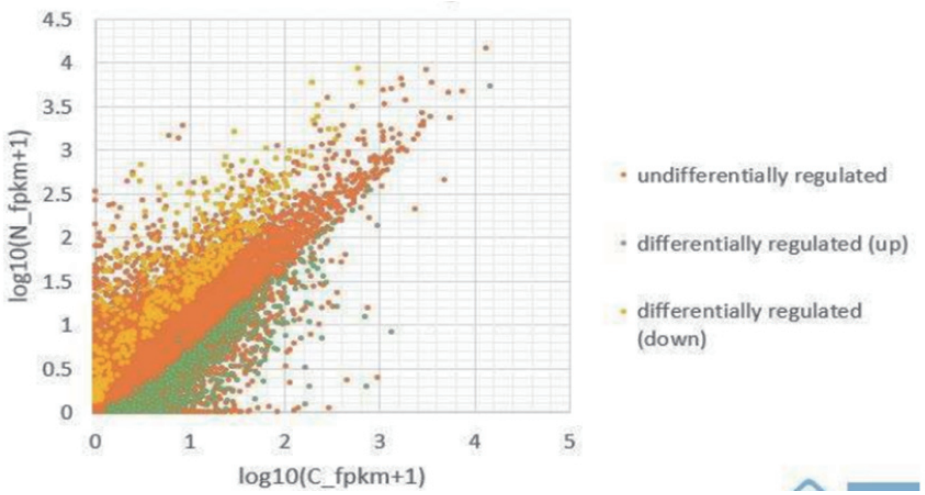


Figure 2. scatter graph of irregular & regular data

The traditional scatter analysis graph used to be a kind of flat analysis. Time-line of the QUIZ and other background factors are not considered. If we can add these background factors to the analysis mode, then a three-dimensional multidimensional analysis map will be established. I believe this will give us a new perspective to understand what is happening. Collect different data and labeled with time-line, stored in computer. This would be possible within a course management/learning management system (CMS/LMS). Most CMS/LMSs provide constant monitoring of student activity whether they are responses, and enough data could be created by their devices. Through these behavioral data records, teacher can learn some effective learning methods and study habits. I hope that through the combination of new data analysis software and LMS in the future, we will be able to perform connectivity and imaging processing for a single data source. A multi-dimensional analysis will reveal some facts hidden outside the surface data.

Predict of academic achievement

Through LMS , students who have passed the exam previously can help us to creature a database which could be made a trend analysis at some point of the scatter plot. If the participants' more data be obtained, the trend will be more accurate. The main measurement range can be borrowed from MOOC, e.g. length of study-time, length of viewing the Video & PPT, clicks' number of viewers, QUIZ results after video viewing, start-time-point and so. Collect different data and labeled with time-point, stored in computer. This would be possible within a course management/learning management system (CMS/LMS). Most CMS/LMSs provide constant monitoring of student activity whether they are responses, and enough data could be created by their devices.

Big-data-based Learning Intervention

A. Improvement of LMS's assessment

First, we should improve the LMS function. For the LMS platform, there is a record data function. The user's usage time, frequency and browsing process should be recorded, and the repeated Quiz should be rejected. When the test time is too short or too long, the screen should be alerted. Video learning must have a small test to prevent students from cheating. Secondly, the score appraisal needs to introduce a team task scoring mechanism to decompose, collaborate and solve work and tasks. At last through big data mining, the trend of the students' performance could be forecast. Study time-line and duration & the ratio between man-machine, teacher-student, and student-generated interaction should be at a certain equilibrium value.

B. learning intervention time and intervention model

When students are not actively involved in learning and have an abnormality in unconventional learning performance, it is time to intervene. Instructors and Tutors can conduct interviews or provide some psychological support through video conferences.

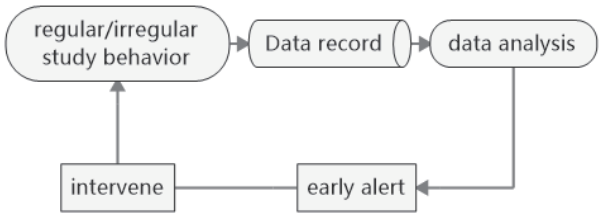


Figure 3. Learning intervention flow diagram

About intervention model, it needs to consider some backgrounds factor from gender, difference ability, students' attitude and teacher's authority. For example, from my research's data, female students undoubtedly have an advantage in subjects that require concentration and discretion (e.g. Accounting). It is precisely because of various background differences that cooperation and teamwork are still very important under the blended learning environment. In my opinion, collaborative learning is ideal solution. When human-machine dialogue and interaction produce emotional boredom, students need an team's intervention. In order to get an ideal effect, we should take three steps. First step we should divide students of class into different teams. An ideal team should be consisted of three types students (A1. A2. A3). The main process of collaborative learning can be split into three steps. In the next step, according to the abilities and characteristics of different students, tasks of different level are arranged for the team members to complete. The task of teamwork and the design of individual independent tasks can be reflected according to their ability as following Table-6. The framework of assignment of task cooperation objects and difficulty level is shown in Figure 4.

Table 6. Collaborators and tasks

Participant's ability level	Independent Mission	Collaborate Task
A1 (Positive and excellent)	C1 (very hard)	C3(Easy but cumbersome)
A2 (Passive and mediocre)	C2(medium difficulty)	C1(very hard)
A3 (Negative and lack of ability)	C3(Easy but cumbersome)	C3(Easy but cumbersome)

In Fig.4 I design a framework that different types' students work together or finish independently

for different level tasks. Under cooperative tasks, they should work together from collaborative assignment to solve the difficulties with mutual assistant. For some participants who need assistance, it will inevitably choose to turn to their partners if the work of independence cannot be completed. This is the time of intervention we are looking for, to change some of its original learning habits and to gain more team experience in cooperation to improve its own deficiencies.

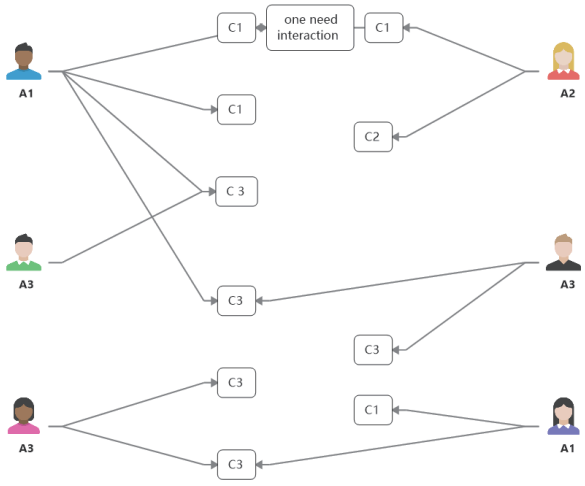


Figure 4. Cooperative assignment in BL

The final step is assessment of the score, the team cross-assessment, peer assessment, and internal team assessment each accounted for a certain percentage. In Table 7 we adopt some standard for peer-peer assessment. All data of the evaluation system would be saved, analyzed and compared.
It will provide students with a clear and more objective evaluation system.

Table 7. Peer mutual evaluation index

Norm / Grade	Content	Process	Result	Expression
Excellent	Very rich	Complete & Clear	Accurate	Clear& simple
Good	Rich	Necessary process available	Roughly accurate	Easy to understand
Medium	Enough	Logical integrity	Partly accurate	Understandable
Need improving	Not enough	Incomplete logic	Some right	Fuzzy
Failure	Poor	Unclear	Completely Incorrect	Misunderstood

Conclusion & Discussion

In the current widely-recognized blended learning, it contributes to the diversity of teaching methods and to helping students deep learning. However, there are still several challenges in the teacher's work and the students' willingness to learn and the effect of continuous learning. Therefore, with the continuous improvement of the big data technology and application teaching platform, I believe that in multi-dimensional analysis and emotional simulation, we can go further in future and provide support for improving the accuracy of predict in students' academic tests. The main advantage of big data in hybrid teaching is that the data is mass and

comprehensive. It can be combined with simple analysis or multi-dimensional analysis to fulfill simple or comprehensive tasks. In the teaching process, it helps teachers to find out the time points of intervention.

In a collaborative learning environment, we use the personal information of big data to do grouping, task assignment and peer evaluation. In a good and mutually reinforcing environment, collaborative learning will greatly improve learners' ability and to develop self-learning's ability and teamwork spirit. All could be enhanced by big data's analysis.

The analysis and learning of big data are inseparable from the teacher's guidance and the design of teaching tasks; we still need to accumulate enough cases and more behavioral analysis and psychological guidance of the student team model. One aspect of model accuracy lies in the correlation between key drivers and related factors. In the future we can do more in the improving LMS and data-mining and analysis.

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09

Chapter 9:

VR/AR/MR for Learning

Fostering Thoughtfulness through 360-degree Video Immersive Experience

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Abstract: We would like to discuss effective ways of taking and creating 360-degree video.Through these consideration, we would like to deepen our knowledge about 360-degree video which differentiate from usual video and pictures.

Mr. Abdullah M. Abdulharim of Meridian University, who investigates "compassion" for many years, appeals that we can feel other people's feeling if we can get a sense of immersion. We think that sense of immersion is one of the key factors to utilize 360-degree video effectively.

we would like to discuss the possibilities and future challenges of 360-degree video.

Key words: Virtual reality, 360 degree video, Thoughtfulness,

INTRODUCTION

When we watch a 360 degree video with a virtual reality (VR) goggle, we can feel as if we were really there. It provides virtual experiences which are difficult to have in our daily life. People who watch the video feel as if they were the main character. We came to have an idea that such immersive feeling will help people foster thoughtful mind. When we focus on the disabled we could find the some new solutions to foster thoughtfulness toward them.

Our university is focusing on Social welfare and we work and study with some disabl
ed students. They happily cooperate to proceed this project.

We would like to set the following purposes.

1 while using 360 degree camera, we record the relation and eye-sight between the disa bled and ordinary people.
2 To analyze the disabled's feeling and people around them.
3 to clarify the better relations relying on the questionnaires of both sides.

RESEARCH DESIGN & METHODS

We asked students with severe disabilities to wear a 360 degree camera, a wearable terminal. And we created a VR video. And those who watch the video can experience the movement of the disabled. We shot two videos. This video shows a disabled person moving using a wheelchair. Disabled people can not move without using a wheelchair. Therefore, disabled people use wheelchairs on a daily basis. One is a video of wheelchair users moving from school to the station.

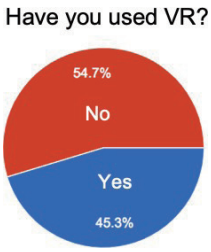
The second video shows a wheelchair user moving through the crowd. We conducted an experiment to consider the effect of such 360-degree videos to foster thoughtfulness. First, users answered a pre-questionnaire, then they experienced the video, and finally they answered a post-questionnaire.

The 360-degree video experience and questionnaire survey was conducted from November 5 to 20, 2018. We surveyed 50 students of Nihon Fukushi University. Fifty students experienced a 360 degree video of a wheelchair in the university cafeteria.

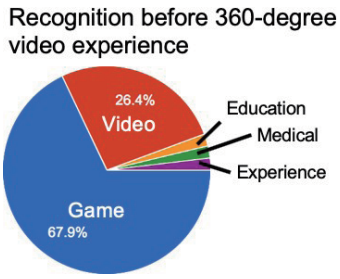
RESULTS

Pre-questionnaire

The number of people who have used VR is the same as the number of people who have never used VR.



Most of VR's recognition is games and videos. In addition, from the point of view of welfare, there were some answers such as education and simulated experience.



We asked how VR would help in the future. Opinion such as Six people answered "Game", Eight people answered "Medical", Eight people answered "Simulated Experience", Seven people answered "Go to a place where I can not go", Four people answered "Welfare", Four people answered "None", "I do not know".

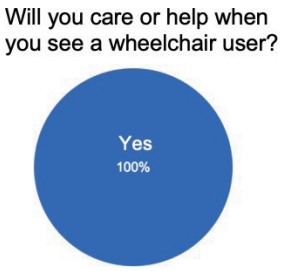
Many people were surprised and interested at the VR experiment. The reason is that the experience person looked at the image 360 degrees and felt immersive. Many did not know the 360 degree camera. There were many people interested in it.

Post questionnaire

We asked the question what kind of things VR would be useful in the future. This question asked the same question in the pre-questionnaire. Because I want to know the change of feeling after having VR experience. Opinion such as Eighteen people answered "Think about the feelings of other people", Eleven people answered "simulation", Five people answered "Welfare and Class and Education", Five people answered "Medical". Before the survey, Four people answered "none" or "I do not know" but after the survey it was zero.

We asked about the impression when comparing movement of a walk and a wheelchair. Opinions such as "difference in eye height", "vibration by a wheelchair", "feeling like looking

down from the surrounding people", "does not recognize that it is crowded", and "an elevator is necessary".



We asked will you care or help when you see a wheelchair user. All people answered "Yes". Everyone was able to have thoughtfulness for the disabled.

We asked what kind of support do you want. Opinions such as "Easier to pass through crowded roads", "Press the elevator button", "to call out".

The changes in the responses of the pre-questionnaires and post-questionnaires were clear. T hrough the VR experience, we can see that thoughtfulness to the disabled is fostered.

CONCLUSION

The target population was limited in this study. It is also necessary to carry out a questionnaire surv ey for non-students. By doing so, we can make more thoughtfulness.

We asked the same questions in the pre and post surveys. There was a change in the answers of the same questions in the pre-question and post-question surveys. This makes it easier to imagine the future of VR after a virtual experience. Through the experiment and the surveys, we found that 360-degree videos have potentials to foster thoughtfulness and to make people more empathetic. We would like to deepen our knowledge more about 360-degree video which differentiate from usual video and pictures.

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Immersive Experience of Student-Centered Learning with 360-degree Videos for Teacher Education in Cambodia.

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Abstract: Recently, the education system in Japan has attracted high interest from other countries. Japan's education system is practiced not only at school education but also at companies. I, together with my colleagues, have conducted mock classes incorporating music and dance at an English teacher training school in Cambodia. As a result, Cambodian students were able to work actively in the mock classes. The next step I think effective is to learn from good practices of active learning conducted by experienced teachers and to be conscious about student's behavior during such learning. Using 360-degree videos with a VR headset, they can feel the atmosphere of active learning class from the perspective of a person inside a classroom. I posit that such immersive experiences will help them better understand crucial factors for the success of active learning. In this study, I consider such effects through interview surveys. VR contents will help Cambodian education break through traditional one-way lecture style and promote student-centered learning. I would like to make a model case for pursuing better education in developing countries with deepening understanding of innovative educational methods.

Key words: VR technology, Cambodia, Active learning

INTRODUCTION

In this research, I regard educational support for developing countries and globalization of Japanese education as social challenges, and to solve them, I will pursue the possibility of the use of Virtual Reality (VR) contents.

Educational support for developing countries

In Sustainable Development Goals (SDGs), they say that they will provide all the people with inclusive, fair and high-quality education to promote the opportunities for them to learn for their lifetime. As for educational projects of international development, not only establishment of schools but also how high-quality education children can have, and how appropriately they can learn, have been gradually inquired. For thinking about the quality of education, I will also approach the challenge of the way to train teachers in developing countries.

Effective use of VR technology for educational area

I plan to correspond the above utilizing VR technology. What I mean is that I regard VR technology as a tool for solving challenges. Although there will be many impacts of VR, we should also care about negative influence on children (e.g. Bailenson, 2018; Sobel, 2019).

Considering this idea, I think that because smartphones have been already widespread even in local villages in developing countries, what we have to do most is not only criticizing bad aspects of technology but also contemplating how to face them.

RESEARCH DESIGN & METHODS

This research is carried out by graduates and undergraduates from Nihon Fukushi University, Kansai university, and Meisei university.

The purpose of the activity is to improve the educational environment with ICT tools, which is supported by MEXT, called Edu port project (international expanding project of Japanese teaching methods). Nevertheless, from the preliminary survey before the first trip to Cambodia in February 2019, we found out that ICT tools, such as computers and projectors, are not mainly used in local areas, hence we decided to narrow our activity at the minimum. We conducted activities regarding [To learn with enjoyment], which is Japanese teaching methods. We included dancing and music into an English class to let students know how enjoyable learning is, and to create a relationship between us. Moreover, we made a group using SNS (Facebook, which is common for the locals to use) to arrange our activities continuously. What is more, we will visit Cambodia this August considering from our previous activities. This trip is that to know how familiar the local students are with VR technology conducting questionnaires, and also to know what is needed to utilize VR contents in local areas.

Future Challenges

I think that if we promote international understanding education through this research, the synergistic effects in between two countries. Furthermore, we cannot visit there again and again, hence it is essential for us, learners, to spontaneously learn ourselves. For that, I came up with the idea that sharing contents on Facebook or keeping touch with a particular person cannot be good enough. Going forward, we will stock VR contents on YouTube, and bring the appliances made of a carton box as a present, to the local students to enable them to see the VR contents. Thanks to that, I believe that they will be able to feel that VR contents get closer to them, and it will lead them to the improvement of the environment where they utilize those contents, and spontaneously learn themselves.

As described earlier, if we can improve the process of learning, it will motivate Cambodian students to let them learn spontaneously, and it will promote the local English education.

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Application and Research of MR in "Morality and Learning" Education in Colleges and Universities on the Integration of Industry and Education[1]

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Abstract: Foster character and civic virtue as the fundamental, integrate production and education to seek development. Through industry-university-research cooperation, use MR (mixed reality) and holographic technology to explore future new educational and teaching modes by combining the Internet, big data, cloud computing and artificial intelligence,build an interactive system of "moral education exhibition hall" with application-oriented features, and build an intelligent application scene and ecosystem. Provide "Morality and Learning", "Five-Enter" intelligent education system solutions, to provide students with more innovative, interesting, interactive, intelligent new experience and future education, enable the application of high quality development of universities.

Key words: VR、AR、MR, Integration of industry and education, Morality and Learning, Five-Entry Education

INTRODUCTION

In the vast and complex context of the times, China has taken the implementation of network power and the acceleration of the construction of "digital China" as a major strategy for national

[1] 基金项目：国家社科基金重大项目《驱动中国创新发展的创客与众创空间培育战略研究》（ 15ZDC014）、教育部科技发展中心高校产学研创新基金—“北创助教”基金《产教融合：MR在高校“德学”教育上的应用及探究》和广东省高等教育教学改革项目（2018-657）的研究成果之一。
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development. According to the 13th five-year plan for the development of national education released by the state council, "efforts should be made to promote the in-depth integration of information technology and education, and explore new educational and teaching models in the future by making comprehensive use of Internet, big data, artificial intelligence and virtual reality technologies".

The existing problems in current application-oriented higher education and teaching can be listed as follow. First of all, moral education needs to be further strengthened.With the advent of economic globalization, informationization and post-industrial society, the challenge of moral literacy is becoming increasingly severe. The cultivation of talents in colleges and universities should improve the moral civilization and comprehensive quality of the whole nation. In addition, educational values and social values need to be further unified. Traditional teaching methods in colleges and universities are not attractive and students are not actively involved. Teachers' reform consciousness of "organizing teaching around social problems" is not enough, and the effectiveness and pertinence are not enough. What'more, the school needs to seek the innovation path of integration of industry and education. With the development of campus information construction, the classroom form supported by traditional classroom and space is more and more difficult to meet the needs of constantly developing teaching reform. It is necessary to strengthen industry-university-research cooperation and promote the in-depth integration of scientific and technological innovation and education and teaching. Besides finally, the knowledge and ability structure of educatees do not adapt to their career development. Many colleges and universities, especially application-oriented colleges and universities, lack the cohesion between the curriculum standards and the core standards of enterprise technology, and the competitiveness of students is not strong, failing to achieve comprehensive development and independent progress.

VR, AR, MR and other technical trends as future strategic emerging industries have attracted the attention and participation of mainstream elites from all over the world. Through fusion education "industry-university-institute with politics" to promote cooperation, prompting VR/AR/MR/HR/AI/BD/CC, coordinated development between to speed up the construction of power and an innovative country, deepening the reform of supply side structural, foster new growth point and form the kinetic energy has great significance, which will help to promote the development of new era college talent training quality, meet people's increasing need of a good life.

MR BRIEF INTRODUCTION

VR.Virtual reality (VR) is a combination of simulation technology with computer graphics man-machine interface technology, multimedia technology, sensing technology and network technology. Virtual reality technology (VR) mainly includes simulation of environment, perception, natural skills and sensing equipment. At present, maintaining a steady state and the problem such as reducing the incidence of motion sickness has been basically solved. VR technology has flourished in science fiction movies.

AR. Augmented reality technology (AR) research can be traced back to university research institutions such as MIT's media lab and corporate pioneers including Alphabet Google's Thad Starner, who is head of smart glasses technology. It was a new technology that "seamlessly" integrates real world and virtual world information, it was originally in the real world of a

certain space range difficult to experience the real time information (visual information, sound, smell, touch, etc.), by the science and technology such as computer, simulation and then overlay, applied the virtual information to the real world, was perceived by the human senses, so as to the sensory experience beyond the reality. Augmented reality technology includes multimedia, 3d modeling, real-time video display and control, multi-sensor fusion, real-time tracking and registration, scene fusion and other new technologies and means.

MR. Mixed Reality (MR) refers to a presentation technology that integrates real Reality and virtual Reality by using 3D and AR technologies to anchor virtual objects into users' real world space. This project is to develop the application and research based on the integration of industry and education in "moral education" in colleges and universities, among which hybrid reality technology is a kind of virtual reality technology, which is the crossover field of simulation technology and computer graphics man-machine interface technology, multimedia technology, sensing technology, network technology and other technologies.

MR refers to "mixed reality". MR=VR+AR= real world + virtual world + digital information. Hybrid reality technology is a hot spot in academia and will be the next major general-purpose computing platform. With the development of information technology, these advanced technological means will gradually integrate into people's life and be used by more and more industry institutions and enterprises to improve production and life. In the next few years, will achieve rapid development. The horizon 2018 report identifies the use of mixed reality technology in education as an important trend in the next two to three years, and says its prospects are promising.

HR. HR Holographic Reality, also known as virtual imaging, is a technique that uses interference and diffraction principles to record and reproduce a real three-dimensional image of an object.

RESEARCH AND APPLICATION

1.Study abroad

The United States is the birthplace of VR technology. The level of VR research technology in the United States basically represents the level of international VR development. At present, the basic research in this field in the United States mainly focuses on four aspects: perception, user interface, background software and hardware. Ames Labs, NASA: engineering data gloves to make them more usable. Complete real-time simulation of space station operation at the Johnson space center. Use a lot of cockpit - oriented flight simulation technology. Simulate the Hubble space telescope. It is now working on a pilot plan called virtual planetary exploration (VPE). At present, NASA has established VR training system for aviation and satellite maintenance, VR training system for space station, and VR education system for national use. The computer science department at the University of North Carolina (UNC) was the first and most famous university to conduct VR research. They mainly study molecular modeling, aviation driving, surgical simulation, and architectural simulation and so on. Dr. David Warner and his study team at Loma Linda university medical center have pioneered pediatric VR therapy by using computer graphics and VR devices to explore problems associated with neurological diseases. MIT is a pioneer in the research of artificial intelligence, robotics and computer graphics and animation, which are the basis of VR technology. In 1985, MIT established the media lab to conduct formal research on virtual environments. SRI research center established the "visual perception plan" to study the further development of existing VR technology. After 1991, SRI

conducted training studies on military aircraft or vehicle driving using VR technology, trying to reduce flight accidents through simulation. The HIT Lab at the University of Washington's Washington technology center had brought VR research into education, design, entertainment and manufacturing. Illinois state university had developed a distributed VR system that supports remote collaboration in vehicle design. George Mason University had developed a real-time fluid simulation system in a dynamic virtual environment. From the early 1990s, the United States took the lead in applying virtual reality technology in the military field, mainly in the following four aspects: First was virtual battlefield environment. Second was carried out soldier simulation training. Third was carried out joint exercises between different services and arms. Fourth, was conducted commander training.

The UK is a leader In Europe in some aspects of VR development, especially in distributed parallel processing, design of assistive devices (including tactile feedback) and applied research. English Bristol found that the intersection of VR applications should focus on the overall integration of technology. They are leading in some areas of software and hardware. The UK ARRL's research and experiment on remote presentation mainly includes VR reconstruction. Their products also include architecture and scientific visualization computing. Some other developed countries in Europe, such as the Netherlands, Germany and Sweden, have also actively carried out research and application of VR. Sweden's DIVE distributed virtual interactive environment is a Unix-based heterogeneous distributed system where multiple processes on different nodes can work in the same world. The training and simulation system developed by the physical electronics laboratory (TNO-PEL) of the TNO institute in the Hague, the Netherlands, improves the existing simulation system by improving the human-machine interface to fully involve users in the simulation environment.

IDC researchers predict that global spending on AR and VR products and services will surge from $11.4 billion in 2017 to $215 billion in 2021. In 2018, international and domestic giants have fully entered the field of MR (mixed reality technology). The technology can be applied in nine areas: video games, event live streaming, video entertainment, healthcare, real estate, retail, education, engineering and the military. Currently, mixed reality technologies are mainly used in entertainment, training and education, medical care, navigation, tourism, shopping and research and development of large and complex products.

Foreign holographic teaching theories mainly focus on the study of biological special laser phenomenon, using holographic teaching theory to study the characteristics of cell biological laser system (GH PLESU;2013. The MD MANU;2013, TV Bogdanova, 2012); Other literatures mainly study the new development of holographic teaching and biotechnology. For example, many scholars apply holographic teaching to the numerical reconstruction of digital holograms taken in microscopes, allowing simultaneous amplitude and quantitative phase contrast imaging, such as C Depeursinge, 2012.A Moreira, P Prats-Iraola, 2013)

2.Domestic research

In the outline of the 13th five-year plan for China's national economic and social development, it is clearly proposed that "vigorously promote the innovation and industrialization of virtual reality, interactive film and television and other emerging frontier fields, and form a group of new growth points", which points out the direction for the wide application of VR, AR and MR technologies. Some scholars have listed VR and AR technologies as the eight most "fashionable"

core technologies in 2020 (as shown in figure 3). VR, AR and MR have wide application prospects in the fields of education and training, culture and art, entertainment, military, medical treatment, scientific research, tourism and advertising.

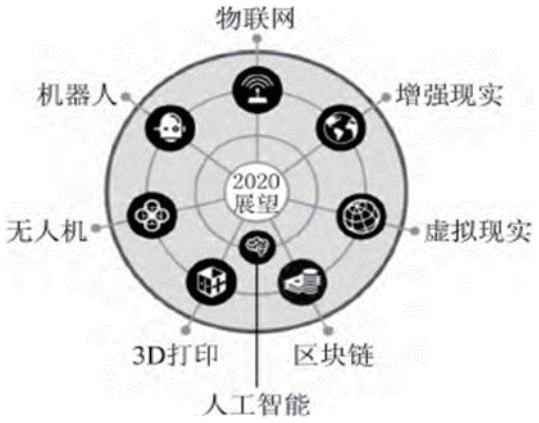


Figure 1. eight emerging core technologies

China's main specific applications in scientific and technological research, virtual training base, virtual simulation campus studio training and other aspects. Wu shengwu, the deputy director of the electronic information department of the ministry of industry and information technology, once gave a data: In 2017, the market size of China's virtual reality industry reached 16 billion Yuan, with a year-on-year growth of 164%, made many breakthroughs in key core technologies and key application fields, some technologies have been at the forefront of the world. Representative cases of domestic universities include: application of Beijing university of aeronautics and astronautics in distributed flight simulation; The application of virtual planning and virtual design in architecture of Zhejiang university; Application of Harbin Institute of Technology in human-computer interaction; Tsinghua university also has its own research on sense of immediacy. Chongqing vocational college of finance and economics has applied VR into teaching, and identified it as one of the future development directions of logistics management major. The school also held a logistics skills competition, and asked students to design virtual supply chain game schemes in the way of campus simulation and training.

The domestic holographic teaching theory mainly focuses on the application of teaching in various disciplines, especially on the education of middle schools (Yang zhicheng;2019. Xing chengyun; Wen-qing wang;2013), It mainly studies students' comprehensive qualities such as language construction and application ability, thinking development and improvement ability, aesthetic appreciation and creation ability, cultural inheritance and understanding ability in high school study. Other researches are mainly about computer or medicine, such as ma jianping (2017) and li mengdi (2016), which are used to explain the relationship between part and whole, point and surface.

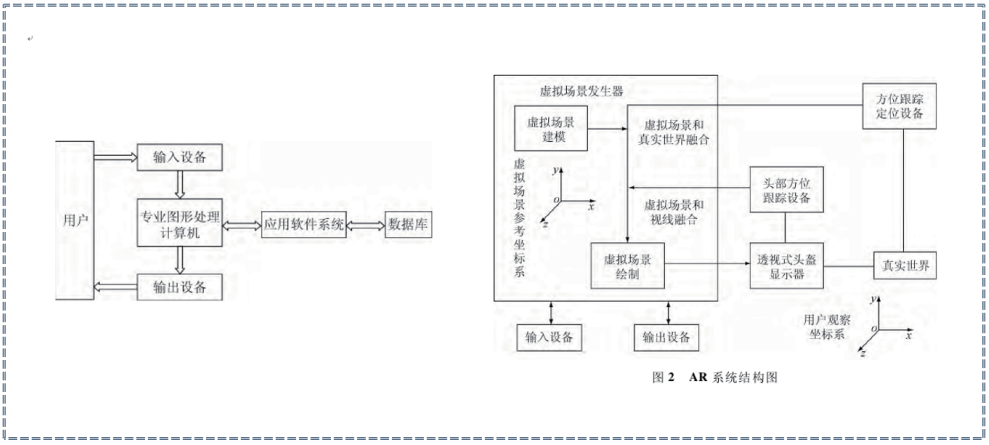


Figure 2. MR (AR + VR) system structure diagrams

COMBINING MR WITH LEARNING IS A BIG LEAP

Analects of Confucius say, "Where virtue does not lonely, there must be neighbors." Moral education comes first. Colleges and universities should further cultivate students' professional spirit and ability through the integration of industry and education, so as to realize their dreams of becoming talents and stimulate their gumption.

The MR boom in 2019 is making it a trend for MR mixed reality technology information-based teaching. The holographic teaching method is not confined to the classroom, but reintegrates modern information technology, teaching modeling and related disciplines, so that students can develop in the process of active participation in activities. MR (mixed reality) holographic teaching reflects the development of artificial intelligence and the integration of big data and cloud computing. MR is the further development of virtual reality technology. It introduces real scene information in the virtual environment and builds an information loop of interactive feedback between the virtual world, the real world and users, so as to enhance the sense of reality of user experience, featuring authenticity, real-time interaction and visualization. Mixed reality has the potential not only to create new markets, but also to upend existing traditional markets. Wu yan, director general of the higher education department of the ministry of education, said, "if we continue to push forward the virtual simulation project, it will improve the quality and promote fairness of China's higher education, and will achieve a very important and effective means, an innovation, in the cultivation of outstanding talents."

Foster character and civic virtue as the fundamental, integrate production and education to seek development. In the education and teaching of application-oriented universities, how to improve the quality of education and teaching and promote the combination of theory and practice is very important. In the face of 5G era and information development, it is an irresistible trend to integrate VR/AR/MR technology into education and teaching. The research results show that: education and teaching from the traditional teaching mode to the process of human-computer dialogue, intelligent application, not only can improve students' interest in learning and learning efficiency, optimize and make up for the shortcomings of traditional teaching methods, but also can help students to develop independent learning ability in learning. The teaching effect will be improved obviously when the teaching environment changes from single learning to multi-environment learning.

Virtual reality technology will develop into a new breakthrough to change our way of life. The application of mixed reality in education and teaching is a new leap in the development of education technology. It creates an environment of "independent learning" and replaces the traditional learning mode of "teaching promotes learning" with a new learning mode in which learners acquire knowledge and skills through the interaction between themselves and the information environment. Through MR design technology, create products to create immersive application scenarios and ecosystems, effectively improve the interaction between users and the real environment, connect the Internet of things, digital data and the physical world of applications, and better provide education, training and other services for teachers and students. Virtual reality technology and its application will also promote the establishment of virtual reality and system simulation laboratory, experimental training room, the scientific research results quickly into practical technology, into productivity.

RESEARCH DESIGN & METHODS

Project basis

Influenced by the system and mechanism and other factors, the supply side and the industrial demand side of talent training cannot fully adapt to the structure, quality and level, and the "two skins" problem still exists. We need to strengthen moral education, deepen the integration of industry and education, and promote the organic integration of the education chain, the talent chain, the industrial chain and the innovation chain.

Guangzhou institute of technology adheres to the educational thought of "moral conduct and learning as the top", and vigorously carries out "Five-Enter" (entering into the classroom, entering into the library, entering into the experimental training room, entering into the stadium, entering into the society) theme of educational practice activities, and takes this as the lifeline of the work of "moral cultivation". Guangzhou university of business and industry signed a comprehensive strategic cooperation agreement with China telecom Guangzhou branch, and became the first university to deliver 5G, comprehensively expanding the construction of smart campus. The university has a number of provincial key disciplines and special specialties, as well as special experimental and training rooms supported by the central government and new business virtual simulation comprehensive experimental and training rooms based on system integration, interdisciplinary, professional and field.

In order to improve the level of education and teaching, promote high-quality development, Under the guidance of the science and technology development center of the ministry of education and the Beijing institute of innovation, Guangzhou university of business and technology, together with China research center for industry-university-research cooperation of wuhan university and Shanghai film and technology co., LTD., jointly promote the "teaching assistant of beichuang" program of the ministry of education. This paper attempts to apply VR, AR and MR technologies to the process of promoting virtue and cultivating people in application-oriented universities, establish "interactive system of virtue education exhibition hall", and carry out the application and research of MR holographic teaching.

The project design

Combined with the practical situation of application-oriented universities, the integration of

science and education promotes the application and research of MR holographic teaching of "moral education" education and related disciplines. Relevant software and hardware and platforms are introduced to jointly develop scientific and systematic scientific products and scene applications, to promote the overall development of the majority of students, reflecting "student development as the center, student learning as the center, learning effect as the center." The project promotes industry + education, gives full play to the advantages of both sides, and deepens the integration of industry, education and research, and school-enterprise cooperation, so as to obtain more intellectual resources and broader human resources through cooperation.

1. Build the application scenario of systematic wisdom. Introduce related software and hardware and platforms, through cooperation to develop scientific and systematic scientific products and scene applications. Through the form of mixed reality, multiple people from different places can be brought into a holographic space at the same time. In this space, learners can see their real environment as well as three-dimensional teaching content presented in virtual form. Teachers and students will be presented in holographic images in the teaching space for convenient communication at any time. Construction of teaching, learning, practice three application scenarios, so that education and teaching more efficient intuitive and self-help generation.

2. Explore the intelligent education system solution with the characteristic of "Morality and Learning Five-Enter". Integrating modern advanced AR, VR and MR technologies, virtual holographic teaching is introduced into application-oriented colleges and universities, and modern teaching and interactive virtual holographic scenes are integrated together to provide intelligent education system solutions featuring "Morality and Learning Five-Enter" in application-oriented colleges and universities. Break the one-way teaching mode and combine 3D holographic interactive technology to realize two-way efficient interactive teaching. Through the 3D holographic interactive all-in-one machine and AR projection in smart school, classroom and exhibition hall, the effects of education display are enhanced, teaching display means are enriched, and the majority of students can participate in it personally, so as to effectively realize the interactive and personalized future smart education and provide the majority of students with new, interesting and interactive experience.

3. Carry out MR holographic teaching application and research of "moral education" education in colleges and universities. On the one hand, based on the integrated theory of technology acceptance and use (UTAUT2) combined with the media system dependence theory and the physical and mental development of young people related theories, the study was conducted by combining quantitative and qualitative methods, and proposed targeted Suggestions and countermeasures. On the other hand, in cooperation with domestic leaders, analyzed the characteristics and uses of VR/AR/MR, key technical support, relevant modeling technology, software design and engineering, and several applications. Based on the development trend, challenge and opportunity of virtual reality, this paper discusses the application of "Morality and Learning" and "Five-Enter" MR holographic teaching.

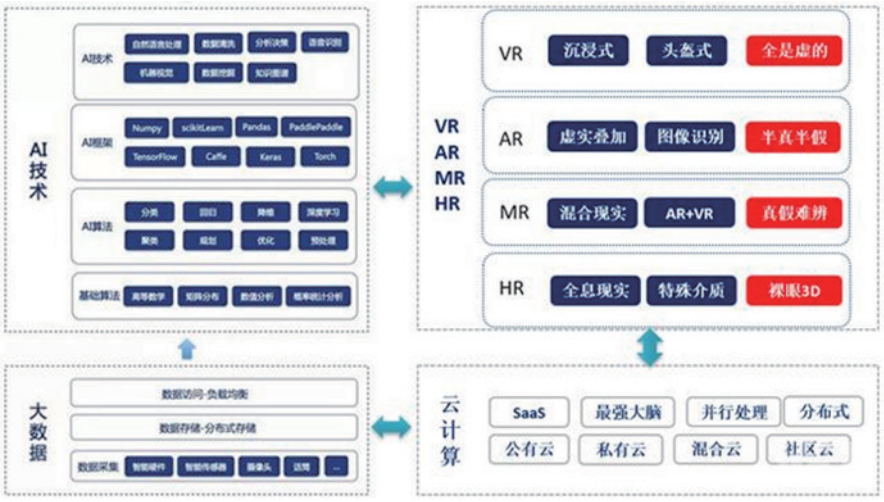


Figure 3. collaborative development of VR/AR/MR/HR/AI/BD/CC

AI, BD and CC can be understood as infrastructure architectures, while VR/AR/MR/HR is the real application terminal in the future. The combination of basic and application plays a significant role and is invincible. VR/AR/MR/HR/AI/BD/CC is complementary to each other. If they are truly organically fully integrated, education and teaching will have a more encouraging and qualitative improvement. The collaborative development of VR/AR/MR/HR/AI/BD/CC serves education and teaching as well as economic and social development will make people live a happy and healthy life.

project expectations

It is plan to introduce MR holographic teaching application system, including holographic client system, holographic server system and holographic rendering system; Build an application-oriented "interactive system for the exhibition hall of moral education", which can be realized through the exhibition hall of moral education achievements, mobile APP, moral education assistant or small robot, and integrate the terminal with the server of the exhibition and experience hall. Related courses application and scene development, related products and services have promotion value; published a series of 3-5 papers, compilation of guidelines. Provide students with more innovative, interesting, interactive and intelligent new experience.

RESULTS

The combination of artificial intelligence and education is a challenging interdisciplinary frontier technology and research field. This project aims to through industry-university-research cooperation, to explore the new mode of cultivating people by virtue of using MR (mixed reality) and holographic technology, combined with the Internet, big data, cloud computing and artificial intelligence, and establish the "interactive system of virtue education exhibition hall" ,which is with applied characteristics. Integrate the real situation at this moment with virtual reality, enhance the sense of reality of pleasant experience and scene, provide students with more innovative, interesting, interactive and intelligent education and teaching, and construct intelligent application scene and ecosystem. This is not only the technical dimension, but also the interactive integration of resources of system integration, which will promote the high-quality development of application-oriented colleges and universities and enable them to build intelligent education and future schools.

With the integration of VR, AR and MR technologies with Internet of things, cloud computing, big data, artificial intelligence, "Internet +" and other technologies, 3D holographic interactive intelligent education has great potential in application and teaching integration in application-oriented universities. The application and development of ER (extended reality) technology in the future is worth expecting.

10

Chapter 10:

Innovative Learning Space: Maker Space, Learning Center

Designing a Learning Environment for Pre-Service Training at an Active Learning Classroom

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Abstract: The purpose of this study is to clarify the design of the learning environment for students, who take the pre-service training course, to learn how to implement active learning. The authors interviewed the students, and analyzed data based on the grounded theory. As a result, the students are “The existence of a TA that produces classes that can be relaxed” “Active learning classrooms that can change shape according to the way you want to learn” “Students who help each other” “LMS that can look back on yourself”. By these four factors, it turned out that they are learning independently and cooperatively.

Key words: Active learning, University education, TA (teaching assistant)

INTRODUCTION

Since the Ministry of Education promoted active learning, people payed more attention toward the shift from traditional teaching to collaborative and active learning. Active learning was employed by higher education at the beginning, and then it has expanded to elementary and secondary education. For instance, hands-on activity is recommended in senior high-school subject "information" so that computer rooms are well prepared for active learning. The objective of “information” is aiming to nurture "ICT and information literacy" by hands-on experience. In reality, however, students do drill and practice for passing the exam of data processing specialist, or they operate word-processing software just following instruction written in manuals. The authors insist that these kinds of practices are far from active learning.

If students, who did not learn active learning methodology in the pre-service training at the university, become high-school teachers, they would reproduce one-way teaching methods in high school education. It is recommended that students should experience active learning in pre-service training so that they would gain a certain idea about active learning and employ it in class when they become teachers.

LITERATURE REVIEW

As mentioned above, Tachibana (2014) points out shallow understanding of the teacher's goal in the information department as a cause that the class contents of the information department

are limited to the PC operation according to the manual. "Information technology utilization", which is the educational goal of the information department, means collecting, organizing, integrating, analyzing and disseminating information. By acquiring these abilities, learners can participate actively in the information society. However, many teachers misunderstand them simply as technical education that deals with information equipment, and the content of learning is intertwined with the practice of operation skill acquisition. Utsumi (2004) points out that in order for students to acquire such ability to use information, teachers must develop classes to acquire various knowledge through practice. In order to do so, the teacher needs to present basic and extensive knowledge of the information in the class and facilitate the student to link the information to the student's computer usage motivation. If students can acquire knowledge through practice with situation, they will be able to say that they have acquired the information utilization ability in a proactive and collaborative manner. For that purpose, it is necessary to promote active learning in the subject "Information", and the student who will teach in the future as a teacher of information needs to learn about information experientially. However, teachers who are currently teaching have never experienced active learning when they were students. Akita (2017) points out that since teachers teach their students as they did when they were children, they avoid new attempts such as active learning that do not know the effects. Those who want to become teachers in the future often take a positive view of the 12 years of school education they have received. Such a teacher makes full use of the view of learning cultivated in 12 years of school education, and in this case, teaches students as hard as a teacher. In addition, since classes in the classroom are conducted by a single teacher, there is little opportunity to see other teachers' classes. As a result, it is unlikely that you will have the opportunity to look back on your own class or get new ideas for education. As a result, they are satisfied with the current situation, and new attempts such as active learning are avoided. In order not to repeat such a situation, it is necessary for the student to learn the subject "Information" through active learning and to become a teacher in the future after having a deep understanding on the experience.

In the traditional university class form, the students aimed at acquiring only the knowledge that the teacher speaks, and there was little that the students learned each other. In order to learn how students learn various knowledge and connect them to behavior while students are working on problems in real society independently in university education, students learn by discussing each other or by team cooperation Environment is required (Kubota, 2012). In order to do so, a student with a teacher's perspective of TA between students and teachers, and a student with a similar age of TA will be able to establish a tripartite relationship and create an environment towards new learning.
Also, in order for active learning to be effective, it is necessary to incorporate active learning methods according to the scene of the class (Suzuki, 2017). To do so, it is necessary to prepare a classroom where you can flexibly change the arrangement of desks and chairs and select various tools so that you can adapt to various forms according to the situation.
By incorporating the above ideas, it is expected that in the university's teaching profession, students who wish to be teachers will experience active learning and adopt new ways of learning when they become teachers based on that experience.

PURPOSE

Based on the above idea, this study will clarify what kind of learning environment that students who are taking teacher training subjects will be able to tackle issues in a proactive and collaborative manner. In order to train teachers who can practice active learning, this research

makes recommendations on the ideal course of teaching in university education.

CASE STUDY

The classes in the Information Technology Education, which are the subjects of this research, are compulsory subjects for obtaining a teaching license for the information technology department. With the goal of acquiring the ability to use information and acquiring the method of active learning, students are actively and cooperatively participating in classes and preparing an environment for experiential learning. There were 270 students in the 2018 spring semester. The lesson plan is shown Table1.

As shown in the curriculum in Table 1, classes incorporate group-based learning activities. Students share new ideas within the group and work together to meet new ideas and draw their own answers. Then, the surprises and emotions that the students have gained as they learn by themselves become the motivation for the next class, and the learning cycle is developed. In order to sustain this cycle, there is an environment where students themselves can act actively, and a system to support active learning that activates exchange of views among students is required. For that purpose, the following three strategies were adopted.

(1) Practical use of tools in a well-equipped classroom

In the classroom there are various tools for students to do active learning. The classroom wall can be used as a whiteboard or as a large screen. In addition, the desk and chair are equipped with casters so that various forms of group activities can be performed. Mobile whiteboards and small projectors can be used

Table1: Class plan of the Information Technology Education Act

Class schedule	Class contents	Class schedule	Class cintents
1st class	[Orientation] Explanation of outline of class Ice break	9st class	[Evaluation] Consider group evaluation.
2st class	[What is ICT?] Try using ICT actually We consider how we can use ICT for education	10st class	[Class Design] How to write class plans, production Student make discussion correction in the group
3st class	[Presentation on ICT Education] We make presentation using Presentation tool in group	11st class	[panel discussion] Invite your current teacher and listen to the story Discussion
4st class	[programming] Programming experience Think about programming education	12st class	[Active learning] Allowing students to conduct classes independently
5st class	[debate] Debate in a group match The subject is "about programming education	13st class	[Micro teaching] Perform simulated lessons for 15 minutes per person
6st class	[Class analysis] Analyze actual high school classes	14st class	[2nd Regeneration TA] Class by student volunteer
7st class	[Role play] Let's become a given role	15st class	[Summary] Review of all classes
8st class	[Guest lecture] Lecture by a special guest		

for group activities. Each 50 iPad and Mac book can be connected to the Internet, and students can use it freely. In such a classroom, students decide how to work on their own task, change the layout of the classroom according to it, and select tools to learn. From the perspective of how TA can use the tools, students can learn independently and in a collaborative manner, TA will make classes while discussing the contents of classes with the TA team.

(2) Communication outside the class by LMS

In LMS (Learning Management System), students submit reflections and issues from the class to the next class to discuss. Group activities can also be conducted on LMS. By this, it is possible to advance discussions within the group even outside the class, and to maintain consistency inside and outside the class. Also, the TA can comment on the students, read the comments from the students, and give advice. That leads to motivation of students and TA for the next class.

(3) Placement of TA

The progress of the class is led by the TA, and the teacher takes the form of commenting at the end. The TA consists of students who have taken classes in the previous year, and two third graders form a team with five fourth graders. The contents of the class will be examined jointly by the TA and the teacher. By organizing classes with students who are similar in age to the students, it is possible to take up topics the students are interested in. Also, it is easy for students to ask questions and can deepen their understanding of the class.

Research Method

(1) Choice of method

Students, TAs, and teachers in the teaching profession learn while interacting with each other in a class called "Informatics Education Method". Since the learning environment for students to learn in a self-directed and cooperative manner, which will be clarified in this research, has a strong relationship with the situation that occurs in the class being studied, data is collected this time using an interview method did. In addition, this research adopted a qualitative research method because the emphasis was placed on the process of learning of the teaching profession's students, TAs, and teachers, and the context in the class to be studied. In addition, the Grounded Theory Approach (Tochigi, 2016) was used as a reference.

(2) Procedure of investigation

The survey collaborator (hereinafter referred to as collaborator) is student M who attended the Information Technology Education Act in the spring semester of 2018. The survey period is from April to July 2018. The survey method is interviews. Interviews were conducted for 90 minutes after the end of each class, and students were asked to freely talk about their learning activities in the class and recorded them on the IC recorder. In addition, this study collected reflections that students post as a task to LMS to reflect on their learning in this class after each class. In conducting the survey, collaborator explained and accepted the purpose of the research, recording interviews, using data obtained for research only, and describing individuals so as not to be identified.

(3) Analysis procedure

The recorded data obtained in the interview was transcribed into text and analyzed. In the analysis, in light of the purpose, the researcher focused on the part including various concrete examples and performed open coding with the main concept part as one concrete example. Next, the researchers summarized several similar concepts and summarized their relationships in categories as shown in Figure 1.

Table2:List of core categories that make up the categories in Figure 1

Category	Sub category	Speech example
TA to give classes that can be relaxed and received	It is easy to prepare for the presence of a TT with a similar age	"When you go to the school, there is a question section where the graduate students can answer any questions, so you can ignore the instructor and keep going. So I think that it overlapped with TA. “
	TT will advise	"TA responded insanely and concretely. It is very impressive to have given us specific advice.”
Active learning classrooms that can change their form according to the class form	AL classroom not at high school	"There is something like a Japanese house that looks like a table, so I can do something about it. I thought it would be possible to change various forms according to the class form.”
	AL classroom with various things	"I used a tablet, a drone, a small projector, etc. It was a feeling like something like this. I have never used a tablet, so I have a Mac (PC), a whiteboard, etc. That’s great. “
Existence of students who can help each other	Importance of accepting the other party's opinion	"If you accept the opinions of others, I’m less stressed. Because I’ve been fighting alone.”
	Experience saved by fellows	"In the Debate, everyone was better at giving a presentation than their own, and I were helped by the other members' talk skills."
	The difficulty of coordinating	"Group work is very difficult to cooperate with other member.”
LMS that can be introspective	Introspection deepened by writing LMS 5	"I just wrote a reflection on the KPT. At first I thought that writing the reflection in the KPT was a rule that I had to keep, but I did some introspection while I was doing it.”

RESULTS

As a result of analysis, it was found that the following four factors create a learning environment for students to learn independently and collaborately.

(1) The existence of a TA that produces classes that can be relaxed

The student M was able to relax and take classes by engaging with the TA, and the student was able to actively ask questions to the TA. “I was able to relax and take classes. I ignored the teacher and went to ask the tutors to ask questions when I was attending a school, and I felt like it was like that. I asked a lot of questions.” The TA took care of everything and gave me specific advice."

(2) Active learning classrooms that can change shape according to the way you want to learn

By taking classes using the tools in the active learning class in the active learning classroom, M felt the difference between his high school and university classes. In addition to saying that M is a creative class in the information department education method performed in the active learning class, “The active learning classroom is like a traditional Japanese house in Japan. It's the same as you can take a Living room depending on what you want to do in that room, so I thought it would be amazing to be able to change it according to the class form.” It he said.

(3) Students who help each other

In addition, in this class, students often work in groups, so communication among the students is stronger than in other classes. From there, students learn the importance of accepting the other member's opinion from the discussions conducted in group work. Student M said, “I had many discussions with the members of the group. For example, if I suggested something, everyone would say that there is a problem already, or otherwise I would say no, I feel that the discussion goes on is. I learned the importance of accepting people's opinions from there. That's because I was not able to do it myself...” There are also times when you look at other students' performances and learn for yourself. Student M started from Mr. T with regard to the presentation, and made a great temper to bring in everyone, and a temper to soften, “I thought that I had to steal these two good places as anything I'm telling you.”

(4) LMS that can look back on yourself

After class, students use the KPT (keep, problem & try) method to post reflections to the LMS. Students aim to be able to write a review that includes three things: “continue good things”, “problems" and” “what to do next”. LMS reflection is an essential task. Students posting reflections to LMS at first to take credits also have the framework of the KPT method, so they can see themselves objectively while continuing to write reflections along it, it becomes possible to reflect more deeply. For example, student M said “At first, I considered KPT as a rule for writing reflection, but as I wrote reflection based on KPT, I was able to look back on myself.”

The TA wrote a comment for each student's reflection. LMS's conference room supports students to deepen their introspection interactively outside of class. The student feels that she receives the reflection of the TA, and feels that she respects the introspection seriously, and thus provides motivation for the next class. The student M said, “I think that Mr. I (TA) is great, she was a person who accepts everything very seriously. Maybe I think that I myself is a hard working person, and I have a feeling that he pulled the rails by teaching me how politely.” “Um, LMS reply was licked a bit. Oh, there was a great feeling that they were facing serious problems.”

In the class, four or five people form one group and work on the task. The contents of the class are made by the TA who has already taken the class based on their own experience, so it is easy for the students to be friendly and for the teachers of the information in the future to be highly necessary. In the first class, activities incorporating group work as ice breaks are adopted, and activities are gradually organized to achieve learning goals by using iPad, MacBook, white board, etc. At first, students do not know how to use the tools in the classroom, but by participating in various activities under the facilitation of TA, the tools are gradually adapted to

their own learning Choose to learn.

The students were able to learn in the form of active learning in the class of Information Technology Education Method. It can be said that students learn while interacting with other students in an environment that incorporates the three elements of “use of TA”, “use of various tools”, and “reflection by LMS”. It can be said that “the ability to use information” was acquired not only by using students' information devices but also by tackling the actual problems and leading the way to the solution.

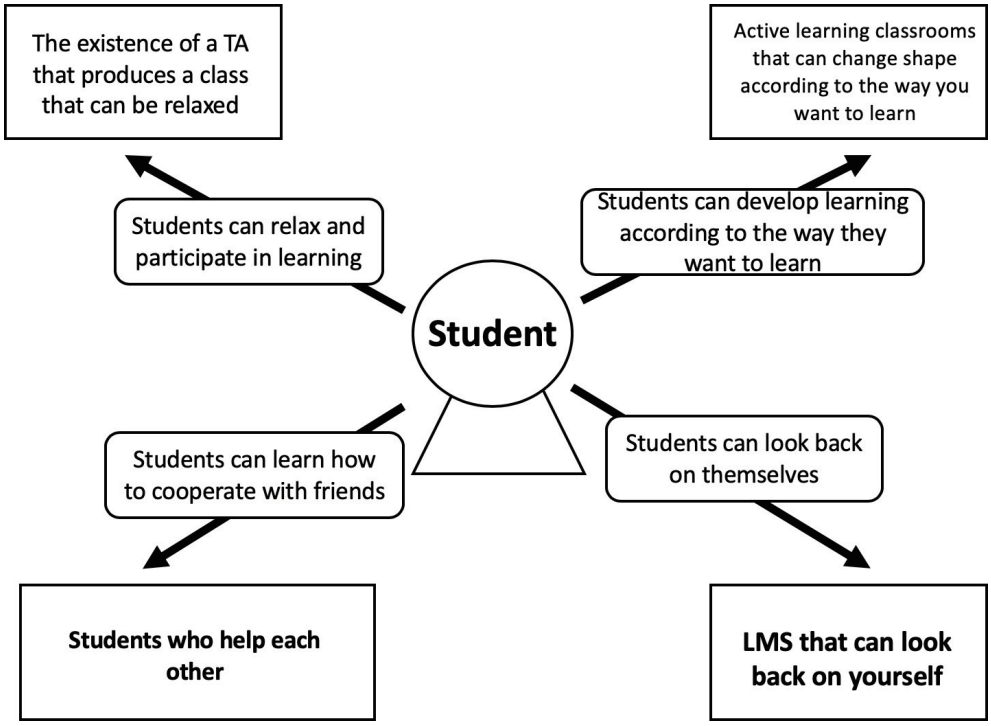


Figure 1: List of core categories that make up the categories in Table2

CONCLUTION

The students worked on classes using active learning classes under TA facilitation, and after class, they used KPT to reflect the classes using the KPT method. Students noticed new perspectives by being able to work on new things in the class and writing reflections on LMS because of the existence of TA. In this research, what it talked most about from TA as a student and from M as a student was about communication between TA and the student. When conducting classes as a TA, Y was most important to communicate actively with the students so that they could be motivated and take classes. And that way of thinking comes from the experience that T, who was TA to the students, actively communicated with him. Because of that merit, the student M, under the TA facilitation, uses various tools in the active learning class according to the way he wants to learn, and works with the same student peers, Sometimes I could learn while helping each other. For students, TA is sometimes a senior of teaching subjects, and can be seen as a form that he should do in the future. By encouraging such TAs to achieve their goals using tools in class or commenting on LMS, TAs present the next step to the context through tools and LMS, normal communication By doing this, students can improve their level through experience. In addition, TA will learn the know-how as an informatics teacher for making students use information ability by facilitating according to the situation of the student

while teaching.

Through active and collaborative classes utilizing active learning classes with abundant equipment, class participants are changing the way they learn and their values to the class form. The change in values that it is learning to change the environment according to the way one wants to learn is to adopt a new way of learning when they become teachers based on their experiences Would be expected. As mentioned above, through involvement in the class and LMS, TA becomes a catalyst to gain new awareness as a form to be done for the students in the future, and learners can learn by having new awareness each time they perform classes I think it's fun. And it is the impromptu communication with the TA in the class or LMS that is the factor that generates many discoveries that make the learning enjoyable, and that it is possible to construct a self-directed and collaborative learning environment Think.

SUMMERY

This study revealed a learning environment where students can learn independently and cooperatively. As a result, in the active learning classroom, the learning environment in which students can tackle issues independently and collaboratively is the flexible use of various human resources and various tools such as TA that can respond flexibly to various situations. , The three elements of reflection by LMS were shown to be important. In the future, it will be required to conduct a further survey on how each factor is regarded as meaningful to the students.

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International Collaborative Learning in Authentic Contexts: How Can Students Learn Actively through Collaborative Projects?

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Abstract: Recently, university faculty in Japan are expected to use new methods of learning. Researchers have examined a variety of active learning methods experimentally that enable students to acquire key competencies. Most faculty, however, have maintained traditional teaching methods. This study introduces theories and cases for a new approach to learning: The third-generation activity theory, or the theory of expansive learning which describes various types of learning. The theory of expansive learning focuses on learning processes in which the very subject of learning is transformed from isolated individuals to collectives and networks. Learning occurs, not in isolation, but through interactions among people and through the use of mediated tools between activity systems. Since learning theories have evolved, metaphors of learning changed from "acquisition" and "participation" to "expansion." This study analyzes project-based learning in which heterogeneous students work together across a boundary, expand their activities, and create knowledge collectively. The author employs the activity theory as a framework to describe how students from different universities work together.

Key words: International Collaboration, boundary crossing, expansive learning, activity theory

INTRODUCTION

With the emergence of new technologies, such as artificial intelligence (AI), Internet of things (IoT), robotics, and big data, our society has changed rapidly. The Japanese government described the forthcoming society as "society 5.0" and explained the need to educate children to survive in this new society. Reflecting on human history, our society started from "gathering and hunting society (society 1.0)" and moved into "farming society (society 2.0)", "industrial society (society 3.0)" and "information society (society 4.0)." At the present time, we are moving into a "super smart society (society 5.0)." The fourth industrial revolution is creating new values and services one after another, bringing richer lifestyles. In this transition period, however, we need to educate children to confront new problems in the new society.

We share a variety of knowledge and information through the Internet and create new values in the society 5.0. We also receive information that we need through AI and big data. Robotics and automated driving are expected to solve problems of depopulation. Therefore, it is urgent to create new human resources to cope with society 5.0 so that we can achieve a bright future.

University education is shifting towards active learning to enable students to acquire new competencies. How do we educate students to live a good life in society 5.0? Although universities tend to employ new teaching methods to support self-regulated learning, most

lecture styles are still traditional. Faculty members have kept this traditional teaching style, which is a one-way transmission of knowledge from teacher to students.

In this paper, the author presents more informal and project-based learning to nurture 21st century competencies. Students should not stay inside classrooms but move into real society. They can collaborate with different kinds of people and work together to achieve common goals. When students make their own decisions, they will be more responsible and collaborate with each other. This paper describes student experiences with an inter-university collaborative project for a teacher training college in Cambodia.

CASE STUDY: WORKSHOP IN CAMBODIA

This case study is an example of informal learning in which students voluntarily participated in the program. The Japan Ministry of Education, Culture, Sports, Science and Technology (MEXT) initiated "Edu-Port Japan" which is a collaborative platform to disseminate Japanese-style education overseas. The Japan Society for Educational Technology (JSET) joined this platform to support teacher education in Cambodia. Ten students from three universities, Kansai University, Nihon Fukushi University, and Meisei University, joined the JSET Edu-Port program to conduct a workshop at the Provincial Teacher Training College (PTTC) in Siam Reap, Cambodia.

The students voluntarily participated in the project. Professors from each university also served as advisers. The project started from October 2018. The students periodically had video conferencing sessions in ZOOM to develop an activity plan. Since the three universities are located in Tokyo, Nagoya, and Osaka, it was difficult for students to meet face-to-face. They introduced themselves through video conferencing and discussed what kinds of activities they wanted to create. The request from PTTC was to improve English education for Cambodian students. However, the students were not English education majors. Their majors were different, such as Informatics (Kansai University), International Welfare Development (Nihon Fukushi University), and primary education (Meisei University).

They had difficulties to overcome in order to perform well.

(1) They did not meet directly, but had discussions only through video conferencing and SNS. Communication and understanding each other were difficult.
(2) Their majors were not in English education. They did not have sufficient knowledge about methods to teach English.
(3) Half of them had not visited Cambodia. They did not know enough about Cambodian history and culture.

The students studied Cambodian history and culture and teaching methods at their own university. Although their English proficiency weren't good enough to teach English, they tried to locate methods they could introduce to improve English levels. Their target was students of PTTC who intended to become primary school teachers after graduation. The Japanese students thought that they could introduce enjoyable English learning since Cambodian students will teach elementary school pupils.

The Japanese students visited Cambodia in February 2019. It was the first time that they met

each other directly. As soon as all members met in Siam Reap, Cambodia, they tried to organize the workshop. They tried to avoid direct teaching and planned to introduce enjoyable learning activities to Cambodia students. The methods they introduced included songs, games, dances, and plays for learning English.

Forty (40) Cambodian students participated in the organized workshop. Both student groups were actively involved in the activities and enjoyed them. Cambodian teachers appreciated the Japanese students' contribution to PTTC and proposed to continue this project with the students.

Edu-Port Japan offered opportunities for Japanese students to contribute their efforts to assist developing countries. After a long preparation period, the Japanese students managed to develop objectives to show Cambodian students how to improve the English levels of elementary students, even with minimal competency levels in English education. By collaborating with other students, the group performed better than an individual student. They were also motivated by these experiences and increased their self-esteem, as well as deciding to continue this project.

THEORETICAL VIEWPOINTS

There are two basic metaphors of learning, which are the acquisition metaphor and the participation metaphor. The acquisition metaphor, which comes from a cognitive tradition, explains that learning is primarily a process of transmitting and preserving knowledge and skills. On the other hand, the participation metaphor, which Lave and Wenger (1991) described in "community of practice," explains that learning primarily is a one-way movement from incompetence to competence. In both metaphors, learning as defined as a vertical movement from novice to professional along with some uniform levels of competence (Engestrom, 2016; Bateson, 1972).

The case presented in this paper does not fit into either of the two metaphors, therefore, the author introduces "the theory of expansive learning." This theory presents an "expansion metaphor" which explains that learners may acquire knowledge previously unknown to them. Expansive learning involves changes in the object of the activity system. In successful expansive learning, this eventually leads to a qualitative transformation of all components of the activity system (Davydov, 1990).

Based on the theory of expansive learning, the author examined how students moved in a horizontal direction and across the cultural boundary of each university by collaborating with each other. Initially, the students were accustomed to the culture of their universities and had not encountered other university cultures. Therefore, they did not know how to communicate with each other even though they had video meetings periodically. When they met in Siam Reap, Cambodia, they realized that they did not understand how to implement their project properly. They also realized that they did

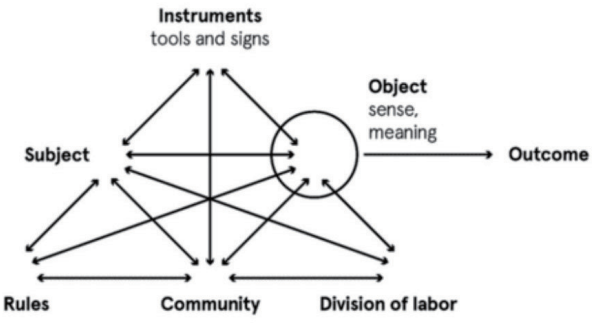


Figure 3.1. General model of an activity system

(Engeström, 1987, p. 78)

not understand the PTTC context. Before conducting the workshop, they had to negotiate with each other and agree on what to do at PTTC. This is not vertical, but horizontal learning, that transforms their knowledge.

Before visiting Cambodia, most of the students thought that they needed to teach Cambodian students about English teaching methods. Therefore, they studied English teaching methods and prepared materials to teach. However, they realized that those materials were inappropriate in the PTTC context after an extensive discussion among the Japanese students and with their professors. They promptly prepared new content and materials for Cambodian students three days before the workshop.

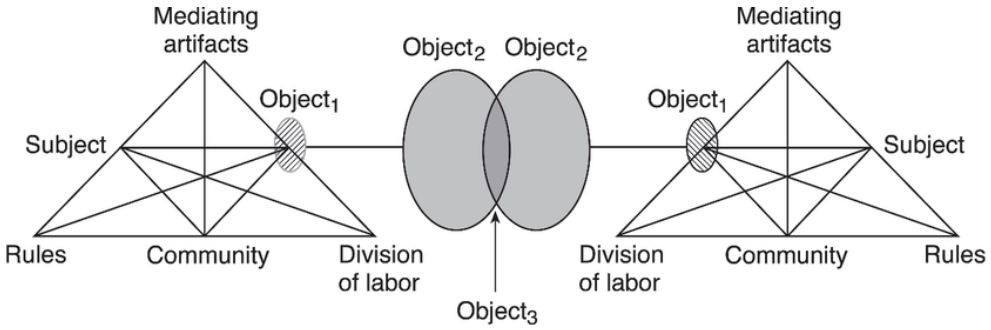


Fig. 2: The theory of expansive learning (Engestrom, 1987)

Through this experience, the Japanese students learned the following:

(1) The Japanese students assumed that they had to teach English teaching skills to Cambodian students before visiting Cambodia. The Japanese students realized that teaching and learning are reciprocal processes. When they teach the Cambodian students, they also learned from the Cambodian students. It is not a one-way process, but more dialectical.
(2) The Japanese students crossed two boundaries. First, they had to cross the boundary of their own university. Second, they had to cross the cultural boundary between Japan and Cambodia. By crossing boundaries, they acquired multiple perspectives that they did not have before joining the project. As a result, they changed their cultural perceptions to accept differences with more open minds.

The theory of expansive learning focuses on a learning process in which the subject of learning is transformed from individuals to collectives and networks. Collaboration among the three universities enabled students to perform better. Modeling the zone of proximal development was initiated and achieved. This horizontal movement creates new collective competencies that differ from vertical learning (Holzman, 2009).

FUTURE DIRECTION

By experiencing expansive learning, the Japanese students gained self-esteem and wanted to continue the project this year. They are planning to visit Cambodia again in August and February. They contacted PTTC teachers to ask when they can conduct a workshop of English teaching methods to Cambodian students. They, themselves, made contact and recruited new students to work together to expand their activities.

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11

Chapter 11:

AI in Sustainable Development Goal 4(SDG 4)

The challenges of vocational education and training under artificial intelligence

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Abstract: The artificial intelligence (AI) will have several changes in all aspects of work in the future. While vocational education and training is the most direct job training method, it also has several challenges which AI brings. The first one is that AI will create more job positions than eliminating jobs, which means more workforce needs to be trained or retrained to adapt to the labour market. The second challenge, because of the skills mismatch, there are a lot of employees who need to learn new skills suddenly. Most of them are current labours, so the continuing vocational education and training is becoming more and more necessary. What skills need to be trained is the third problem. As we know, AI is replacing this kind of jobs firstly, those repeated, low-tech positions in the manufacturing industry. It is urgent to enhance the level of vocational education and training to effective job competitions between workers and robots. The numbers of job positions will not be cancelled with AI technologies, however, the standard of the workforce should be improved. In another world, labours should take more continuing and higher vocational education and training during their career life. And we should not only focus on the next generation talents, but the current employees are also huge human resources who are waiting for training and education.

Key words: vocational education and training, artificial intelligence, skill mismatch, workforce

INTRODUCTION

As much as 14% of the global workforce may need to switch occupational categories by the year 2030, due to increased digitalisation, automation, and advances in artificial intelligence. What is the impact of AI technologies on vocational education and training (VET)? The most obvious change is the application of automation like robots in the workplace. Those robots will take over some workers positions in some factories, while this replacement mainly occurs in manufacturing industry recently. In addition, AI will not only take over some positions to make some labour unemployment and it will create more job positions, which need new skilled workers in the future. Which kind of job will be replaced and will it spread to other industries in the future? How unemployed people change jobs and how to cultivate new labour? Should VET train new skilled workers from the next generation or from the current workforce? How is the ratio distributed? Vocational education and training is an education and training that must be accepted before the workforce go into workplace, so those questions could be the challenges and difficulties on VET which AI bring.

The first challenge is the expansion in the number of relevant talents. Compared with the number of skilled workers who are replaced by AI, there are more new job positions will be created by new technologies. According to the World Economic Forum, artificial intelligence will eliminate 75 million jobs and create 133 million new jobs around the world in 2025. At the same time, around 54% of workers need to be retrained in the future. And another data from the PricewaterhouseCoopers analysis that in the United Kingdom, artificial intelligence is poised to eliminate 7 million jobs by 2037, though it is also expected to create about 7.2 million new jobs in the country by that time, in healthcare, science and education. Because of the changes in work itself, the VET should also change the majors and increase the number of students in different types of vocational schools in order to adapt to the development of technology under AI. According to the National Bureau of Statistics of China, in 2018 there are 11.7 thousand different types of vocational schools in total, the number of students in vocational schools enrolled in this year is 9.28 million and the total number of students in vocational schools is 26.85 million. In modern manufacturing and emerging industries, more than 70% of new employees are from vocational schools in China, which means the VET has already possessed the ability to cultivate workforces on a large scale. The Chinese government has passed a plan to expand enrollment of 1 million students in higher vocational colleges in 2019 and the enrollment targets include ordinary high schools and secondary vocational schools graduates, retired military soldiers, laid-off and unemployed people, migrant workers and new professional farmers. One hand the workforce who are replaced by AI technologies need to be retrained, the other hand the new talents also need to be retained to adapt to the new labour market. Based on reports mentioned before, they all make this prediction that AI will create more job Positions. As a result, it could be more labour who receive more VET in the future.

The second challenge is the expansion in continuing vocational education and training. By 2022, more than half of all employees in the world will require re- and up-skilling (The World Economic Forum's 2018 The Future of Jobs report). Under the development of AI technologies, those kinds of talents are lacked like AI researchers, software developers, data scientists an so on. At the same time, a large number of low-end jobs in the manufacturing industry will be replaced by robots. The emergence of new technologies has made old jobs obsolete, and the expansion of new jobs does not guarantee that the old workers can be redistributed free of charge. The job skills required for new and old jobs are different, and most of the workforce does not have the skills needed to do the job. A mismatch in skills can lead to turmoil in the labour market, where unemployment is rising and skilled workers are lacking (Skill Mismatch and Structural Unemployment). In this case, there are two kinds of employees need to be mentioned: old workers and new workers. In the face of the challenge of artificial intelligence, the German government (German Federal Ministry for Economic Affairs and Energy) plans to invest 3 billion euros in artificial intelligence research in 2025 to achieve the "AI made in Germany" strategy. The German government not only focuses on educating the next generation of artificial intelligence experts but also focuses on training the existing workforce. The president of BIBB (Federal Institute for Vocational Education and Training) Friedrich Hubert Esser said, the future work world will pay more attention to continuing vocational education and training and because of the rising quantities of data, a shortening of the half-life period of knowledge, and increased flexibility in the workplace in the future, continuing vocational education and training is not an optional but a must. ("Continuing training – essential for the future world of work!" Digitalization, robots and artificial intelligence will change work). Because of the problem of skills mismatch in the workplace, the continuing VET is becoming more and more necessary for every workforce.

The third challenge is the increase in the level of vocational education and training. Job positions with lower skills in the manufacturing industry are mostly replaced by artificial intelligence, like transportation, logistics, assembly and so on. In recent years, Amazon has added packaging robots to a few warehouses in the United States, and each warehouse can cancel at least 24 individual job positions. Which means that Amazon will cut more than 1,300 manual jobs in 55 logistics centres in the United States. Even though those old skills jobs will be cancelled, the new skills jobs will be created in the future. Faced with this situation that workforces and skills are mismatched, the workers should take some higher education and training in order to achieve some jobs transfer. In addition, because of the requirements of talents in the labour market is becoming more diversification, increasing the level of VET can make labour adapt the market more flexible. In 2011, UNESCO undertook the definition of "higher education" in the International Standard Classification of Education (ISCE): it is based on secondary education in specialized disciplines and provided learning activities includes not only academic education in the traditional sense but also professional education and vocational education. So developing higher VET is the third challenge which AI brings.

RESEARCH DESIGN & METHODS

Case study: take Germany vocational education and system as an example. Because the positions which instead by AI are most in low-quality, the new workforce should be trained or educated at a higher level. In Germany, there is a new pilot that students could be awarded a PhD degree in the University of applied science, The means of VET can also be treated as higher education. Based on the new opportunities after the reform of the Bologna Declaration, the University of Applied Sciences in Germany continues to provide practical and career-oriented education with social needs, closely matching professional requirements. AI Technology is not only a kind of academic research, how to apply this new technology is more important. New PhD program in those universities is a new attempt to cultivate the next generation workforce to meet the new requirement of the labour market. Current employees, Enterprises especially big enterprises who have deep influences by artificial intelligence, play an active role in retraining and reemploy workers. Compared with the normal University, the University of applied science has more and deeper cooperation with companies in the respect of talents training. Thus higher VET in the University of applied science could be a new path to train more high-quality workforce in the future.

Literature research: Based on some relative papers and reports from governments, universities and enterprises, they all believe that more and more workforce needs to be retrained in the coming years because of the new technologies. The new technologies especial artificial intelligence has already begun to affect our daily work, some companies begin to use robots to replace low-skilled workers and some companies even begin to build new factories to make intelligent productions. Even though those only happened in the manufacturing industry. There is a pilot plant for intelligent manufacturing of Robert Bosch GmbH in Reutlingen, Germany. Robots are replacing employees in Bosch right now and as an employer, this company has its own training method: life-long education and continuing VET. As employees in Bosch, they can study in Robert Bosch Kolleg where is a college organised by the company and they regularly hold some seminars for their employees to talk about questions like, What technologies are suitable in the future? How can you promote innovation? Or what we can be good in the job position? AI technology is affecting our work, and continuing professional education at

the company may be a path to try because as an employer, they know directly which type of employee they need.

Data analysis: This paper is trying to analyse data about distribution and number of labour from the National Bureau of Statistics of China and Statistisches Bundesamt in the past 30 years and predict the trend of labour under the AI technologies. Firstly, this paper is trying to collect the number of employment and unemployment in different industries to predict the changes in the labour market in the future. Secondly, it will analyze the number of students who choose VET or higher education to prove whether the number of students who choose VET is becoming more or not or whether more students choose to receive higher VET. Thirdly, it will do research on the occupational classification of diploma in vocational schools to make sure that new technologies like AI is one reason which has an influence on the setting of majors in vocational schools. Under this situation, what adjustments should vocational education and training make, like the number of vocational schools and Students, the distribution of majors, the degree of skills an so on?

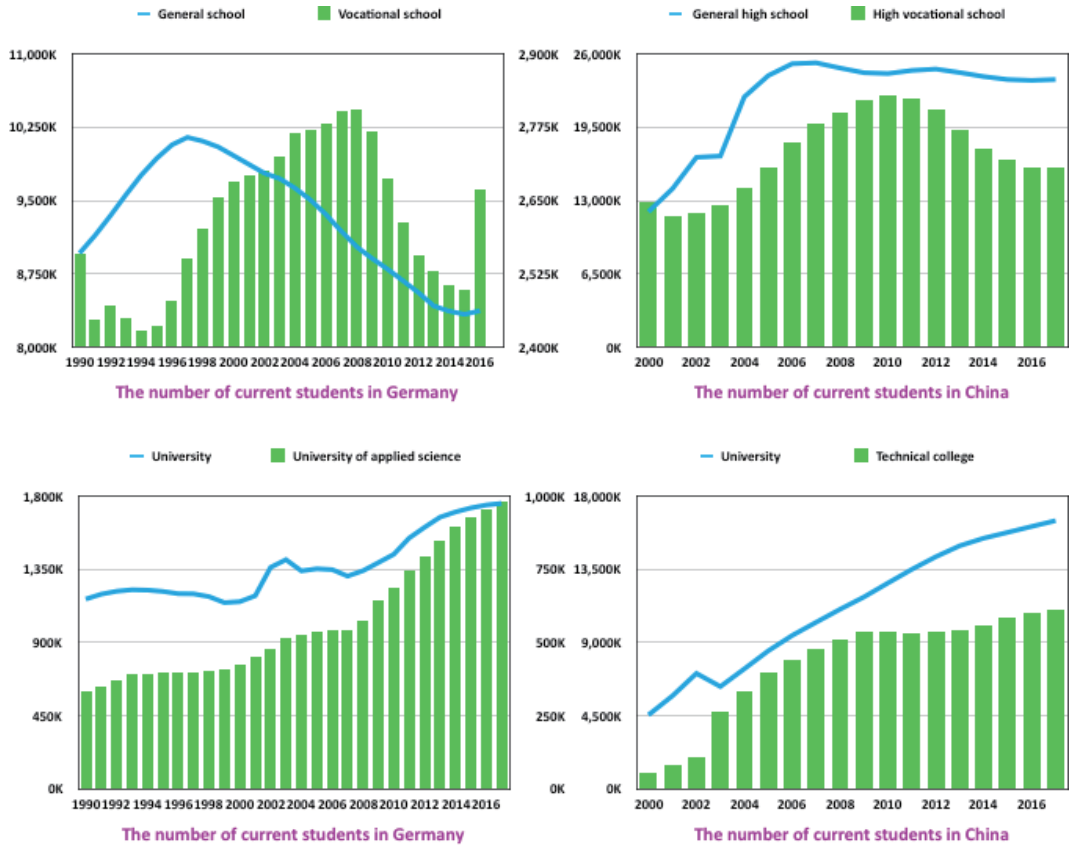


Fig.1 The number of students in different levels in China (2000-2017) and Germany (1990-2017) (Source: China Statistical Yearbook 2000-2018 & Statistisches Jahrbuch 1990-2018 für die Bundesrepublik Deutschland)

Figure 1 shows that the number of students in vocational schools in all levels are increasing between China and Germany. In two countries, the number of students in secondary education schools is far more than the students in high education. In Germany, the fast growing number is that the students in high vocational schools. While in China, students still tend to choose normal universities. There is a policy in the Chinese government report in 2019, which is the higher vocational colleges will add 1 million enrollment students this year.

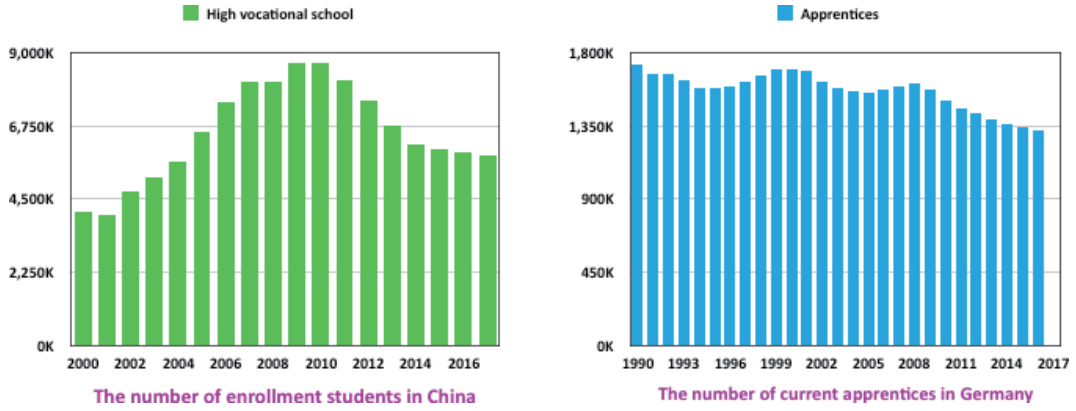


Fig.2 The number of enrollment students in high vocational schools in China (2000-2017) and the number of apprentices in Germany (1990-2017) (Source: China Statistical Yearbook 2000-2018 & Statistisches Jahrbuch 1990-2018 für die Bundesrepublik Deutschland)

No matter in China or in Germany, the attractiveness of secondary level vocational education and training is declining. The labour market seems to prefer highly educated students, no matter vocational or general education students. Because of automation in the workplace which new technology like AI brings, some basic low-qualified workers are replacing by robots or new machines gradually. Developing higher level VET may be a kind of feasible method to adjust to the requirement of labour market and students themselves.

RESULTS

Vocational education and training should service for more workforce. As we know, artificial intelligence is changing the numbers and distributions of work around us. Almost all research institutions have come to this conclusion, which AI will create more jobs than eliminate jobs. This means more workers will be needed in the labour market, while according to the prediction from World Bank that the labour growth rate will fall half in the next 20 years. Vocational education and training should not only pay attention to the next generation of labour but also focus on adult existing labour.

The AI technologies will bring job skills mismatch in the labour market. Work skills and the environment will become more flexible and those workers who are replaced by the robots are necessary to be retained in the future. Based on the former education, most of them have already taken some vocational education and training in schools. And now they need skills up training and the best place is the original place of work. In other words, when training employees, the company should take more responsibility. Especially in China, the manufacturing industry is undergoing transformation and upgrading and the demand for talents may be higher than before. Thus, more low-quality youth need to integrate into vocational Education and training and the labour market in the future. The dual education system in Germany is quite stable, and vocational schools have deep cooperation with enterprises. This is not only because of legal constraints but also in the interests of the company itself. , they can't always get the suitable skills workers by continually hiring new workforce and fire old one. They need to think about the skills they need for the job and how to develop talents by themselves.

Obviously, the employees who were first replaced were those with lower skills. So the most direct way to transfer this kind of workers is higher vocational education and training. In the global society, our investment in adult training and education is seriously inadequate. Instead,

our government believes that the investment in education for the next generation is reasonable, while investment in the existing workforce is much less. The truth is no matter the current employees or future employees, we both need to improve the training levels to suit the market.

CONCLUSION

Recently, AI has a relatively direct impact on some job positions in the manufacturing industry. While for example in China, vocational education and training is the most main method to educate and train new workforce in the manufacturing industry. In general, the requirement of VET in new job positions may grow higher than the positions replaced by AI. Currently, our occupations require more like secondary vocational education, while in the future the new jobs may require higher level college education even doctor education. All the number of students in vocational education and training schools are increasing, and the fastest growing is the number of students in high colleges.

AI as new technology is now increasing higher productivity for most companies, at the same time, the problem of workforce transitions is also coming. The up- and re- skills training for current labour is an inevitable trend. One problem is the skill mismatch in the labour market, where there is demand for new positions, there may not be enough available and qualified workforce to be found. As the government, it has the responsibility to support those unemployed workers to transfer into new positions. As large companies, it can take a lead in some areas, like on-the-job training and provide opportunities for current workers to update job skills.

In the AI era, vocational education and training is becoming more and more important. Without available VET system, there would be a regretful situation in the future, which is the lack of taking advantage of labour. No matter the proportion or the level of VET should take some revolution, and on the job training should also take more in the workplace. A closer collaboration between VET and work itself will make it possible to meet the challenges of new technologies.

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Thinking and Exploration of the Development of Artificial Intelligence CurriculumintheFieldofBasicEducation

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Abstract: With the innovation and development of information technology, artificial intelligencetechnology has penetrated into various fields and entered the public vision. Human societyhas entered the era of artificial intelligence. The intelligent era has created new requirements for the goal of talent training. "AI + education" has also become a new trend in the field of education. This paper takes artificial intelligence education as the starting point, through theliterature review, summarizes and reflects on the current situation of artificial intelligencecurriculum in the basic education stage, and discusses how to carry out artificial intelligencecourses more effectively in the basic education stage. Finally, this paper puts forwardreasonable suggestions, and further promotes artificial intelligence into the classroom andinto the teaching materials.

Key words:Artificial Intelligence Curriculum, Basic Education, Educational application

INTRODUCTION

With the innovation and development of information technology, human society has entered the era of artificial intelligence. In the era of artificial intelligence, the tools used by people have shifted from material tools to information tools, and major industries have gradually become intelligent under the promotion of artificial intelligence technology. At the same time, the era of artificial intelligence emphasizes people's "soft skills" and the demand for innovative talents in the field of intelligence increases. In particular, the winning news of AlphaGo and Go World champion Li Shishi and Ke Jie's man-machine wars once again attracted public attention. While being amazed at the development of artificial intelligence technology and the results of human-machine wars, people also gradually paid attention to the learning ability ofAlphaGo. The main working principle of AlphaGo is deep learning. In October 17th, Google announced AlphaGo Zero, joined the algorithm of reinforcement learning, and was able to self-learn to defeat AlphaGo, which is called the strongest version of Alpha. The development of AlphaGo has caused widespread concern and set offa new wave ofartificial intelligence. But artificial intelligence is not a new concept. It has been proposed for more than half a century. John McCarthy's definition in 1955 was "science and engineering of intelligent machines." Professor Nelson, a well-known professor of artificial intelligence at Stanford University in the United States, defined artificial intelligence as "artificial intelligence is a discipline of knowledge -how to express knowledge and how to acquire knowledge and use knowledge", and another Massachusetts Institute of Technology Professor Winston believes that "artificial intelligence is to study how to make computers do intelligent work that only people can do in the past." So far, artificial intelligence still has no completely unified concept.Although the definition of

different definitions has the limitations of the corresponding era, these different definitions lay the foundation and foundation of artificial intelligence. Artificial intelligence has experienced the ups and downs of development. After more than sixty years of exploration from the birth period to the rebirth period (He,2016), the technology has continued to develop and innovate, and the application field has gradually expanded.

Artificialintelligence + education

After long-term scientific exploration and technological breakthroughs, artificial intelligence technology has made significant progress under the promotion of decades of technological development and has become a frontier science. Nowadays, the development of artificial intelligence technology has penetrated into various fields such as medicine, agriculture, commerce, finance, education, etc., and has quickly entered the public's field of vision. "Artificial intelligence + education" has also become a new direction for the exploration of education, which has led to the path of educational change. Try and explore.

Recently, domestic education experts and scholars have also focused on the field of “artificial intelligence + education” and focused on the connotation of educational artificial intelligence (EAI) (Yan et al., 2017), the development of artificial intelligence + education (Yang et al., 2018) International The theoretical frontier of the field "artificial intelligence + education" (Li & Wang , 2019), the application of artificial intelligence in education (Gao & Guo , 2019) and other aspects have been discussed and discussed. On the whole, experts and scholars are constantly exploring in the field of “artificial intelligence + education” and trying a wider range of applications. It is worth noting that the final landing ofeducational artificial intelligence requires many efforts.

At the dawn of the intelligent era, China has also attached great importance to the integration and development of artificial intelligence and education, and has intensified the promulgation of relevant policies and plans. On July 8, 2017, the "Notice of the State Council on Printing and Distributing the Development Plan of a New Generation ofArtificial Intelligence" clearly pointed out the implementation of the National Intelligence Education Project, setting up artificial intelligence related courses in the primary and secondary schools, gradually promoting programming education, and encouraging social forces to participate in education. Yule's programming teaching software, game development and promotion . In April 2018, the Ministry of Education issued the "Education Informatization 2.0 Action Plan" to realize the transformation of education informatization from 1.0 to 2.0, which pointed out that the type of thinking should shift from instrumental thinking to artificial intelligence thinking. At the same time, it is pointed out that it is necessary to enrich the artificial intelligence and programming courses that meet the needs of the times and development, and further promote artificial intelligence education . On May 16, 2019, the International Conference on Artificial Intelligence and Education, with the theme of “Planning Education in the Age of Artificial Intelligence: Leading and Leaping” , opened in Beijing. Minister Chen Baosheng mentioned in his speech: We will take the popularization of artificial intelligence as a premise and foundation, and timely refine the new technology, new knowledge and new changes of artificial intelligence into a new discourse system, according to the different cognition of students in primary and middle schools. Features, let artificial intelligence new technology, new knowledge into the discipline, into the profession, into the curriculum, into the teaching materials, into the classroom, into the teaching case, into the students' minds, so that students have basic awareness, basic concepts,

basic qualities, artificial intelligence, Basic interest. From the national level, China has actively promoted the integration of education and artificial intelligence, and is gradually exploring and experimenting with it. Artificial intelligence is no longer only concerned with the construction of the learning environment, and is constantly deepening into the teaching and learning systems.

The status quo of artificialintelligence courses

The application of artificial intelligence technology in education mainly includes the following aspects: First, as a technical means to assist education, such as the creation of intelligent classrooms, intelligent learning platforms, intelligent tutors, intelligent emotion recognition and other product applications; second, as an educational content Enter the classroom and carry out artificial intelligence courses in large, middle and primary schools. Compared with basic education, the artificial intelligence curriculum in higher education is open early and the curriculum system is relatively complete. Some researchers have shown that how artificial intelligence develops more systematically in basic education still needs further thinking and exploration, especially in how artificial intelligence can better support basic education and the construction of artificial intelligence education curriculum. There is no further research on the aspect. (Qiu et al.,2018) The development of artificial intelligence courses in the basic education stage is also in the preliminary exploration stage.

Guided by the support of various policies, the artificial intelligence curriculum has gradually moved from colleges and universities to basic education. Since the new era, higher requirements have been put forward for the goal of talent training. The core literacy of Chinese students has pointed out that core literacy is centered on cultivating “all-round development”, and its training objectives are divided into cultural foundation, independent development and social participation. In terms of comprehensive performance, it is the six qualities of humanistic heritage, scientific spirit, learning to learn, healthy living, responsibility, and practice innovation. It can be seen that in the era of artificial intelligence, it is important to train talents for artificial intelligence and prepare students for the future. It is important to develop artificial intelligence courses with innovative skills and thinking in the basic education stage. .

1.Current status offoreign artificial intelligence courses

Shortly after the artificial intelligence was introduced, some developed countries in the West (such as the United States and the United Kingdom) have already started courses in artificial intelligence in the high school stage. (ZhangJ.P.,2003)As early as 1999, the UK incorporated the artificial intelligence curriculum into the information and communication technology curriculum in secondary schools. (Zhang,J.P., & Zhang,J.H.,2005)Robot education in the United States is also in full swing. Nowadays, artificial intelligence technology is developing rapidly, and countries have increased their investment in artificial intelligence education.

At present, foreign countries have established artificial intelligence courses: (1) the development of programming education as the core idea: as a continuation of the idiomatic model of information technology education, programming education is not a separate in the new round of national curriculum standards in Finland. The subject curriculum, but the integration of mathematics, manual and other specific teaching in different disciplines to achieve the landing. Compared with other European countries, programming is a separate specialized course, Finland is more inclined to integrate it into different disciplines. This is also the unique mode of the

primary programming education into the national curriculum(Kang,2019). (2) Robot education represented by Europe, America, Japan and South Korea: For example, Korean robot education has also been featured in more than 1,000 private schools nationwide(Yoo,2015).

2.Current status ofdomestic artificial intelligence courses

The artificial intelligence course started late in China. The Ministry of Education officially promulgated the general high school curriculum standard (the experimental draft) in April 2003. For the first time, the " artificial intelligence preliminary" elective module was set up in the information technology course, thus taking the high school stage in China. The first step in smart education. At the end of 2017, the "Ordinary High School Information Technology Curriculum Standards (2017 Edition)" was published, of which "Preliminary Artificial Intelligence" was also offered as a selective compulsory course. Many primary and middle schools in our country have started the exploration of artificial intelligence courses. The core content and core literacy of artificial intelligence education, the design of classroom activities based on the core content of artificial intelligence, and the artificial intelligence thinking in the existing information technology courses in Beijing Haidian District In the way of classroom activities, the organization and implementation of the classroom activities were explored and practiced, and the artificial intelligence curriculum system of primary and middle schools with Haidian characteristics was established. (Ma et al.,2019)The National People's University Affiliated High School conducted an artificial intelligence course based on the " STEAM+Artificial Intelligence Education" curriculum model, with the goal of cultivating innovative talents and produced good teaching practice results. (Zhou et al.,2018)Generally speaking, the current development of artificial intelligence courses in China is roughly divided into the following categories: (1) STEAM+ artificial intelligence curriculum model: such as (Kuang, 2018) using this model to draw teaching results: STEAM-based artificial intelligence curriculum teaching design The constructed model can improve the students' interest in the artificial intelligence curriculum, independent learning, innovative thinking, and programming thinking by guiding the teaching design of the artificial intelligence curriculum in middle schools. (2) Maker Course:Artificial intelligence integrated into robot Maker education, docking IoT Maker education, (Zhu et al.,2019)(3) Information technology course: Based on Python programming language, experience development of intelligent programs.(Ren, 2018) From the content of the course, artificial intelligence education mainly relies on information technology courses, STEM courses, Maker courses, computer science courses, and the goal of artificial intelligence education is only part of the curriculum objectives. Although there are different topics of artificial intelligence related courses from elementary school to junior high school to high school, these courses are fragmented and lack systematic design of artificial intelligence awareness, methods, and ability goals. (Xie et al.,2019) At present, there is a lack of resources for artificial intelligence education in the curriculum system of primary and secondary schools in China, and there is no perfect curriculum system. (Fan,2018) That is to say, the current artificial intelligence curriculum is mainly based on other courses, and there is no real sense as a curriculum to systematically design and plan teaching objectives, teaching content,teaching activities and resources.

From the goal of the artificial intelligence curriculum, Xie et al.(2019) believe that primary and secondary schools are the basic stage of student learning. At this stage, the series of artificial intelligence education courses are set up, focusing on the transformation of artificial intelligence thinking and the improvement of thinking ability as the training objectives to stimulate Exploring interests and understanding basic ideas is the starting point to improve the ability

to analyze and solve problems using artificial intelligence-related technical ideas, hands-on practical ability and innovative creativity. (Xie et al.,2019)The NPC Middle School curriculum case aims to cultivate students' high-level interdisciplinary thinking ability. Zhou,S.J.,& Wang,F. (2019)and others believe that K-12 artificial intelligence education goals: apply intelligence, generate intelligence. In general, the artificial intelligence curriculum is based on the cultivation of students' intelligent thinking, innovative creativity and the use of artificial intelligence-related technologies to comprehensively solve problems.

From the perspective of teacher allocation, most of the artificial intelligence curriculum teachers nowadays are composed of technical teachers such as information technology and general technology or teachers with relevant hobbies. Due to the shortage of artificial intelligence professionals, there are still fewer artificial intelligence full-time teachers, so it is difficult to guarantee the quality of artificial intelligence courses.

The basic education stageartificialintelligence course to carry outrecommendations

1. Increase the intensity ofcurriculum construction

The entry of artificial intelligence into primary and secondary schools requires the implementation and advancement of relevant education departments. Actively guide small and medium-sized schools to carry out such courses to ensure reasonable class hours and teaching arrangements. Accelerate the construction of teaching demonstration sites and promote regional development. It is also crucial to further harmonize the objectives and content of the curriculum to promote the convergence of the curriculum system ofthe primary,secondary and secondary schools.

2.Actively build a school-based curriculum

Since there is no perfect unified artificial intelligence curriculum system and the teachers, students and software and hardware facilities of different schools are different, in order to meet the growth needs of students, the development of school-based curriculum has become an effective means of implementation, promoting the diversified development of students. According to their own characteristics, each school can set up an artificial intelligence course that is in line with the school's reality. In the process of constructing the school-based curriculum, the corresponding humanities knowledge can beintegrated according to the cognitive background ofthe students.

3. Improvethe formofcourse opening

In the form of courses, not only must there be popular courses but also professional courses, such as elective courses or community courses. This will meet the needs of science and expertise of students of different levels.

4. Clarify the course objectives

Many primary and secondary school artificial intelligence courses will useArduino, MakeBlock and other hardware as the main carrier to carry out the teaching, but in the process of opening up should pay attention to the goal orientation, not only the acquisition of knowledge, the product-

oriented result orientation, is the process orientation ofthinking cultivation.

5. Optimize the construction of the teaching staff

The development of new courses is undoubtedly a huge challenge for teachers. Teachers need a higher level of professional knowledge and the ability to learn knowledge. There is no uniform regulation and standard for the choice of artificial intelligence teachers. Then, while the education government departments advocate the implementation of artificial intelligence courses, they must also conduct conditional screening or assessment of relevant teachers and improve the corresponding teacher training system. This training system pursues its roots. Starting from the training of higher normal education, the people engaged in this industry should systematically study theory and practice in the university. After entering the job, you can be handy. After the work, the continuous vocational training of the school units should also keep pace with the times and form a systematic normal work. Thereby improving the professional development ofartificial intelligence teachers and optimizing the teaching staff.

Conclusion

Through analysis, it is not difficult to see that the artificial intelligence curriculum system in higher education is relatively complete, but most primary and secondary schools have not yet formed a system. According to the needs of innovative talents in the 21st century, it is also urgent for primary and secondary school students to improve their comprehensive literacy in the era of intelligence. The popularization and research of artificial intelligence-related knowledge has become the key. How to integrate it into basic education and enhance students' innovative ability needs to turn their attention to the basiceducation field.

The era of intelligence has come, and it is especially important to cultivate students' ability to apply and innovate intelligent technology. The development of artificial intelligence courses in the basic education stage is the general trend. However, how the course is carried out, what content is taught, and how it is opened is still in the exploratory stage. Therefore, the implementation and promotion of the course requires cooperation and experimentation by government departments, schools, teachers, etc., and explore effective application models to enable students to The primary school stage accumulates the knowledge base of artificial intelligence, gradually forms intelligent thinking, and is fully prepared for the future era.

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Analysis of the advantages and problems of artificial intelligence in education

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Abstract: With the big background of the development of era, the studies of artificial intelligence rise year by year, both technical and theoretical level, the related research are relatively rich, under the background of gradually mature in technology, this technology was applied to education become the inevitable trend, China's policies to actively support and promote the development of information-based education, encourage the development of artificial intelligence technology, encourage the applying artificial intelligence technology to education, under the time background, the artificial intelligence + education raises some thinking: artificial intelligence is applied in education? What are the problems in the application of education? Is there a better solution? Nowadays, the combination of artificial intelligence and education mainly involves the following aspects: application of AR\VR technology, data processing system (including data visualization, etc.), subjective question evaluation technology, structure of teaching resources, robot teaching, etc. Although the application of artificial intelligence in education has considerable prospects, there are also some problems such as how does artificial intelligence shape values in the education process? Do the ethical issues in ai apply equally to educational ai? In the process of the development of things, there must be some problems, which are the key to prompt us to think and actively solve.

Key words: Artificialintelligence,Education,Robotteaching,Problem

A PREFACE

On April 13,2018, the ministry ofeducation ofthe People's Republic of China issued by the education informationization 2.0 plan ofaction, become the guiding ideology in the direction ofthe current education development in our country, the plan for the ideaofeducation development in our country with a variety ofchanges, including concept ofthinking type shift points out that "one ofthe problems faced by the current education is the way ofthinking still stay in the industrial age, our thinking type need from instrumental thinking to thinking of artificial intelligence." [1]how to apply artificial intelligence to the education became a education resource development, the types of education development in our country, the hence great importance have been attached to various problems in the development ofteaching methods, combining the artificial intelligence and education, after the initial exploration, to see the way, and to further the research ofartificial intelligence and education at present how to realizethe depth offusion, in

the current era background, artificial intelligence + education caused us a lot ofthinking.

BOVERVIEW OF AI + EDUCATION

(a) What is artificial intelligence

As an emerging discipline, there is no clear definition of ai. Piero sgarufi, founder of the silicon valley institute for artificial intelligence, thinks the current definition of ai confuses theory with practice, joking: "pick one you like and we'll all be happy." When it comes to artificial intelligence, what is the first category we should identify as "intelligence"? There have been many "interesting solutions" to this problem in history. For example, the Turing test, in which a program talks to a person for five minutes and then asks the person to guess whether it is a person or a program that is talking to them, passes the test if it succeeds in deceiving the interrogator in 30%ofthe tests.

Nowadays, artificial intelligence is combined with multi-disciplines and has been developed in fields such as medicine, daily life and education, involving machine vision, intelligent control, robotics, genetic programming and other aspects. The victory of alpha system has attracted the attention of the world. With its strong computing ability, self-learning and certain speculation function, more people can see its considerable future. However simple repetition computing power has not meet the requirements of this era, to create "humanoid machine brain" has been on the agenda, nowadays the international scholars devoted to use mechanical components to imitate human cranial nerve yuan, had some scholars put forward "human is but with advanced machines have multiple neurons, have what can't imitate?" However, the ethical issues involved are also the "inhibiting factors" for the development of artificial intelligence.

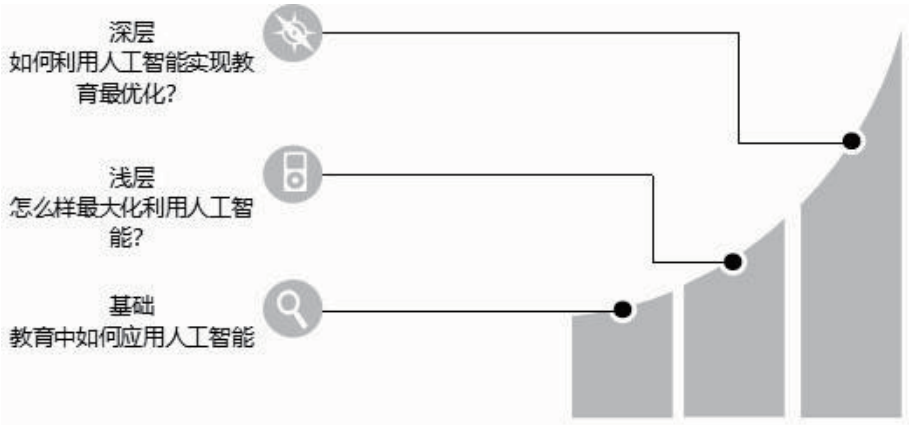
(b) Ai + education

Education creates the future, combining innovation, creativity and creativity. Cultivate talents with education, create technology with talents, improve education with technology, the three complement each other, the cycle is repeated. The application of artificial intelligence technology in education has great potential and value.



Intelligent education has entered a new era in China today, this age has the education informatization and intelligent education, intelligence, integration, under the background of The Times of intelligence, integration, we have stepped into big data and the advanced stage of artificial intelligence technology development, based on AR technology, emotional computing, human-computer interaction, such as marked, now education is in a state of the development of technology, intelligence, wisdom, let today's show, the algorithm of education and the understanding of the acme. How to effectively use data, achieve visual teaching, ensure the

accuracy of intelligent algorithms, how to free humans from complex work, such as marking papers, correcting homework, etc., are all issues that should be concerned about when applying artificial intelligence to education. Some scholars use a very vivid description, "education is an important people's livelihood, is also the future talent training the biggest dividend. So how to effectively grasp the integration of artificial intelligence and education? I proposethe following points.



1. Basics --how to apply ai in education?

The focus of combining artificial intelligence with education lies in how to apply artificial intelligence in education. Artificial intelligence involves language learning and processing, knowledge performance, intelligent search and other categories, and can be combined with multidisciplinary applications. At the moment, though, ai is trying to turn education into information. But the immaturity of machine brain research has temporarily held it back. At present, the combination of artificial intelligence and education involves the following aspects: application of AR\VR technology, data processing system (including data visualization, etc.), subjective question evaluation technology, structure of teaching resources, robot teaching, etc.

(1) applicationofAR\VRtechnology

AR\VR technology cannot be popularized due to its high cost and other characteristics. However, with the increase of China's comprehensive national strength, the application of AR\VR in classroom teaching has been greatly improved. Virtual medical laboratory, chemical laboratory, virtual biological system and other problems in education have been solved. At present, AVR desks have been put into production, which will cause a new wave in the education field in the near future. Virtual reality education is highly praised in the education circle mainly for its advantages of convenience, safety and resource saving brought by its approach to the authenticity of scenes and the teaching environment of simulated teaching resources. Compared with the broad sense of artificial intelligence education, virtual reality education has been studied as a separatescience.

(2) dataprocessingsystem(datavisualization)

A large amount of data is the foundation of artificial intelligence. Some people believe that the application of artificial intelligence in education mainly relies on data processing and visual analysis. Through the collection of student data, such as test scores, exercises completed, before

and after class homework problems collection, reasonable analysis, and effectively pointed out the existing problems. Teachers cannot pay attention to every aspect of every student's problem, but artificial intelligence technology can monitor and feed back to teachers, students and parents through data. Effective promotion of teaching, and according to different personal data reasonable development of recommended teaching programs to promote personalized learning. In addition, some companies have developed an artificial intelligence system to constantly observe students' psychological status, aiming to help schools pay more attention to students' mental health, and find and deal with problems in time. The effective use of data is an effective breakthrough to realize the deep integration ofartificial intelligence and education.

(3) subjective question evaluation technique

Correcting homework and examination papers is very complicated work, but it has always been a must for teachers to complete. In previous studies, objective examination papers can be corrected by machine, which has saved some energy for teachers. How to make teachers get rid of complicated work has always been a problem that people are committed to research. At present, in addition to objective questions, some subjective questions can also pass the machine evaluation. The subjective question evaluation technology is currently mainly used for correcting English compositions with high accuracy. However, due to its technical limitations, it mainly adopts the "machine + person" double-judgment mode [3]. Some people suggest that this approach makes teachers unable to grasp students' learning situation through homework, so that they cannot change the teaching progress in real time and make effective response. Therefore, it is necessary to continue to study the combination of data processing system and education, make effective use of the two and better display students' learning situation with scientific data information.

(4) structureofteachingresources

In addition, how to realize real-time learning is also the main direction of current research. Currently, flipped classroom and other non-traditional teaching methods are implemented. Pre-recorded teaching video occupies a certain position in education. How can students optimize the use of resources? Artificial intelligence (ai) considering the related problems and propose solutions accordingly, truthfully recorded when the class situation, sent to the students after class, students can intercept need part directly by keyword, save time and effort, the real "where does not point" can be achieved, but also have developed intelligent pen, through the special pen and paper content can be uploaded to the network database,needed to extract at any time, convenient for students to review open the door.

(5) robotteaching

Robot teaching is a comprehensive subject with high-tech performance, which has added vitality to the current primary and secondary education. At present, roboteducation is mainly divided into five ways.

Robotics teaching RSI	Robotics is regarded as a science. In all levels of education, all kinds of courses make all students generally master the basic knowledge and basic skills of robotics
Robot assisted instruction RAI	The robot mainly plays the auxiliary role, generally serves as the teaching aid tool and so on
Robot-Managed Instruction RMI	It refers to the planning, organization, coordination, command and control functions of robots in classroom teaching, educational affairs, finance, personnel, equipment and other teaching management activities. The robot management is from the organization form, the organization efficiency and so on carries on displays its automation, the intelligence characteristic, belongs to one kind of auxiliary management function
Robot proxy RRR	Its main role is to act as an agent for teachers and students to deal with other matters besides classroom teaching, such as borrowing books or even making meals for them, so as to devote more time and energy to teaching and improve learning efficiency
Robot led teaching RDI	Teaching tasks dominated by robots become the master of teaching organization, implementation and management

By far the most intelligent robot is equivalent to have 4 years old children's intelligence, the public understanding of robot teaching tends to be hosted by robots, although there are many small intelligent robots in the world now, they can answer a simple question, can accept simple instructions, rich database can show many kinds of knowledge, complete the teaching mission. However, there is still a long way to go before robots can lead teaching. With the combination of artificial intelligence with virtual reality technology and multimedia technology, it is not too difficult to make it become a reality. At present, robot teaching is mostly suitable for children before the age of 8. The introduction of robots to teaching has also gradually become a trend, thriving and promising in the future.

Future factory CEO Wang Kaifeng thinks "AI education is a development trend of the future, the world of artificial intelligence in the next five years will maintain 55% annual growth rate" on January 18, 2019 national conference on education, education of the CPC leading group also put forward "to break bureaucrats' backs to burden for teachers" bao-sheng Chen, conforms to the modern education development direction, to promote the development of the artificial intelligence education laid the foundation.

2. Shallow --how to maximize ai

Has been put forward in the field of education technology "hot" education technology problems, whether the people now study enthusiasm will over time show a sharp decline, is now blind follow suit phenomenon about the existence of artificial intelligence research, to solve these problems, we must think about how to maximize the use of artificial intelligence, combined with the artificial intelligence application of the above mentioned, from our modern process of background of the development of artificial intelligence, artificial intelligence application

in the field of education can not assumes that combines artificial intelligence and a variety of technology, At present, the main way to maximize the use of artificial intelligence is to combine the teacher's teaching design in the classroom. The application of artificial intelligence alone is still in the immature stage from the technical level. From the perspective of application, the main role of artificial intelligence as "teacher" is not able to make real-time adjustment according to the classroom situation. For the development and research of artificial intelligence, we should gradually deepen on the basis of developing the auxiliary function of teaching, so as to achieve fine and fine rather than rapid development and high investment. The state should also implement standardized management for the corresponding resource development, play a specialized, refined supply. To avoid the uneven quality of educational resources caused by the crazy investment of businessmen who perceive its huge development potential.
After discussing how to maximize the application of artificial intelligence, another deep issue should also arouse our attention --how to use artificial intelligence to achieve the optimization of education, we know that the generation of educational technology is to help promote the performance of education. How to produce optimal educational performance while maximizing the use of artificial intelligence? Under the same teaching effect, the problem of resources is also an issue we should consider. However, this problem is often ignored by us when all parties explain the benefits brought by the new technology. The problem of how to use artificial intelligence to achieve the optimization of education cannot beignored and needs to befurther explored.

C PROBLEMS EXITING IN THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN EDUCATION

The combination ofartificial intelligence and education has promising prospects, but there are also many controversial issues that are not well received. Are these problems having an impact that cannot beignored?Will it hinderthe development ofai + education? In the process ofcombining artificial intelligence with education, Imainly put forward the following two questions:

1. how does ai shape values

It seems that emotion has always been regarded as a unique characteristic ofhuman beings. In the process of education, it is not only necessary to impart knowledge and experience, but also to cultivate their correctoutlook on life, values and world view. Besides the imparting ofknowledge, it is important to cultivate a positive and healthy personality. The biggest difference between man and machine is that man has feelings. The artificial intelligence does not have the emotion, does not have the emotion whether to cultivate the emotion. With the rapid development ofartificial intelligence education, how to shape students' values through artificial intelligence? There hasn't been much discussion about this issue. The authorsearches on CNKI with artificial intelligence and values as the main topics. There are only 7 articles, but none ofthem involve how to use artificial intelligence to cultivate values in the context of artificial intelligence education. Ofcourse, this problem also makes us clear that teachers are irreplaceable.

2.Do the ethical issues in ai apply equally to educational ai?

Compared with the research ofartificial intelligence, there have been many controversies, among which there are always ethical questions without a persuasive answer. Hawking, who has long

supported the idea that artificial intelligence will destroy humans, has refused to install chips in his brain to improve the fit with intelligent wheelchairs. "Now is not the time to worry about who controls ai," hawking declared. "it is time to worry about whether aican be completely controlled. In the next 100 years, mankind will face the challenge ofartificial intelligence that is smarter than human. Hawking has previously warned that artificial intelligence could end humanity." Speaking at the Massachusetts institute oftechnology, MrMusk described artificial intelligence as the "greatest existential threat" to humanity. "I think we should bevery vigilant about artificial intelligence," he said. IfIhad to guess at the biggest threat to human survival, it would probably beartificial intelligence." [5]on the one hand,people continue to develop artificial intelligence and enjoy the convenience brought by artificial intelligence, on the other hand, they are full offear for it. They are afraid ofbeing "attacked by toolscreated by themselves". Artificial intelligence is just like the applein eve's hand. Itis this concern that raises "ethical questions" for ai. So will the combination ofeducation and artificial intelligence be affected by these ethical issues? Do people stop doing research because ofthese ethical issues? Weknow that education is the foundation offuture development. Can we imagine a future in which artificial intelligence breeds "antisocial talent"?

There are some other problems in artificial intelligence and education, but it is the existence ofthe problem itself that gives us the motivation to solve the problem, I believe we are constantly moving forward.

D CONCLUSION

The combination of artificial intelligence and education has obvious advantages, such as freeing teachers from complicated work and assisting teachers to observe students better, but there are also some problems, such as the inability to teach students about emotional values. Artificial intelligence cannot replace the position of teachers in a short time, but better development of the application of artificial intelligence in education is also the direction we need to work on.

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What students discussed about Sustainability in the Knowledge Building Class

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Abstract: In order to empower the 21st century learners, schools and education practitioners need to go beyond the traditional knowledge acquisition to support learners to work as communities and advance their community knowledge collectively. Knowledge Building, an idea-centered, principle-based, technology-supported pedagogy, aims to prepare students as epistemic agents through engaging in socio-cognitive interactions. In the knowledge-building community, learners make collective and cognitive efforts to sustained inquiry and advance their community while teachers work as facilitators that provide students with scaffolds. While there is increased research interest, more research is needed on how knowledge building can work in regular classrooms and how the discussion will go when the teacher fades out. In this study, we designed and implemented a knowledge building environment in a year 7 science class, with the support of Knowledge Forum (KF), to facilitate students' understanding of Sustainability. This study aims to 1) investigate students' conceptual understanding before and after the intervention. 2) explore the key concepts discussed in the Knowledge Forum. 3) investigate how students' understanding of knowledge building and sustainability developed over time. Pre-post tests were conducted to get students' domain understanding. Students' participation in Knowledge Form and their learning reflections were also collected and analyzed. Findings suggested that students had significant changes in domain understandings. Keywords such as energy, pollution, global warming, renewable energy discussed were identified and how these concepts developed in their discussion were also tracked and reported.

Key words: Knowledge Building; Knowledge Forum; Sustainability; Education for Sustainable Development;

INTRODUCTION

Sustainability is increasingly important as a concept within education and education plays a pivotal role in global sustainability (UNESCO, 2005). One of the aims of the Education for Sustainable Development (ESD) is to 'prepare young people for a lifetime of sustainable living'. However, despite the increasing emphasis on ESD, it is not clear whether and how this aim has been achieved in an educational setting. There is limited research that explored students' understanding of sustainability (Rickinson,2006), especially in Secondary school level. `

To achieve the goal of ESD, it requires innovative teaching and learning, e.g., inquiry-based

learning and experiential learning, which motivate learners' interest and students' agency (UNESCO, 2012; Christie, Miller, Cooke, & White, 2013). To develop students' understanding of sustainability in the school context, it's necessary for learners to actively engage in the current environmental issues with real-life experiences. This could be realized through investigating scientific concepts surrounding such issues in the collaborative discussion, online investigation and experimentation. However, sustainable living turns to be "a new area of the curriculum with little exemplification of how it might actually be taught in classrooms" (Corney, & Childs 2003, p. 327).

Knowledge Building, an idea-centered, principle-based, technology-supported pedagogy, aims to prepare students as epistemic agents through engaging in socio-cognitive interactions. A key focus of a knowledge building environment is that students take on collective responsibility toward a knowledge creation goal (Scardamalia & Bereiter, 2006, 2014). To achieve this goal, students are required to take the role of setting goals, deepening the inquiry, evaluating their learning process to identify where they are, whether they are advancing their knowledge, and to monitor their inquiry process for the next stage. (van Aalst 2009). Learners make collective and cognitive efforts to sustain inquiry and advance their community, while teachers work as facilitators that provide students with scaffolds. While there is increased research interest, more research is needed on how knowledge building can work in regular classrooms to build students' understanding of sustainability and how student-directed discussion will develop when the teacher fades out.

In this study, we designed and implemented a knowledge building environment in a year 7 science class, with the support of Knowledge Forum (KF), to facilitate students' understanding of Sustainability. This study aims to explore 1) Students' participation in the Knowledge building discourse and Knowledge Forum; 2) what changes in students' domain knowledge 3) the key concepts discussed on Knowledge Forum; 4) The development of students' understanding of sustainability during this process.

RESEARCH DESIGN & METHODS

Participants and Context

This study was implemented in a Year 7 science class in a Hong Kong international school. The teacher had rich teaching experience and students were used to collaborative learning. However, they had no prior experience of Knowledge Building pedagogy or using Knowledge Forum (KF). The participants were all computer literate and could use their iPad and school-provided MacBook to assess the Internet in class; This study was implemented for five weeks with the topic of Sustainability. There were4 sessions every week and each took 60 minutes.

Instructional Design

A knowledge building environment mediated by Knowledge Forum was designed and implemented in fostering students' understanding of Sustainability. Knowledge-building pedagogy and Knowledge Forum were designed and implemented. Students involved in generating questions, researching information, engaging in the online discussion, building on each other's theories and reconstructing their ideas collectively. The instructional design are described below.

First, students watched videos and read images in relation to energy and sustainability. Then, a number of collaborative learning activities were designed to foster the concept of a learning community. In this stage, students generated their own questions and posted to the Knowledge building wall in class and searching authoritative sources to answer the questions. They also built Group Concept Mapping on their interested topics.

Later on, students were introduced Knowledge Forum 4.7 and they moved their discussion from physical wall to the online forum. Students were given a Knowledge Forum user guide that included a general introduction to its functions and scaffoldings (e.g. My theory, New information) and showed them how to post, read and build on notes. Then the students use notes to share new information, view each other's ideas on Knowledge Forum. New topics spring from student generated questions, which drive students to learn about the relevant concepts and direct the whole discussion to go further.

After students posted some notes in Knowledge Forum and developed some clusters. A reflective knowledge building talk was designed in the subsequent class session for students to reflect their discussion on Knowledge Forum and share their ideas on what constitutes good notes/discussion. After the reflection, students reselected their topics to work on, designed their group research questions, researched resources and each group demonstrated their learning and understanding of the topic through different representations. During this whole process, students were encouraged to write learning diaries to record their learning and write a reflective essay and portfolio note about their personal and collective advances.

Data Sources and Analysis

A written pre-/post-test domain test was conducted to assess students' level of understanding of Sustainable Living. Students' responses were coded using a four-level scale (developed by the researcher and the teacher) that illustrates different levels of understanding. All students' pre-/post-test responses were coded by the researcher and an independent rater scored 40% of the domain test. Inter-rater reliability was .892 (pre-test) and .982 (post-test). Analytic Toolkit (ATK) was used to retrieve and analyze students' activities on Knowledge Forum. Students' focus group interviews were conducted at the end of instructional design, immediately after the post-test. The interview was to examine their experience with knowledge building and transcripts were analyzed. The interviews provided qualitative data on students' views on how knowledge building and Knowledge Forum affected their academic performance.

RESULTS

Students' Participation on Knowledge Forum

Students' participation on KF was analyzed with the Analytic Toolkit (ATK). The ATK general descriptive picture revealed that, over a five-week period, the participants contributed 237 written notes. Table 1 shows student's' overall participation and interactions, and their high level of contributions on KF. On average, each student created 12 notes, read 44.2% percent of other students' notes; In addition, there were frequent student interactions on Knowledge Forum, with links being made to 55.6% of all notes posted.

Table 1. Descriptive measures for knowledge building activities on Knowledge Forum ATK Index.

ATK Index	Mean	Standard deviation
Number of notes created	12.0	7.26
Percentage of notes read	44.2%	22.65%
Number of notes revisions	1.8	1.67
Number of scaffolds	10.8	8.6
Percentage of notes linked	55.6%	18.2
Percentage of notes with keywords	24.9%	17.79%

Changes in Students' domain Understanding

Paired t-test on domain understanding showed a significant difference between pre-test scores (M =1.512, SD =.494) and post-test scores (M =2.308, SD = .669), t (17) = -6.265, p = .008. The results provided some preliminary indications that knowledge building intervention might have a positive effect on fostering understanding of the sustainability. This aligns with the finding that knowledge building environments promote deeper conceptual understanding and better learning outcomes (Chan &Lam 2012).

Keywords Discussed on Knowledge Forum

All the notes on knowledge forum were input into WordCloud, and were output and divided into individual words. Keywords discussed each day on Knowledge Forum was analyzed. 50 keywords were discussed and identified. The most frequently discussed key words include: energy, pollution, wind, solar, fossil fuels, global warming, sustainable, renewable, environment, water, people, knowledge, electricity, gas, hydroelectric etc.

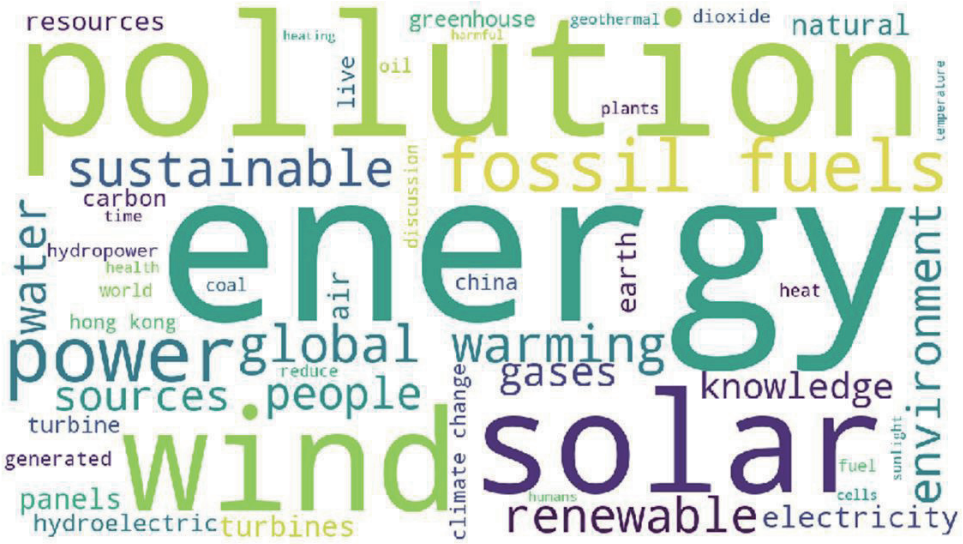


Figure 1. Key words discusses in the Knowledge Forum

The development of Key concepts

The network of the keywords in each week were analyzed using the KB Dex (Oshima, Oshima, & Matsuzawa, 2012). Results showed that in the first week, students' discussion mainly focus on the energy, pollution, renewable energy, environment and resources. In the second week, the discussion moved gradually to sustainability, power, wind, solar, water, fossil fuels. In week 3,

some key concepts such as oil, reduce, fuels, plants, solar panels, turbines came to the center of the discussion. In the fourth week, the keywords became closely connected in the discussion. Results showed that the most frequently discussed keyword at the initial stage were general concepts. As they learnt more about sustainability and got into deepened inquiry, the concepts such as wind turbines, solar power, geothermal were discussed more in the thread, suggesting that students' moved from big concepts to sub-concepts through sustained inquiry and selected their focused research questions as the discussion went on.

Students' Understanding of Energy and Sustainable living

To track students' understanding in different areas, their KB reflection, reflective journal, and Meta-discourse on discussion were analyzed and four categories were identified. Qualitative data showed that as students were gradually aware of the environmental issues around as they learned more about this topic. Individual case was analyzed in order to see the closer picture of how Individual students' understanding of sustainability developed over time and how the Knowledge Building environment and discussion on Knowledge Forum facilitated their understanding.

Case: Student K

Student K was a middle level student within the class. In the pre-test, she got level 1 (the highest is level 4). In regard to the question of "What do you know about green or sustainable living?" She answered that "I think being sustainable is having a way to work with the environment without disrupting it". According to the ATK result, K created 12 notes, and read 48% of all the notes created in the database, this is at the average level in the KF discussion.

Start with the joining in the discussion of "what is energy and what energy is used for". Her initial thoughts is "My Theory energy is used for powering things that are electronic. (May 5)" Then, after viewing other people's notes and discussion, she turned the attention on the impact of consequences of energy use on the environment, especially in Global warming.

Global warming will take a long time to clear up as it is constantly being added to and not many people know what effects it will have on the environment and even people. (May 6)

In her learning diary on May 6, she also reflected that she had learned Non-sustainable energy sources, such as fossil fuels from manufacturing industries, can cause a large amount of pollution, which affect our health severely. And arose the question of "How can we prevent air pollution? What does all this pollution mean for our planet in the long term?" and reflected, "We need to take action rapidly, because even here in Hong Kong, we are surrounded by air pollution and it can cause severe problems with our health." From the learning diary, we noticed that K made connections between the environmental perspectives (energy, global warming) with the social-cultural perspectives (health), as indicated in the figure 2. After her reflection on possible consequences of energy use, the discussion that she joined was mainly on Pollution. (E.g. where does pollution come from; Pollution in Hong Kong; Air pollution and corresponding strategies to reduce it); Again, K reflected in her learning diary on May 11 that "we really need to start making a more sustainable approach to more things."

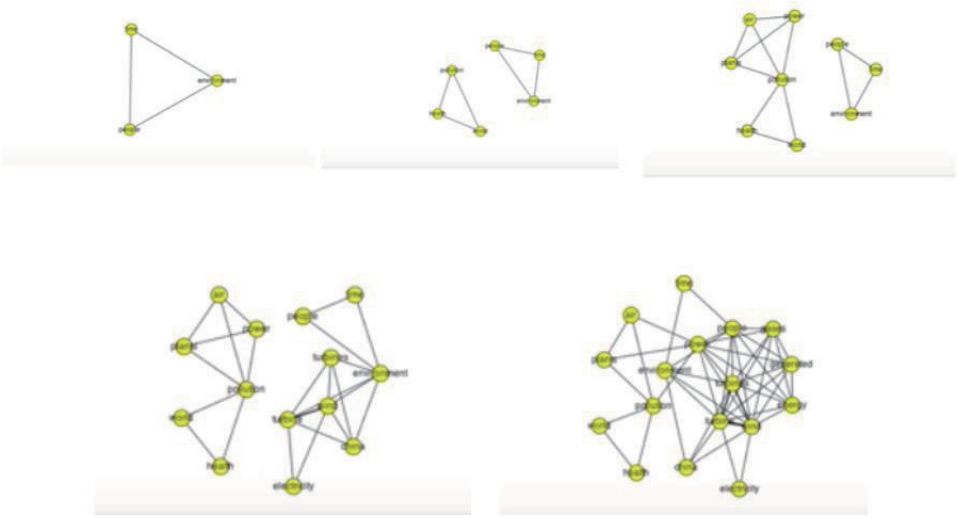


Figure 2. Student K's Network of words changes in the 4 weeks

Besides, the portfolio note reflected how the discussion grew in the Knowledge Forum supported Knowledge Building environment and how their understanding of pollution developed and how her understanding of environmental (e.g. pollution impact), social (e.g. people's awareness) and economical perspectives (e.g. factories) gradually getting connected.

"The topic of this discussion is pollution. It began with the question why do people pollute? At first I thought that the only reason they pollute is because they are being wasteful……. I also found out that sometimes it is a lot cheaper for people to be lazy with their weak environmental awareness. In the discussion someone had a further question about how much pollution factories cause. The discussion started with 1 question and then developed into a series of questions that ended up leading into a very deep conversation."

It could be seen that students' made use of the Knowledge Forum in helping them to develop their conceptual understanding through making their ideas available to peers and also sharing and building on each other's ideas.

The questions were answered using other people's knowledge and research from the internet. All the discussions were on knowledge forum. We benefited from knowledge forum because it is an easy and simple way of sharing thoughts with other people and creating discussions which go into further detail creating a web from one simple question, Knowledge forum is also a great way of sharing people's opinions in a group."

Motivated by the pollution related facts discovered in the previous week, student K chose to work on renewable energy, especially focusing on the wind power with a group of people interested in the same topic. Their investigation mainly aims to understand questions like: What is a Wind Turbine; what are the advantages and disadvantages of using wind turbines? Does China use wind turbines and should it; who created the wind turbine and what were their intentions? How does the environment positively benefit from wind turbines? Apart from the discussion, they also created a wind turbine model to understand and demonstrate how it works. Student K got Level 3 in her posttest and demonstrated a deeper understanding of energy and sustainability, and growing awareness of the need to live a green life and the actions needed.

Besides, K also had a deeper understanding into collaborative learning process and expressed the benefits of idea diversity in improving their conceptual understanding. As the data shows, the students gradually deepened their understanding in the environmental, social and economic perspectives in relation to sustainable development, but most focusing on the environmental and social parts. They also changed from a blurred impression of Sustainability to be clearer of the tensions and consequences of human actions and developed a sense to action up in their real life. Besides, students also developed a more holistic view and viewing the three aspects to be isolated but as the intertwined and closely related with one another. This is consistent with the findings on students' understandings of Sustainability (Walshe 2013).

CONCLUSION

Findings suggested that students had significant changes in domain understandings in Sustainability. Keywords such as Energy, pollution, global warming, renewable energy discussed were identified and how these concepts developed in their discussion were also tracked and reported. This study suggests that a knowledge-building environment, mediated by Knowledge Forum, has a positive impact on students' understanding of Sustainability. The findings provided preliminary but converging evidence of how students' participation and interactions in knowledge building discourse help develop their understanding of social, environmental, and economical aspects of Sustainable development and build their sense of live a sustainable living. The findings also support the notion that students' understanding could be developed through innovative pedagogy such as inquiry-based learning and computer-supported collaborative learning (Christie, Miller, Cooke, & White, 2013).

This study also has implications for research on Education for Sustainable Development. It suggests that knowledge building pedagogy, with the support of knowledge forum, could be considered as a promising and innovative pedagogy to both promote students' deep understanding and development of sustainability. More cases analyses are needed to understand the pattern of students' SD growth, and further investigation is needed to test knowledge building for SD development in different educational settings and multiple classes.

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12

Chapter 12:

AI in Primary and Secondary School Education

An approach for improving the lesson with ICT in the rural area of the Philippines

- Forming a teachers' attitude toward the lesson improvement -

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Abstract: This research aims to discuss an approach for forming a teachers' attitude toward the lesson improvement with ICT in rural area of the Philippines. The authors show a case study based on BYOD (Bring Your Own Device), a policy that permitting teachers to bring and utilize their own personal devices such as a smartphone, a tablet computer and a laptop computer to their classroom, and discuss how this method encourages the teachers to struggle for student-centered lessons.

Key words: ICT, Rural area, Philippines, Teachers' attitude, Lesson improvement

INTRODUCTION

Educational reform in the Philippines

Philippines Department of Education (DepED) implements the educational reform that is mainly focused on the transformation of the K-12 Alternative Educational System from 2012 until 2018 (Reyes 2017). Although a former educational system in the Philippines consisted 10-year program, they add two years as a senior high school education to follow the global standard. In addition, DepED expects to replace a traditional teacher-centered instruction for memorization to student-centered learning with the thinking activities or problem-solving activities (Department of Education n.d.).

Definition of the problem

The teacher takes an important role in the case of the transformation from traditional education to the alternative one because the teacher designs the learning activities in the classroom. Gutierez and Kim (2017) tried to conduct the opportunity regarding the professional development for teachers in the Philippines to enhance their teaching skills to follow the educational reform. Therefore, the teacher should form own active attitude toward absorbing a new educational concept and developing learning activities. The student is unable to acquire new skills without the lesson aiming new learning goals.

However, especially the schools in the rural area, the teachers are defeated when they form an

active attitude toward practicing new educational activities by an environmental obstacle. To activate the thinking in order to create a new action, they require an opportunity to encounter a new environment or artifacts and utilize them (Vygotsky 1997). In the accustomed setting, thinking is not enabled and a new action does not create, whereat they routinely reproduce the action without any thinking. Thus, to encourage the teacher to struggle with thinking for new educational goals, we provide something unfamiliar such as a new environment and an artifact for the teachers.

Although the educational reform in the Philippines is implemented, it focusses on the enrichment of the number of the classroom. A lack of ICT equipment for improving the lesson in the classroom is an issue, especially in the rural Philippines. ICT enables design and practice the learning activities that relate to the student-centered education, because uncountable articles have reported various cases. In addition, it has possibility to change teacher's teaching mind from traditional to alternative (Donnelly, McGarr & O'Reilly 2011). However, the school has only a limited number of them. In this situation, the teacher does not have a way to develop a learning activity. The teachers, especially in the rural area, routinely reproduce the traditional instruction even though the educational reform requires to conduct the alternative education because they have no chance to make an effort.

Research objective

In order to empower the teachers in a rural area, the authors suggest an approach for educational improvement by BYOD. We jointly work for the enrichment of the classroom environment with the elementary school teachers and the administrator in the Province of Davao Oriental since 2018. In the process of this trial, teachers conduct new learning activities such as a student-centered experience-based lessons. The authors discuss an approach with ICT for forming a teachers' attitude to improve lessons in the rural area of the Philippines.

METHOD

A Case Study: S Elementary School in the Province of Davao Oriental

S Elementary School (S School), a case study of this research is located in the Province of Davao Oriental, Davao Region (RegionⅪ), Republic of the Philippines. The municipality where S School is located has approximately 36,000 population, and agriculture and fishery are the main industry in this area. This municipality is located 140km far from Davao City, the biggest city in Mindanao Island.

S School has approximately 400 students including preschool pupils and approximately 15 teachers. Although the teacher-student ratio in S School is better than other schools in the Philippines, it has an almost the same educational environment with others. The internet connection is not installed into the school, the 2 computers are available for administrative duties only. S School has 2 projectors and a portable screen and these devices can be used for the lessons, however, there is an obstacle regarding the setting up.

Identifying the current situation in the rural area

The teachers in S School have been following the traditional instruction due to the environmental

obstacles. DepED requires to practice the lessons based on the new concept of the learning that is configuring the thinking and problem solving activities, however, the teachers are not able to develop their practices because of the lack of tools. In addition, the teachers are difficult to find out the advantage of the alternative learning activities from the comparison with the traditional instruction. As a result, they tend to keep the routinized lessons which traditionally conducted.

Defining the approach to encourage the teacher

How we develop the teachers' attitude that is actively improving their own lessons in the school education environment that the government provides. As we mentioned above, in order to promote the thinking and action that is something new from the existing one, new tools which is enabled to create the thinking and action which something new should be provided.

Then, the authors have shown the educational enhancement by BYOD, and more specifically we have suggested the educational usage of the smartphone which the teachers have. The penetration of smartphone in the Philippines is 44.9% in 2018 (Newzoo 2018), thus lots of people including school teachers have own smartphone. The smartphone enables to install of various applications that focus on educational usage. Moreover, it has some functions which are useful for everyday teaching such as a camera function which enables us to take pictures and videos, a voice memo, a calculator, etc. These applications and functions can help and enrich the lessons. Some of the smartphones can be projected their display on the monitor or the screen, thus, the application and function can be shared with the students in the classroom.

Although the new curriculum offers to implement student-centered learning activities in the lessons, the teachers have been confronted with the educational environmental obstacle that comes from the restricted ICT environment. It makes the teacher feeling difficult to deal with the reforming of their lesson from traditional instruction to alternative lessons. Smartphone has the potential to change this situation, and it can be an ICT tool which the teachers deal with the improvement of their own lessons.

RESULT AND DISCUSSION

The process of the intervention

The authors and the principal in S School had made an agreement for improving the school teaching environment and developing teaching skills with ICT tools to enhance their lessons. We had launched the cooperative project in order to achieve both objectives since March 2018. The progress of the intervention will be shown below.

August and September 2018

The authors conducted a one day workshop in S School to introduce the BYOD policy and how to implement it by smartphone. We focused on a camera function that can be used in offline situations because the internet connection was not provided in S School. The first author brought the portable microscope and instructed how to use it with a smartphone.

In addition, we also introduce MHL (Mobile High-Definition Link) connector and Miracast to display smartphone on the screen or the monitor, however, these devices did not function due to the out of standard. The smartphone is sold at an affordable price in the rural Philippines.

These smartphones exclude some functions that should not fundamentally require in everyday communication in the rural area such as outputting the display data and wireless display function.

The three teachers handling the science subject have performed the trial lesson with a smartphone and the microscope after the workshop. They had conducted the lesson based on experience. The students observe the body parts of insects or structure of flowers through the microscope, and the teacher shares the smartphone screen with all students to make a consensus. Although they performed the lesson with the smartphone after the workshop, they returned the lessons to the traditional instruction without a smartphone and the microscope, because they only know how to conduct the observation-based learning activity. Thus, both the science teacher and other teachers who are handling other subjects could not follow BYOD. In addition, we should show the impact of displaying the gadget to encourage having a smartphone that enables to project its screen for future practice.

February 2019

We had installed three tablet devices (an android OS tablet and two iPod touch) in order to show how the educational application can play an important role to enhance and expand the lessons for the improvement. We installed some application which can be utilized in various subject and grades, such as English conversation, science experiments, mathematical calculation, and music exercises in advance. We had chosen the free application because there are several kinds of them, and even free applications can help their lessons. The teachers in S School can be access to these devices when they would like to use, though these devices will be managed by the teacher in charge of ICT in the school.

In addition, we brought a large monitor to display the screen of the tablet devices into the SPED (Special Education, for children who have learning disabilities) room. The SPED room is occupied only in the morning, therefore the teacher can access the monitor in the afternoon.

These gadgets had introduced to all of the teachers including how to operate them. They are familiar with these devices, hence they adopted them without any hurdles.

Effects of the intervention

We have confirmed the forming active attitude of the teachers toward the lesson improvement after both intervention, the workshop and the installation of the devices in S School. A teacher who handles SPED class pupils tried to use the application on the tablet computer in order to teach the alphabet with the enjoyable exercises.

Another teacher demonstrated the lesson regarding the body parts. Every student takes a hair, and observed by the microscope and compare each other by the monitor that displays an iPod touch screen. In this lesson, the student has constructed a hypothesis and draw it in advance of the experiment. After the experiment, they check their own hypotheses and draw the answer that they constructed through the activity.

Moreover, other teachers showed some actions that the authors had not indicated in the workshop. A teacher had brought a laptop computer into the classroom. Another teacher had

used a USB flash drive which was copied music, movie and picture files. Both laptop computer and USB flash drive can be connected to the monitor and the projector which S School has before the workshop.

From this case, these behaviors of the teachers would be assumed the formation of the attitude toward improving the lesson. Then we would like to mention that the BYOD can encourage the teachers to improve the lessons. Especially the teacher who used the microscope and iPod shifted her teaching mind from traditional instruction for memorization to knowledge construction through experience. And also BYOD can be a trigger to expand teachers' actions according to the case without a smartphone. Thue, this approach enables to form an attitude of teachers toward improving the lessons, and it expands teaching methods.

FUTURE PERSPECTIVES

Practical perspective

BYOD, the utilization of smartphones which the teacher has enables to promote attitude toward improving the lesson, however, there are still obstacles regarding spec of the devices. There is some industry standard to display smartphone screens such as MHL, slimport, and Miracast. The users are difficult to identify which the industry standard their own device follows. Moreover, most of the smartphone sold in the rural Philippines does not equip the function of projection to cut the cost.

In addition, a smartphone can be an output device, though output devices such as a projector and monitor must be prepared. Still, the school should struggle to find a grant to enrich the school learning environment.

Research perspective

The authors have intervened in order to find out an approach for forming a teachers' attitude toward the lesson improvement with ICT in the rural area of the Philippines in this research. BYOD, smartphone usage has the potential to be a prompter of teachers' thinking and action for lesson improvement. Although smartphones, tablet device, and iPods can be a factor to make teachers' behavioral transformation, there are additional factors in the environment, for example, output devices to show the screen of the device. The researcher as an intervenient and the school principal also take an important role likewise other factors to push and encourage teachers.
To completely identify the approach to educational development in the rural Philippines, we continuously intervene and collect data in the process of the change.

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The Changing Process of Chinese Teachers' Beliefs When Using Thinking Tools

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Abstract: In the shift from teaching students to knowledge acquisition, to nurturing higher-order thinking skills, teachers need to learn new teaching strategies and utilize new teaching belief in their activities. Using a case study, this paper attempts to clarify how the beliefs of Chinese primary school teachers changed in the practice of using thinking tools (TT) to improve children's thinking skills. The Three Layers Model of Genesis (TLMG), an approach of Cultural Psychology, was used to analyze the process of change in the representative teachers. The authors interviewed eight Chinese teachers and focused on their beliefs when they used thinking tools. The authors found that there were three types of Chinese teacher who used TT. Type 1 kept their traditional belief but changed their value system, Type 2 teachers changed their belief from knowledge acquiring to thinking skills training, and Type 3 kept the balance between knowledge acquiring and thinking skills training. Furthermore, all of the teachers experienced cognitive conflicts after the promoting sign of the importance of thinking skills occurred.

Key words: Belief, thinking tools, thinking skills, Three Layers Model of Genesis, Primary School

1. INTRODUCTION

With the development of globalization, many countries began to focus on nurturing children's thinking skills in the 21st century. Therefore, there has been a concerted effort in educational fields from shifting teaching knowledge to improving thinking skills of students in primary school. To reach this new goal, it is important to change from the traditional belief of obtaining knowledge to the new belief of improving students' thinking skills (Sato, 2016). Thus, it is crucial to identify whether the teachers changed their belief or not in the new practice.

2. REVIEW ANALYSIS

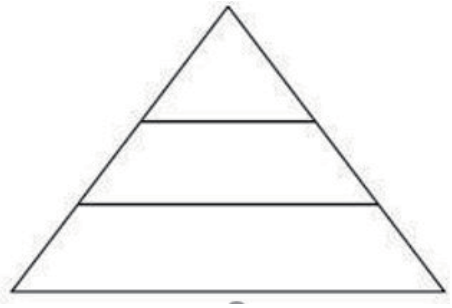
2.1 Belief of teacher

In the 21st century, nurturing higher-order thinking skills became new teaching goals. It asked that teachers shift their traditional belief to the new belief of improving students' thinking skills (Sato, 2016). However, the transition of belief from knowledge-acquiring to thinking skills training is not easy to occur. Sakamoto (2007) pointed out that beliefs are hidden in the core consciousness of teacher and are formed over the long-term and influenced by the social and cultural environment. Therefore, a major issue is how teachers change their exciting belief of knowledge-acquisition.

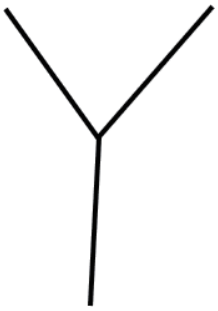
Parwat (1992) indicated that what teachers believe play key roles in changing classrooms since "the problems maybe overcome if teachers are willing to rethink their views on the issues". In the process of rethinking their views, cognitive conflicts may occur since the exciting views and new view are different. To reduce the cognitive conflicts, sometimes teachers avoid facing the issues. However, the cognitive conflicts can trigger teachers changing their existing beliefs (Rolka, Rosken, & Liljedahl, 2007).

2.2 Using TT to nurture thinking skills in China

To promote the quality of education, the Chinese government enacted a policy called the "China's Middle and Long Education Innovation and Development Plan from 2010 to 2020". In this policy, one goal was to promote thinking skills. To help reach this goal, ways of using thinking tools (TT) to improve thinking skills was introduced in some cities in China since 2012.
TT are special graphic organizers which focuses on developing some types of thinking skills. Using special graphic organizers that match with some thinking skills and training students to use them have educational benefits (Kurokami, 2012). For example, using Y chart to match with multiple-angle thinking and Pyramid chart to match with structure (Figure 1). Owing to the fact that thinking cannot be observed, using thinking tools, which would "show one's thinking visually" in class, are useful ways to understand the development of children's thinking process. Furthermore, it is possible to improve thinking skills of students by training them to use TT.



Pyramid Chat



Y Chat

A survey of eight teachers' consciousness showed that some teachers focused on developing students' thinking skills, and some other teachers still paid more attentions to knowledge-acquisition (Zhang, Kubota, Kubota & Li, 2019). This study indicated that teachers used TT for a different purpose, from the perspective of social environment. However, it is not clear whether that the changes of these eight teachers influenced by their beliefs or not.

Therefore, the research questions of this study are as follows:

1. Did the Chinese teachers' change their traditional beliefs when they used thinking tools?
2. How did they change or keep their traditional beliefs? And why?

By examining the process of how Chinese teachers changed their believes, it is possible to supply valuable information to support teachers shift from the traditional beliefs to the belief of improving thinking skills, when educators introduce thinking tools into new area in China. Furthermore, it is also important to clarify what inhibited teachers for changing their traditional beliefs if some teachers did not change their value system.

3. RESEARCH METHODS

3.1 Three Layers Model of Genesis

To clarify the process of how teachers changed, this study used the Three Layers Model of Genesis (TLMG), an approach of Cultural Psychology, to analyze the structure of belief in people. TLMG is a new quality approach which can clarify the changing process of belief (Yasuda, Nameda, & Sato, 2015).

TLMG has three levels. Level 1 examines what teachers did and felt. Level 2 identifies what kinds of symbols made teachers change or promotes or inhibits teachers' feelings and behaviors. Level 3 analyzes the level of belief of what teachers want to do in their teaching to trigger new teaching behaviors. (Table 1). The authors used TLMG to analyze the data.

Table 1 Concepts of TLMG in this study

Level	Concept	Position in this study
Level 1	Feeling and behavior	What did teachers feel and do in the practice of using thinking tools?
Level 2	Symbol	What kinds of symbols made teacher to change?
Level 3	Belief	What did teachers want to do in their teaching?

3.2 Historically Structured Inviting

TLMG chose research collaborators based on Historically Structured Inviting (HSI). HSI occurs when required researchers invite collaborators, who have the experience, to talk about their research theme (Yasuda et, 2015). This study chose teachers who researchers thought could "use thinking tools to teach lesson for high-order thinking skills" as collaborators. Furthermore, this study was on the 1/4/9 principle regarding the number of collaborators, where 1 or 2 people can clarify the specific process, 4±1 people can clarify the multiple experiences, and 9±2 people can clarify the types of the developmental process (Yasuda et, 2015).

This study selected eight teachers to clarify the pattern of the developmental trajectory that occurred when using TT because of its possibility to expand knowledge to support other Chinese teachers who use TT. These teachers were Teacher A, B, C, D, E, F, G, and H, who worked in four primary schools in Guangzhou and Foshan, Guangdong Province. Two teachers worked at the same primary school.

These teachers had the following features: First, the teachers experienced TT for more than two years and six months before March 2018. Second, their teaching experience was from 3 to 18 years. Third, these teachers taught the four subjects of Math, Science, Chinese Literature, and English.

The authors interviewed the teachers three times. The authors interviewed all of the teachers about how they used thinking tools and how their belief changed. Then, the authors drew a TLMG diagram.

4. RESULTS AND DISCUSSION

4.1 Changing process in three types of teachers

Through analysis of the data, the authors found three types of teachers. The teachers of Type 1 kept their traditional belief (Teachers E/F/H), Type 2 teachers changed their belief from knowledge acquiring to thinking skills training (Teachers B/C/D/G), and Type 3 was Teacher A, who wanted to keep the balance between knowledge acquiring and thinking skills training (Figure 2).

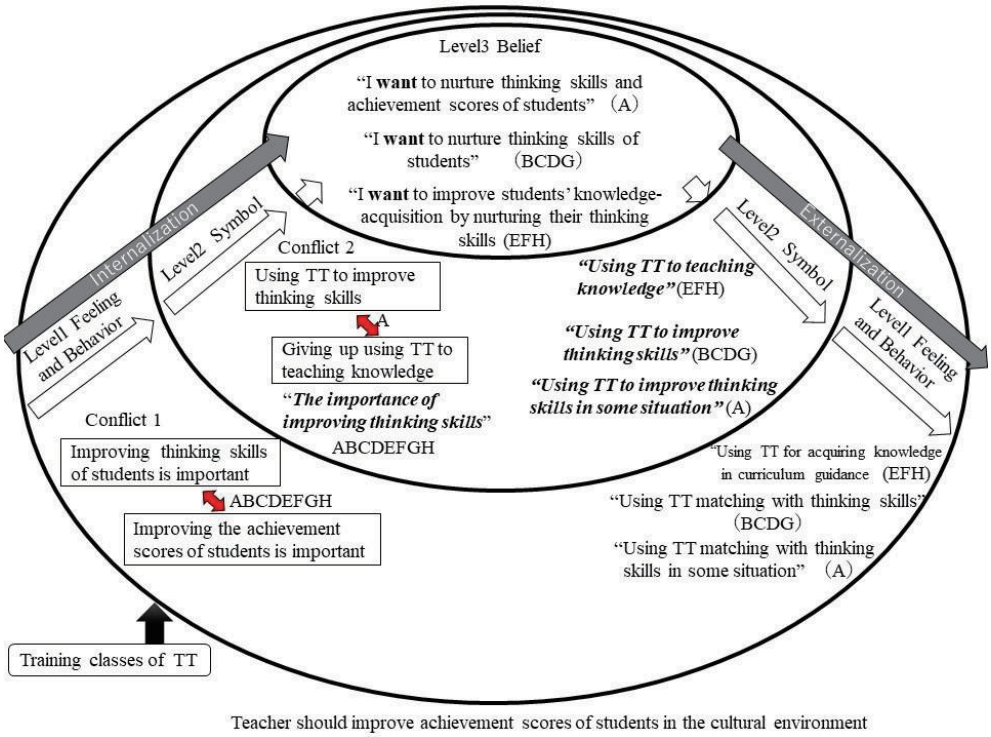


Figure 2. TLMG of the Belief in Teachers After Using Thinking Tools

4.1.1 Type 1: keeping traditional belief

Type 1 are the teachers who kept their traditional belief. They experienced the conflict of whether "improving thinking skills of students is important?" or "Improving the achievement scores of students is important?" (Conflict 1) in the level of internalization. They felt conflict since there was great social pressure to increase achievement scores of students in their school in the social and cultural environment of China. However, they found students became to think more positively after using TT, and the symbol of "the importance of thinking skill" occurred in the level 2. They "wanted to improve students' knowledge-acquisition by nurturing their thinking skills" after the realized the importance of thinking skills. In the internalization process, nurturing thinking skills was the tools to form their meaning system and the belief of knowledge-acquisition remained the same.

In the process of externalization, Type 1 teachers tried to externalize their belief and met the problem of how to use TT in their mind. The new symbol of "using TT to teach knowledge better" occurred. Thus, Teacher E/F/G used TT for acquiring knowledge based on Curriculum Guidance in China.

4.1.2 Type 2: Shifting the belief from knowledge acquiring to thinking skills training

Type 2 are the teachers who shifting the belief from knowledge acquiring to thinking skills training. They were Teacher B/C/D/G. These four teachers also experienced conflict 1 and promoting sign occurred in level 2. Then, they changed the traditional belief of teaching knowledge and believed that they needed to "nurture thinking skills of students".
Type 2 teachers began to nurture thinking skills of students, the new promoting sign of "using TT matching with thinking skills". The promoting sign triggered teachers change of their behavior that used TT to improve students' thinking skills in the externalization process.

4.1.3 Type 3: Balancing both knowledge acquiring and thinking skills training

Type 3 is Teacher A, who experienced three conflicts and made great effort to balance both knowledge acquiring and thinking training after she took part in the training class about how to use TThe also had the experience of conflict about which was important between improving thinking skills and the achievement scores of students. The promoting sign of "the importance of improving thinking skills" occurred after she thought that developing thinking skills was important for the students' lifetime. However, she was felt the dilemma of continuing to use TT or giving up TT after feeling a sense of failure in the open lesson. She spent much time preparing the open lesson using TT but was not sure that this kind effort was good for improving the achievement scores of students or not. She experienced great pain in Conflict 2, using TT to improve thinking skills or giving up using TT to teach knowledge. As a result, the belief of both of nurturing thinking skills and teaching knowledge were important and gained importance in her teaching.

Teacher A tried to externalize her belief into behavior. The new symbol of "using TT to improve thinking skills in some special situation" occurred in Level 2 in the process of externalization. At that point, she used TT that matched with thinking skills in some teaching situation in the feeling and behavior level.

From the results of this research, the authors discovered that promoting signs in the internalization process, that trigger people to change their values systems, occurred in all of the teachers. Valsiner (2018) said promoting signs occurred before people changed their value system and the value system trigger the changer of people's behavior. This showed that the promoting sign of "the importance of improving thinking skills" is crucial to help teacher construct a new meaning system. However, the value systems of eight teachers were divided into three types even if all of the teachers had the same promoting sign in this study. Sakamoto (2007) pointed out that teachers' beliefs were hidden in the core consciousness and hard to change. In this study, the authors clarify some teachers changed their traditional belief (Type 2 and 3). Furthermore, the meaning system was different even if Type 3 did not change her traditional belief of knowledge-acquisition. These results showed the diversity and complexity of constructing the new value system in teachers.

Furthermore, the authors found that the Type 3 teacher who balanced both knowledge acquiring and thinking training experienced Conflicts 1 and 2, but Type 1 and Type 2 teachers only experienced Conflicts 1. This result showed that the teachers who balanced both of teaching knowledge and improving thinking skills might have more cognitive conflicts. Rolka.et al (2007) indicated that cognitive conflicts can trigger teachers changing their existing beliefs. The Type

2 change in this study was consistent with Rolka.et al (2007). However, the changes in Types 1 and 3 were new discoveries in the practice of Chinese teachers using TT.

5. CONCLUSION

The authors found that there were three types in the Chinese teacher who using TT. Type 1 kept their traditional belief but the value system was changed, Type 2 teachers changed their belief from knowledge acquiring to thinking skills training, and Type 3 kept the balance between knowledge acquiring and thinking skills training. Furthermore, all of the teachers experienced cognitive conflicts after the promoting sign of the importance of thinking skills occurred.

In this study, the authors did not analyze their dialogue when they experienced conflicts. In the future, the authors will clarify what kind of dialogue occurred from the Self Dialogue perspective.

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The design process of integrated studies for children-centered classes by elementary school teachers

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Abstract: The study was performed to clarify the design process of integrated study for conducting children-centered classes by elementary school teachers. In this class, the teachers designed lessons with outside collaboration because of studying about outside of school. However, it was difficult for teachers to design the classes with outside collaborators because the teachers needed to prepare and conduct other classes. Therefore, it is important to identify how the teacher designs and develops lessons of Integrated Studies so that other teacher can utilize the lesson design. The author conducted an interview with one teacher and analyzed it by grounded theory. Three stages of her designing a lesson was identified. From these processes the author identified that, in order to design Integrated Studies, teachers need to design classes based on whether the children were interested in the lessons, and the evaluation of classes from outside collaborators. In this way, teachers can make children- centered classes.

Key words: Integrated Studies, elementary school, children-centered classes

INTRODUCTION

The purpose of the paper is to analyze the process in which an elementary school teacher designed children-centered classes of integrated study. This purpose of the class was learning how children find, learn, and think about their own tasks. as described by the Ministry of Education (2018). In this class, teachers had to design the goal and contents of the class so that children are interested in the class contents (Inagaki 2006). For example, teachers set learning situations where children learn about how to live, traditions and cultures from the people in the area around the school, and encountered different cultures through international exchange. Teachers need support from outside collaborators when teachers design lessons that involve people outside the school. However, according to Murai (2016), teachers do not have enough time to design integrated study lessons because they prepare and teach other subjects. Therefore, the author needed to identify how a teacher designs children-centered classes within various restrictions on designing lessons. It was important to clarify how teachers design lessons for their classes.

In this study, as an example, the author examined to the integrated study and the process of teaching by Teacher T who was in charge of teaching this subject in a Japanese elementary school. When analyzing data, the author paid attention to how the teacher designed the class by engaging with the school environment, external collaborators, and children.

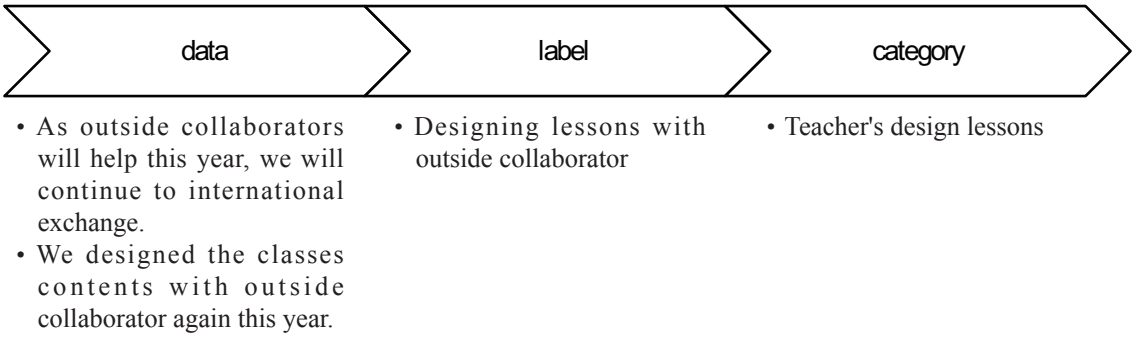
RESEARCH DESIGN & METHODS

This research examined the process in which Teacher T designed children-centered classes of integrated study in a limited environment. The teacher of this research taught integrated studies in the sixth grade for two years. The teacher we selected because she was a leader of other sixth grade teachers, and she designed her classes with other teachers. The author interviewed her to find out how an elementary school teacher designed integrated studies.

The date was analyzed as follows, referring to Sato (2008): (1) Extracting notes about the conduct of Teacher T from the interview, (2) Attaching codes extracted from notes, (3) Classifying codes into categories, (4) Showing the process in which Teacher T designed children-centered design of integrated study from categories.

RESULTS

The purpose of this research was to examine the process in which Teacher T designed children-centered classes of integrated study in limited environment. It is evident from the three stages of her action that in order to design children-centered design of integrated studies, teachers need to redesign after lessons are completed, by reflecting on whether the children were interested in the lessons. Three categories discovered are as followings: (1) she completed the Teacher's design; (2) she reflected on lesson with outside collaborator; (3) she redesigned the lesson in order to do children-centered lesson.



3.1 Teacher's design lessons

In Japan, learning contents of subject learning, national language and arithmetic are fixed. However, the learning content of integrated studies have not been decided. Therefore, it is necessary for the teacher to decide the learning content while confirming whether children are interested in the learning content, but it is difficult for the teacher to design the class because of limited time. Because T teacher had experience designing integrated studies in the previous year, she designed classes similar to the previous year. In addition, she have designed lesson that children in this school interact with other schools. The outside collaborator had proposed activities to T teacher based on the environment of the exchange school. There were classes she wanted to do, but there were only a few things she could do. As a result, T teacher designed

Teacher's design lessons, and the problem shown in 3.2. arose.

3.2 Reflecting on lesson with outside collaborator

T teacher looked back on the previous class with other teachers and the outside collaborator. T teachers felt that the children were not interested in the class. T teachers said that the children were not interested in the class. Furthermore, outside collaborators have assessed that previous learning was not a children-centered class. In integrated study, children need to find, learn, and think about their own tasks. However, T teacher recognized that the class she conducted was not children-centered lesson but Teacher's design lesson.

3.3 Redesigning lessons in order to conduct children-centered lesson

Teacher T asked children how they felt about the class. As a result, the teacher recognized two things that the children did not show interest in the class contents and that the children thought that integrated study was not their own activities. Therefore, Teacher T considered the goals and activities of the class with the children. After that Teacher T use the opinion of the children and designed the class. She respected the opinion of the children and designed the children-centered lesson. However, since the class ended in March, Teacher T had to think about how to finish the integrated studies. Teacher T said "November. There is no time until March" and had time constraints to design classes. She had to design an activity that could be performed in a limited amount of time.

CONCLUTION

In this study, the author analyze how the teacher designed children-centered lessons. Suggestions from this case are as follows. First there is a possibility that the teacher can do Teacher's design lessons by defining the contents of the comprehensive learning in the limited situation. Second, in order to design classes focused on children's interests, it is necessary to reflect on classes that include external collaborators and to change the contents of classes flexibly.

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Comparative Studies of English Textbooks for Junior High School Students in China, Japan and South Korea

~How Active Learning is Achieved~

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Abstract: The purpose of this research is to compare junior high school English language textbooks of Japan, China and South Korea, focusing on how intercultural understanding and active learning are achieved in the textbooks. To figure out the difference between China's and Japan's English textbooks used by junior high school students, we compared the textbooks (Lin, Araki & Sakurai 2019). Results indicated that the degree of difficulty of the textbooks used by China's junior high school students is higher compared to the one used in Japan. Also, our study examined that the "four skills" of Chinese textbooks, has been paid much attention compared to Japanese textbooks. (The "four skills" are LISTENING, SPEAKING, READING, and WRITING.) On the contrary, it showed that the themes of Japanese textbooks were much varied, including active learning contents related to intercultural understanding and the spreading of Japanese culture than the Chinese counterpart. It remains to be elucidated how active learning could be utilized through collaborative learning, discussion or group works in English education, which could promote students' desire for study and improve their vision about the world. As for this research, we aim to examine the South Korean textbooks based on the study we have done above-mentioned in order to better understand the distinguishing features of each country's textbooks and fine more insights for English education from Asian perspectives.

Key words: Junior high school, English education, Textbooks, Active learning, Compare

INTRODUCTION

From the 1970s to the present, China has rapidly developed economy by adopting a market economy. As a result of the demand of high English ability in such economic development and economic globalization, English has become central subject of foreign language education.

In fact, in China, English education has been implemented from first grade elementary school in some areas. At the same time, English is emphasized as an indispensable subject in the national university examination. From such a social situation, Chinese English textbooks seek to thoroughly acquire four skills in English. And, as a trend in recent years, the practice of four skills using active learning is carried out in plenty of schools. On the other hand, in Japan, according to the government guidelines for study of elementary schools announced on March 31,2017, foreign language activities will be conducted in the third and fourth grade and being treated as a subject in the fifth and sixth grade of the elementary school from 2020. As indicated by Ota(2008), the result of the 'relax education' is that the four skills level of the Japanese students' is lower than South Korea and China in Asia. However, according to surveying Japanese junior high school English textbooks by Suzuki(2000), it is believed that the number of contents related to intercultural understanding is not small, and in the meantime, larger than Chinese textbooks.

In South Korea, English has become a formal compulsory subject form third grade of elementary school from 1997. In the 7th curriculum from 2001, it was indicated that the characteristics of elementary school students should be considered, and it would be effective for study if students are able to enjoy the fun of discovery through experiential learning and playing.

Nowadays, it is urgently necessary to improve English skills in global society. Also, there is a need to foster intercultural understanding and communication skills. For this study, we compared the junior high school English textbooks which are used in China, Japan and South Korea, to figure out the difference and the similarities among them. Furthermore, in the wake of development in artificial intelligence, we also seek to consider the feasibility study about relevance between English education and artificial intelligence.

RESEARCH DESIGN & METHODS

In this study, we selected the textbooks used in China, Japan and South Korea, comparing the formation of each textbook. The textbooks below are the title and publisher for each.

China: Go For It, PEP; Japan: Sunshine, Kairyudo; South Korea: Middle School English, Genius Education Press We firstly compared the course of study and curriculum of three countries, which indicated the distinction of learning objectives in different country and circumstances, resulting in different teaching materials. Secondly, the formation of each textbook is compared and examined, focusing on how four skills are devised, which contented the entire characteristic and detailed section. Last but not the least, we paid attention to the active learning parts of the textbooks by analyzing the given examples, figuring out how active learning is achieved among three countries.

RESULTS

Japan tends to develop communication skills, while China tends to aim for the all-round growth, and as for South Korea, the ability that understanding the international community and foreign culture, further developing South Korean culture is emphasized.

In Chinese textbooks, four skills are thoroughly studied, containing more difficult readings and grammars. On the other hand, the difficulty of Japanese and South Korean textbooks is easier

compared to the four skills in Chinese textbook. However, when it comes to the contents, it is said that Japan emphasizes intercultural understanding and tends to focus on international peace, while South Korean textbooks are interesting and focusing on hands-on ability and imagination. As to the active learning parts, the textbook we chose showed that Japan has a distinguishing feature on active learning, especially the unit 'my project', presenting comprehensive study related to active learning. On the other hand, the composition concerning active learning in Chinese and South Korean textbooks is dispersed in each unit.

The textbooks we used for this study are for third grade students in Junior high school, we expect to compare the first and second grade's textbooks for further research in order to obtain a comprehensive understanding about junior high school's textbooks.

Moreover, it remains to be investigated whether active learning benefits for every individual student or not because active learning is considered flexible and diversified, which is not suit all the students who have different levels and goals in language learning or in other subjects sometimes. In pace with rapidly developing artificial intelligence, AI teaching materials has been demonstrated in some schools, such as 'Rewrites' and 'Qubena', presenting a new perspective about how artificial intelligence could be linked with adaptive learning and active learning. It can not only guarantee the quality of study, but also provide adaptive guidance suitable for every student and release the teachers' pressure. However, being dependent on intelligential technology remind us that whether the textbook material and teacher is necessary in the future or not.

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Analysis of Research Hotspots and Trends in K12 Online Education in China

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Abstract: Education informatization in China has been greatly promoted in recent years,alongwith the popularity of the network technology and the smart terminal,and the breakthrough inbig data and cloud computing technology,K12 online education grows rapidly,it's especiallynecessary to comprehensively know about the development history of domestic K12 onlineeducation,research status and hotspots,thus further explore the development direction of K12online education.In this paper,Citespace software is used to visualize the journal papers andmaster's degree papers collected in CNKI database and draw K12 keywords co-occurrenceand the research hotspot in the research of the K12 online education change sequentialgraph,and we found K12 online education research focused on the "basic education","Internet +", "online learning space", "online school" and "business model", etc., indicatingthat K12 online education develops with the national education informatization and, andturns the way of Market-oriented Development.

Key words:Online education; K12;Research hotspots; Visual analysis;

INTRODUCTION

In the Outline of the National Medium and Long-Term Education Reform and Development Plan (2010-2020), the Chinese Government clearly put forward that "information technology has revolutionary impact on education development and must be hughly valued." (Ministry of Education, 2010) In recent years, the informatization level of basic education in China has greatly improved, the learning styles of primary and secondary school students have changed dramatically, and the ways of knowledge acquisition have become increasingly diversified.K12 online education breaks through the limitation of time and space, subverts the traditional teacher-centered teaching mode, tends to personalize and interactive teaching, and focuses on the cultivation of students' personality and creativity. China's K12 education informatization is people-oriented, aiming at promoting educational equity, but the policy of education informatization needs to be further legalized, and relevant policy research needs to be strengthened. At present, K12 online education has a huge scale, and various educational platforms and products such as teaching platform, question bank platform,and teacher retrieval platform,emerging in endlessly. Relevant research is gradually launched.,but what are the hot spots of the research? And what are the trends of K12 online education and related research? This paper uses Citespace to make quantitative analysis and visual analysis of 275 K12 online

education related literatures retrieved from CNKI,and visually presents the hot issues of K12 online education research, providing a reference for the follow-up related research.

RESEARCHDESIGN & METHODS

1. Research tools and methods

Citespace software was used to visualize the data in this study, and Knowledge Domain Mapping and Co-word Analysis of literature were used to analyze the data.

2. Data collecting

Literature selection: This study takes the CNKI database as the source, adopts the "K12 online education" as the key word, or includes "online learning" or "K12 online learning" or "digital learning", or "online education in primary and secondary schools" or "online education", or "basic education", and contains "Internet +" search periodicals and papers, set from January 1, 2001 to July 1, 2019,excluding some conference announcements, draft invitations and other non-related literature on research topics, and ultimately colleted 275 effective documents.

Data processing steps:
Document Exporting: 275 papers were obtained through CNKI advanced search and manual screening, and wereoutput in Refworks and Endnote file formats in the document management center.

Drawing atlas of the research hotspot : using Citespace software to import Refworks text for transformation,and draw the keywords atlas;

Constructing co-occurrence matrix: using SATI software, importing EndNote text and transforming it into EndNote format, extracting information such as "source(journal)" and "year".

RESULTS

1. Overall Development Trend of K12 Online Education Research

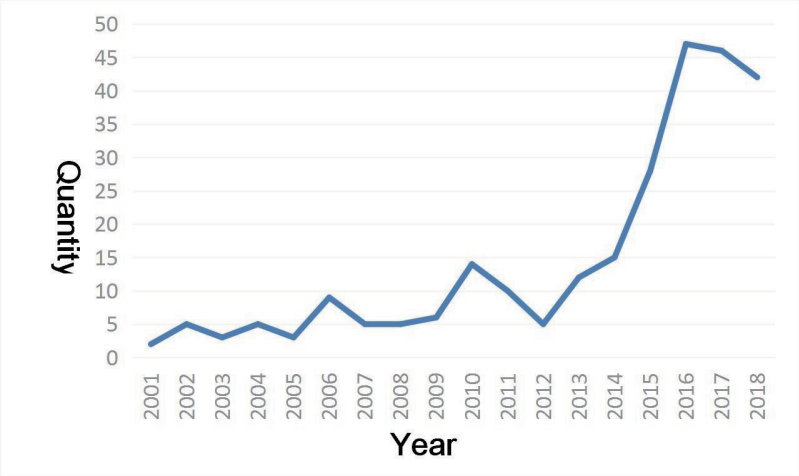


Figure 1. Number andtrend chartof K12OnlineEducationresearchliterature

Through the number and trend chart of literature published, to some extent, it can help us understand the overall development trend of K12 Online Education research in China. Figure 1 presents a statistical analysis of the literature published in 2001-2019 on K12 Online Education research.We can see that, in general, K12 online education research has been on the rise in recent years. From the trend map, we caneven divide it into two stages:

Potential stage (before 2012), this stage, the number of documents is relatively small,but in a slow and increasing development, resulting in that China's information technology foundation is weak, the Internet has not been widely used before 2012, especially in the vast rural areas, the network hardware foundation is very weak, and the development of K12 online education is greatly restricted.

Outbreak stage (after 2012), in September 2012, Vice Premier Liu Yandong proposed at the National Teleconference on Education Informatization Work that during the 12th Five-Year Plan period, we should focus on the construction of "three links and two platforms", namely "broadband network School-to-School links, high-quality resources class-to-class links and network learning space for all", and build public service platforms for educational resources and educational management.K12 online education has been greatly exposed and become the focus of academic circles. Scholars have explored the development of K12 online education. With the gradual advancement of exploration, problems, obstacles and emerging hot spots have emerged, and related researchhasfallen back.

2. Analysis of journal titles

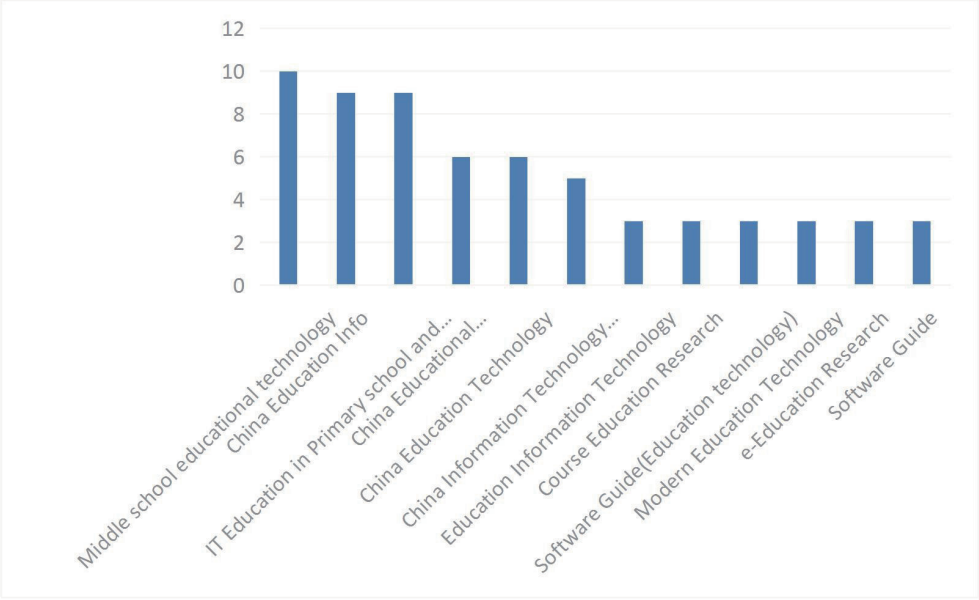


Figure2 Journal sources

The 275 papers selected in this study are widely distributed in 179 journals. Fig.2 shows t he top ten journals and the number of specific papers on online education of K12,they are "Mid dle school educational technology","China Education Info","IT Education in Primary school and Middle school","China Educational Technique&Equipment","China Education Technology","China In formatio-n Technology Education","Education Information Technology","Course Education Research ","Software Guide(Education technology)","Modern Education Technology","e-

Education Research", " Software Guide",totaling 63 articles, accounting for 22.6% of the total periodicals,indicating that K12online education related research involves a wide range of fields. At the same time, through t heanalysis of these 12 journals, we can see that the publications such as "China Education Info", "China Education Technology","e-Education Research"and"Modern Education Technology",are the c ore journals in the field of educational technology and educational informatization,reflecting K12 onlin-e education is closely related to information technology and Internet.

3. Analysis of Hotspots in K12 Online Education Research in China

Visual presentation of research hotspots

275 valid documents selected from CNKI were imported into Citespace software to draw hot spot maps, as shown in Figure 3. In the hot spot map, the bigger the circle is, the higher the frequency of keywords appears.The keywords with centrality greater than 0.1 are represented by purple circle, which can be regarded as key nodes.

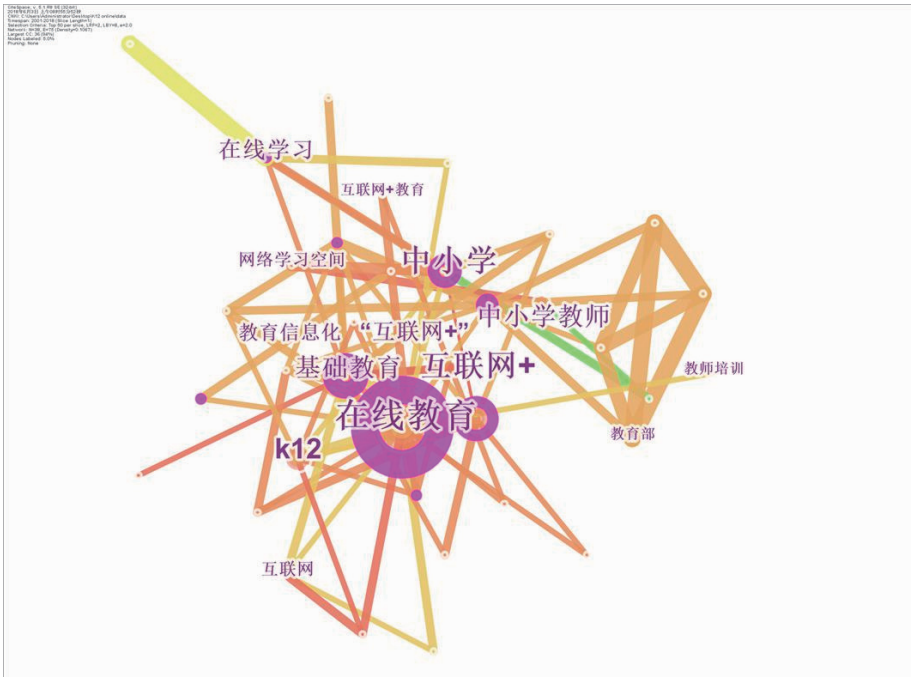


Figure 3 K12 Hotspot Map of Online Education Research

According to the frequency order, the first 16 high frequency keywords are presented, as shown in Table1.

Table 1 Frequency and Centrality of High Frequency Keywords

Count	Centrality	Year	Keywords
42	0.86	2014	Online Education
30	0.37	2014	Middle&Primary school
24	0.22	2015	Internet Plus
21	0.07	2015	K12
17	0.42	2015	Elementary Education
14	0.00	2011	Teacher of Middle&Primary school

10	0.05	2017	"Internet Plus"
9	0.14	2014	Online Learning
7	0.02	2010	Educational informatization
5	0.05	2017	Network Learning Space
5	0.05	2015	Network
4	0.00	2015	Ministry of Education
4	0.00	2016	Network+Education
4	0.00	2010	Teacher Training
3	0.00	2015	Business Model
3	0.00	2018	AI

Analysis of Research Hotspots

Based on the key words of high frequency and high school centers in Fig. 3 and Table 1, the research hotspots of "K12 Online Education" in China from 2001 to 2019 can be analyzed as follows:

As a branch of online education, K12 online education is obviously dominated by the state and government. Whether it is time node or research content, it coincides with national planning. In 2012, the Ministry of Education proposed to build a nationwide "three links and two platforms" (broadband network school links, high-quality resources class links, network learning space for all and the construction of education resources public service platform and education management public service platform). This led to the development of related research on "K12 online education", and spawned the research hotspots of "learning space", "Education Internet +" and "basic education informatization". It focused on the combination of K12 education and Internet technology, and explored the basic problem of resource construction of K12 online education, so as to meet the needs of students' personalized learning and realize the individuality and creativity of K12 online education. K12 education informatization and learning resources development become the eternal topic ofonline education research.

Although online education aims at satisfying students' individualized needs and cultivating students' creativity, and reducing teachers' dominant position in teaching activities, the role of teachers still plays a decisive role in K12 online education at this stage. The key lies in how to position the role of teachers. In addition, in the information age,in the information age, the abilities that teachers should possess areworth discussing.

China's education informatization has always been dominated by the government, but from the research hotspots of "business model" and "artificial intelligence" in the past three years, it can be seen that K12 online education research has gradually advanced. The research direction is to remove the administration in K12 online education, turn to market-oriented, and explore the new route of development ofK12 online education.

Visualization Analysis of the Change ofResearch Hotspots

According to the above hot spot analysis, the time sequence diagram of hot spot change is generated by Citespace in chronological order,as shown in Figure 4.

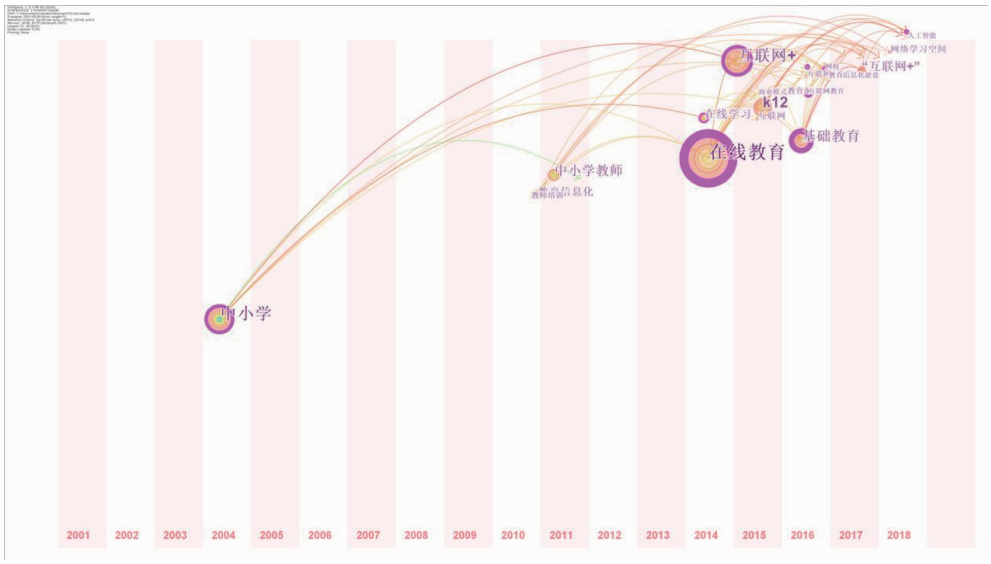


Figure 4 Transition Sequence Map in research hotspots of K12 online education

We can see that before 2012, due to the underdevelopment of computer and information technology and limited network coverage, K12 online education related research mainly focused on education informatization and teacher training. One is the process of education informatization at the national level, the other is the training of elementary and secondary school teachers to improve their information technology capabilities. The object and content of the study are relatively single, and the number of studies is small.After 2012, with the advancement of the national "three links and two platforms", the content of online education research in China has become increasingly rich and diversified. In addition to the informatization process of K12 education, academia is actively exploring the most critical and core issues of "business model", "online school" and "online learning space" of K12 online education.Th-e research is deepening,showing the market-oriented trend of K12 online education. With the leap-forward development of information technology in recent two years, "artificial intelligence" has entered the field of research, indicating that K12 online education research keeps up with the trend of the times and maintains close contact with cutting-edge technologies oft-he times.

4. Conclusion and Reflections

Through searching the related literature of K12 online education in CNKI, assisted by manual screening, using SATI and Catespace, this paper draws relevant charts and graphs of the research trend of heat change and high-center keywords, which intuitively presents the hot spots and development trend of K12 online research.This study holds that 2012 is not only the watershed of the development of online education in K12, but also the watershed of online education research in K12.On the one hand, the significant impact of national policies and government forces on K12 online education and related research, both in the rate and quantity of development, shows that its impact is tremendous. The development of K12 online education is closely related to the process of national education informatization;On the other hand, in recent years, the state has strongly advocated "double creation" and "Internet +", and vigorously introduced the main body of the market. The core elements of K12 online education, such as "learning space" and "business model", have attracted great attention, showing the development trend of K12 online education marketization, and the introduction of advanced science and technology such as "artificial intelligence", confirming this market orientation, with a view to further enhancing the dominant position of K12 online education in exploiting the market.

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Current Status and Prospects of Online Education for elementary and middle school provided by Korean government

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Abstract: Recently, the establishment of an artificial intelligence-based learning environment is making it possible to analyze the learners' learning and provide learner-centered teaching materials. As a result, there is a growing interest in providing learner-oriented learning services. It has become necessary to establish an educational system and environment to foster future talent that can actively cope with this rapidly changing social environment. Korea offers online learning services to help students in public education environments with self-directed learning and better classroom lessons for teachers. The purpose of this plan is to internalize public education and to reduce the educational gap between the local and provincial classes. In addition, policies are being pursued to build a learning environment tailored to students' interests, individual achievement based on differences in learning conditions, and so on. The purpose of this study is to examine the present status and future direction of the public education online service provided in Korea and discuss implications for the direction of education change.

Key words: Public-based online education, e-learning, Learning Management System

INTRODUCTION

Due to the recent rapid development of information and communication technology, discussions on intelligence information technology have been actively taking place, especially with high-value technology changes such as cloud, big data, artificial intelligence, and IoT(Internet on Things), These changes in high value-added technologies have led to convergence of technologies, resulting in a new paradigm inflection point and a change in social structure. In particular, intelligent information technology has emerged as a general-purpose technology due to the expansion of the intelligent information society (Ryu, 2017). In addition, the importance of the learner's self-directed learning ability, creative problem-solving ability, and communication-based cooperation ability emerged from the aspect of intelligence information society (Kim,

2017; Trilling, B., & Fadel, C., 2009). In the era of the Fourth Industrial Revolution, the importance of resources such as capital and labor, which are essential for the development of the past industrial economicera, is decreasing, and intellectual resources such as creativity, ideas, science and technology literacy and problem solving ability become important(Ham, Lee & Kim, 2015). In order to process knowledge and information in the 21st century, a convergent approach is necessary in the field of science, and it is confirmed that different education methods and environment changes are required(Kang & Kim, 2017).

Since the fourth industrial revolution was first mentioned at the World Economic Forum in 2015, its influence has called for huge changes throughout society. In particular, the education sector is considered one of the most rapidly changing areas due to the fourth industrial revolution. In response, South Korea is also scrambling to come up with educational countermeasures based on technological areas such as big data, artificial intelligence, and cloud. Most of these educational provisions are approached from the perspective of online education and deep learning using artificial intelligence.

In South Korea, it drew attention in 2016 through a great country with AlphaGo and Lee Se-dol. Artificial intelligence is drawing attention as a key technology that will lead social changes that cannot be separated from the fourth industrial revolution. As mentioned earlier, the Fourth Industrial Revolution represents a paradigm shift as a general-purpose technology in which everything, including humans and things, is connected. Humans, things, people, and things are linked together to create 'Big data.' Artificial intelligence, which processes and utilizes such big data, is constantly evolving, and is expected to change the landscape of society, economy and culture.

Much research has been done on artificial intelligence. McCarthy (2007) explained that artificial intelligence is a computer-like task for computers to understand human intelligence. This intelligence is a conceptual part of the ability to achieve a goal in the world, and that various kinds of intelligence arise between humans, many animals, and machines. Hopgood (2015) argued that artificial intelligence has been studied in a variety of fields by computer scientists and psychologists over the last 50 years and doing a lot of work for humans. But also expressed concern that artificial intelligence could lead to philosophical and ethical problems with positive viewpoints.

Two perspectives of positive blindness and negative views coexist, depending on scholars, in predicting the age of artificial intelligence. Artificial intelligence is already playing an important role in our lives. This can help develop human life. We are making various efforts to have a new zeitgeist in the age of artificial intelligence and effectively respond to the future. Also, various learning forms using artificial intelligence have emerged.

As online learning forms become more diverse, the number of learners taking E-Learning through MOOC, a large online open lecture, continues to grow (Kim, 2019). With changes in technology such as machine learning, artificial intelligence, robots, and information and communication technology, the industrial structure also changed from mass production and capitalist-oriented industries to the shared economy and the fourth industrial revolution, so that more quality education was needed in the right place.

In this situation, e-learning is more efficient than face-to-face education method in terms of amount of education, speed of learning effect, and cost economics. In addition, e-learning has

the advantage of being a self-initiative timely learning system that enables learners to obtain necessary information at the time they need. In other words, unlike traditional face-to-face education, e-learning has the advantage of being able to adapt quickly to changes in knowledge, such as field work, and in a timely manner (Eom, 2008). The strengths of e-learning are becoming increasingly important in a changing society and technology environment.

In 2018, the Korean Ministry of Education set a 2018 vision for the education sector as "a school where all children are happy, and everyone is open to growth". In a report to the government in 2018, the government presented three top priorities in fostering talent leading the fourth industrial revolution, reported three detailed tasks: primary and secondary education that increases basic capabilities for future society, higher education that trains key people to lead innovative growth, and lifelong vocational education that supports sustainable growth in response to changes in society. As a result, the government has decided to boost computing thinking skills suitable for the digital environment by supporting the revitalization of SW education for middle schools and SW education research and leading schools starting from 2018. In addition, for the detailed implementation and performance management of the Fifth Basic Plan for Education Information (2014-2018), the government has implemented diverse education information service policies, including primary and secondary education information service, higher education and academic information service, lifelong education information service, financial information service and cyber safety.

Accordingly, the Education Ministry is supporting the expansion of IT infrastructure to upgrade the university's information base to secure international competitiveness in higher education and to improve the quality of university education services. Starting from 2017, 10 education universities across the country have been jointly building a cloud-based integrated academic information system for three years. In the field of higher education, the Ministry of Education and the Korea Institute of Education and Science and Information are providing joint utilization services for university open lectures (Korea Open Course Ware; KOCW, www.kocw.net). The KOCW aims to enhance the quality of university education and expand opportunities for higher education among the people in line with the growing international trend of the ‘Educational resources disclosure movement (OER)’ around the world. It provides a service to collect and jointly utilize the materials of lectures and lectures produced by universities. KOCW has free access to materials voluntarily released by universities and institutions at home and abroad. KOCW is signaling a shift to OER form for the spread of MOOC and the use of new teaching methods such as Flipped Learning.

In addition, Korea provides free online learning services for elementary and secondary school students with the aim of realizing internal education and narrowing the educational gap between regions and classes by supporting students' self-directed learning and teachers' classroom improvement. The service is called "e-Hakseupteo, it means e-learning place." e-Hakseupteo started in 2004 under the name "cyber home learning" as part of measures to reduce private education costs by normalizing public education. In this study, we will look at the current state of online education operation provided by the government at elementary and secondary education sites in Korea and discuss the future direction of development.

STATUS OF GOVERNMENTAL ONLINE EDUCATION IN KOREA

In Korea, free online learning services are provided to students of elementary and secondary schools with the aim of realizing public education and narrowing the educational gap between

regions and classes by supporting students' self-directed learning and teachers' classroom improvement. Online education in elementary and middle school education by the Korea government was promoted in 2004 as part of 'Measures to Reduce Private Education Costs through Normalization of Public Education' and it launch a pilot service for three municipal and provincial education offices in Daegu, Gwangju and North Gyeongsang Province. The services implemented since 2005 were carried out individually in accordance with the characteristics of each region, centering on the provincial office of education. In 2016, it analyzed the utilization status and effectiveness of online education, it has been provided through a combined platform that integrated the provincial office of education during December 2017. This service is called "e-Hakseupteo", it means e-learning place. The e-Hakseupteo service has been continuously improved, reflecting changes in the internal and external environment and the opinions of educational sites. In summary, it is shown in Figure 1.



Figure 1. Direction of e-Hakseupteo service change

e-Hakseupteo supports on-line teaching and learning based on Korean, English, mathematics, social science, and science subjects for students and teachers from grade 3 to grade 3 students. Teachers can customize the contents that students need to learn by using video and evaluation items. It is possible to open a cyber-class and manage the student's attendance status and evaluation results in a comprehensive manner. The student can follow the cyber class course that the teacher has established. In addition, video and evaluation items can be selected and taught according to the contents of their own learning.

Cyber learning is promoted with organic system by MOE, metropolitan and provincial education office and KERIS. The Education Ministry has established basic plans, secured budgets, and supports revitalization of education offices in cities and provinces. Since its designation as the Cyber (Home) Learning Center in 2004, the Korea Educational Research Institute has been supporting the operation of municipal and provincial services by conducting such projects as platform and content development and effectiveness research. Since March 2018, the Korea Educational, Scientific and Information Service has integrated its infrastructure and platforms into the cloud, which had been managed by cities and provinces. Metropolitan and provincial education(research) center, which is in charge of actual service operation, establishes annual service plan, recruits cyber teacher to support learner to use classroom allocation service and in case learners want to freely use various contents provided by city or province instead of separate classroom allocation service, they allow to study through self-study type.

e-Hakseupteo integrates platforms that were previously provided individually by municipal and provincial education offices to provide services on a single platform. The LMS of e-Hakseupteo provides separate learning management for learners, professors and administrators. In addition, the LCMS is integrated and implemented to provide efficient content management, learning history, and statistics management for use. The Question Management System provides question management, assessment management, and assessment history management. The service is provided so that e-Hakseupteo contents can be found and linked to them. e-Hakseupteo searches EBS educational content and YouTube materials for use in learning. In summary, it is shown in Figure 2 below.

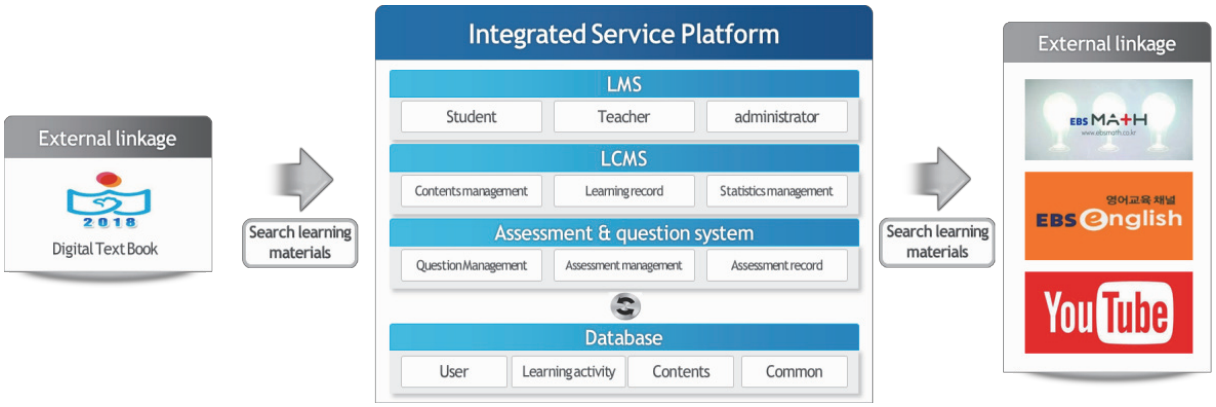


Figure 2. Conceptual diagram of e-Learning Center Integrated Services

e-Hakseupteo content has been developed and secured in a way that continuously expands school levels, target grades and subjects since the pilot service in 2004. In addition, specific contents were developed and provided to reflect the voices required by the education site. In particular, contents that were applied to the 2007 revised curriculum were planned and provided by level consisting of basic, understanding, and deepening, collecting the requirements for learners' self-directed learning ability support and customized content. In addition to major subjects, requests for the provision of contents to middle school technology and households were raised in the 2009 revised curriculum, and contents were developed that reflected this, and the scope of contents provision was expanded from the previous 4th grade to 1st-3rd grade. On the other hand, as the existing PC-centered learning environment rapidly changes to mobile-oriented, Korea Educational and Scientific Information Service has developed various types of contents applying the latest mobile technology from 2014 to 2016 and provided them to each provincial office of education Future contents development model was presented. In 2017, the Ministry of Education, the City and Province Office of Education, and the Korea Educational and Scientific Information Agency will formulate a step-by-step curriculum learning content development plan to support students' self-learning for school classes and flip- Respectively. In the case of revision of the curriculum, it was planned as short-term content based on learning topic and concept in time-based contents based on existing unit so that it can be operated flexibly. In March 2018, the project was developed for the application of the service to the 3rd to 4th grade elementary school and the 1st grade of the middle school, and the contents development for the 5th to 6th grade elementary school and the 2nd to 3rd grade elementary school is being pursued sequentially. In addition, in order to enhance the learning effect and meet the needs of various users, we are developing not only curriculum learning contents but also evaluation question contents, commentary videos, basic contents.

Table 1. Contents of e-Hakseupteo contents

Type	Grade	Subject	Amount
Subject Learning Contents	3rd grade in elementary school ~ 3rd grade in middle school	Korean, Social, Math, Science, English	2,943 species
Basic learning contents	Elementary school ~ Middle school	Korean, Math, English, 3R's	306species
Evaluation question	1st ~ 3rd grade in middle school	Social, Math, Science	5,250 questions
Commentary video	1st ~ 3rd grade in middle school	Social, Math, Science	2,062species
Teaching and learning support materials	Elementary school ~ Middle school	Social, Math, Science	547species

Table 2 summarizes the progress of e-Hakseupteo tours by year.

Table 2. e-Hakseupteo Major Propulsion Contents

Year	Major Propulsion Contents	
2004 ~ 2005	Service opening and nationwide expansion	▌Announcement of measures to reduce private education costs by normalizing public education (2004) ▌Establishing a plan for the establishment of a cyber home learning support system (2004) ▌Demonstration operation of a cyber home learning support system: Daegu, Gwangju, Gyeongbuk ▌Expanded nationwide cyber home learning (2005.4) - Service subjects and subjects: Korean language, social studies, math, science, and English in the first and third grade of middle school
2006 ~ 2007	Expanding the scope of service offerings and subjects	▌Target: 4th grade in elementary school to 1st grade in high school (2006-2007) - Complementary and deepening content for students in the first grade of middle school to high school first grade ▌Balanced development through consulting and application of core services (2007) - System Technical Support: Improvement of Cyber Home Learning System in the City and the City - Development and pilot application of diagnostic and prescription learning management and video consultation system
2008 ~ 2011	Expansion of LMS and LCMS	▌Developing and piloting next-generation LMS/LCMS for cyber home learning (2008) ▌Expansion of diagnostic treatment vacation humidity management system and video consultation system (2008) ▌Connection of the next generation LMS/LCMS municipal education office (2009) ▌Development of content management distribution system and pilot operation of next-generation e-learning-based construction project (2008)
	Developing and Expanding Contents	▌Expanding the development and distribution of content for Korean, social, math, science and English subject areas (basic, understanding, and deepening) for curriculum classes (2009-2011)

It is expected that e-Hakseupteo will continuously develop and secure contents and distribute them to sites. According to the Korea Institute of Education and Research (2019), the assessment questions in 2019 are expected to develop 12,580 new questions. In addition, 1,169 new types of motivational content will be developed for elementary school students to support classes at school sites. The number of e-Hakseupteo service users has been reported to be increasing

continuously from 2017 to the present, when the name was revised to e-Hakseupteo service (Korea Institute of Education and Research, 2019). A total of 274,000 users are currently using the service, the report showed. e-Hakseupteo was used by 2,842 schools, which is 30.6% of elementary and middle schools nationwide. In addition, 9,092 cyber classes were opened and operated.

PROSPECTS OF GOVERNMENTAL ONLINE EDUCATION IN KOREA

With the advent of the intelligence information society, it has become necessary to establish an education system and environment for cultivating future talents who can actively cope with the rapidly changing social environment. The necessity of constructing a customized learning environment considering individual factors such as student's interest and individual learning achievement due to differences in learning conditions is raised, and the educational contents developed and serviced by each institution are unified through integrated management, Therefore, the Ministry of Education stated that 'Providing Intelligent Learning Analysis Service and Building a Content Distribution Platform' as a national task for 'Establishing a Future Educational Environment and Building a Secure School' as a challenge. To this end, e-Hakseupteo began to make changes to improve intelligent learning analysis services.

A. Building Intelligent Learning Analysis Service

Intelligent Learning Analysis Service collects and analyzes learning activity data of learners and provides customized learning prescriptions according to individual learning level and interest (Campbell, DeBlois, & Oblinger, 2007; Elias, 2011). In order to collect learning data, it is necessary to design a profile of data to be collected and implement a collection system. A data profile is defined as data collection method, data processing method, etc. according to the data range of data to be collected, data attributes (type, system dependency, etc.). In order to build a standardized data collection system, we will develop a universal API (Application Programming Interface) considering extensibility so that related international standards and standard system are introduced according to domestic environment and learning data of various education services can be collected.

We design and implement a learning analysis model that can collectively process, analyze and visualize various learning activity data and raw statistical data. And as the data modeling and analysis techniques are improved step by step, customized learning analysis will gradually become more advanced. As a foundation material to support these personalized learning, 'Digital Learning Map' which links the learning resources by establishing the relationship between them (causal relation, reference relation, etc.) by analyzing the subject and achievement standards of the curriculum of the 2015 curriculum do. Through experts in each subject, the government will design a basic conceptual map of the digital learning resource map, focusing on Korean, math, social, science, English, and history textbooks for third and sixth graders in elementary school and first and third graders in middle school. The subject and performance criteria information of these established curricula is implemented as ‘Linked data’ expressed in a semantic way and can be used publicly. Content and learning resources related to future topics, achievement criteria, etc. can be used and expanded by connecting them to digital learning resource maps.

By collecting and analyzing learning activity data, students are provided with a dashboard by visualizing the results of individual learning analysis, such as individual learning levels, strong

and weak points, preferences, comparisons with other learners, customized content information and learning paths. In addition, the teachers are provided with analysis data by individual students and analysis data comparing the same grade of different classes/schools to support their use in improving learning.

B. Establishing a content distribution platform

The content distribution platform provides content by level to support customized learning by developing, collecting and securing diverse content to create an open content distribution environment that shares and distributes content for free education with public, private and individual participation.

In 2018, the government plans to develop, collect, secure, and utilize content in the public sector, focusing on primary and secondary contents, and gradually expand it to private and individual excellent contents in stages. We have established an integrated management system for collecting and securing various types of contents such as multimedia data, video, realistic contents, and standardized metadata and classification system information for detailed information management according to the type and characteristics of contents do.

Provides user management environment such as service user screen, content integration viewer, interface for providing search, content and learning resource information for sharing and distribution of educational contents and provides integrated management function for copyright and quality control. In addition, in order to utilize the learning data of educational contents, it provides individual learning analysis results in connection with intelligent learning analysis service.

CONCLUSION

In this study, we examined the current state of online education operation provided by the government at elementary and secondary education sites in Korea and the future direction of development. In Korea, the government-led online education in the field of elementary and middle school education has been continuously changing and evolving since 2004, based on the school site situation and technology trends. However, even though it had suffered from the ups and downs according to the policy demand, it is developing with steady interest. In order to increase the utilization rate of e-learning sites, which had been declining since 2009, it established the 'Cyber Learning Development Information Strategy Plan (ISP)' from 2014 to 2015, and in 2016 it established to plan the 'cyber learning service improvement plan'. It was necessary to change the service environment to cope with changes in the ICT technology environment, such as popularization of mobile devices and cloud computing, reflecting the changes in the educational environment, such as the expansion of the private online learning market and the introduction of the 2015 revised education curriculum. The e-Hakseupteo, which is a new platform for mobile service environment to replace obsolete systems such as, learning management system and evaluation system based on existing PC environment, was developed and opened in March 2018. At the same time, it has developed a stepwise development plan for contents such as, basic learning contents reflecting the characteristics of the learner as well as the development of the curriculum learning contents and evaluation contents applying the 2015 revision curriculum, and it is sequentially provided to the platform from 2018.

Especially, the change of online education is expected because of the emergence of learning analytics and the increased interest in educational use of artificial intelligence (Ferguson & Shum, 2012; Govaerts, Verbert, Duval, & Pardo, 2012; Johnson, Smith, Willis, Levine, & Haywook, 2011, 2012, 2013, 2014). Luckin, Griffith, Holmes and Forcier (2016) discussed artificial intelligence technologies such as Deep Learning and Augmented Reality and discussed technically possible areas that could be applied to the education field. Artificial intelligence offers five things in education: mentor for all learners, learning 21st century technology, interaction with data to urge learning, accessible classroom, lifelong learning (Woolf, Lane, Chaudhri & Kolodner, 2013). In addition, many scholars have created educational programs designed with artificial intelligence and have concluded that they have a positive effect on students (Kaufmann & Schmalstieg, 2003; Koedinger & Brunskil, McLaughlin & Stamper, 2013; Matcha & Rambli, 2016).

It is also necessary to look at artificial intelligence in terms of providing educational opportunities that are targeted in online education in Korea. As the artificial intelligence accumulates and owns the knowledge, it can solve the problem that the degree of ownership of knowledge and information is different due to past economic gap. According to Woolf et al. (2013), artificial intelligence can provide a learning environment to those who are unable to attend school because of economic reasons and can continue learning based on these functions. In other words, the intellectual inequalities in the artificial intelligence can be resolved to a certain extent by accessing advanced information that was provided only to a small number of people.

Artificial intelligence has enabled students to personalize mentoring and individual learning in education (Koedinger et al., 2013), and has provided students with more learning environments using augmented reality and virtual reality (Kaufmann & Schmalstieg, 2003). In addition to providing this knowledge, it is also possible to provide students with tailored assessments and solutions (Lee & Heo, 2018).

Based on the above discussion, the e-learning site, which provides new platform and theme-based classroom-based content for learning, will receive various e-learning opinions on new platforms and new content types, it will be an important task. In addition, various strategies for activation beyond the establishment of new services need to be reviewed in detail in order to link cooperation schemes between the propulsion systems and the opinions of the field in order to link them to actual service utilization in the future.

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Bottlenecks and specific strategies of introducing Artificial Intelligence into elementary and secondary schools

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Abstract: As the New-generation Artificial Intelligence Development Plan has been being carried out, China is now in growing need of high technology experts in artificial intelligence. The future development of AI talents begins by laying a solid foundation in primary and secondary schools, and the popularization of AI education should start with children. This paper mainly analyzes the current development bottlenecks in introducing AI technology into primary and secondary schools, as well as proposes specific adaptive strategies of how to introduce AI into elementary and secondary schools, based on the research achievements of incorporating intelligent robot projects into Maker education and STEAM education.

Key words: artificial intelliegence; primary and secondary schools; innovative talent; bottlenecks; adaptive strategies

With the rapid development and application of “Internet +”,cloud computing, big data,virtual reality, Internet of Things, block chain, neuroscience and other new theories, artificial intelligent (AI) has become the focus of current research. AI research mainly covers knowledge representation, machine learning, pattern recognition, natural language processing, intelligent robots, expert systems and etc. AI is believed to be the engine of new generation technology that will boost economic and social development in the future.

AI development has entered a new stage as China has defined goals of “2035” and “2050” to strive for, raised new standards for children’s ability and quality in the future; in Development Plan for a New Generation of Artificial Intelligence, published by the State Council on July 8th, 2017, states that: by 2030, the theory, technology and application of artificial intelligence will reach an internationally advanced level in general. China will become a globally important artificial intelligence innovation center. A batch of globally leading bases of artificial intelligence technology innovation and talent training will be formed, and will cultivate high-level talent teams and innovation teams. And students studying in K12 will become the backbone of high-level AI talents that the nation strongly demands. Therefore, AI should be introduced into primary and secondary schools, into textbooks, into classrooms, into lesson plans, into students’ heads, and AI education should start with children.

One: History and present situation of AI development

At the seminar held by Dartmouth College in the U.S. in 1956, John McCarthy and other experts proposed the concept of "artificial intelligence" for the first time, many years later, it is recognized as the starting point of global AI research. On a global scale, many countries highly value AI research and development, U.S, Germany, France, Japan, South Korea and other countries have launched AI related support and industrial policies successively. On the two sessions held in March 2017, China, "artificial intelligence" was written into report on the work of the government; in Development Plan for a New Generation of Artificial Intelligence, it proposes: "carry out AI education for all, implement AI related courses in primary and secondary schools, popularize programming education step by step, encourage social force to participate in the development and promotion of programming teaching software that combine education with entertainment. AI competitions should also be held and supported, and all kinds of AI popular science creation are encouraged "[2] .

By January 2019, 59 institutions of higher education have established AI colleges or AI research institutes, 32 institutions among them have established AI colleges, 19 institutions have established AI research institutes, 8 institutions have established both AI colleges and AI research institutes[3]. On May 16th 2019, Chinese Minister of Education Chen Baosheng proposed at the conference of Artificial Intelligence in Education (AIED): plan to build 50 AI colleges research institutes or cross-disciplinary research centers by 2020, cultivate AI innovation research teams and professional high level talents; help students to form basic sense, basic concepts, basic quality, and basic interest."[4] Therefore, in order to popularize AI education in primary and secondary schools, it is necessary to set schools as the main battlefields for AI talent cultivation, design and add more AI courses, further promote AI education in primary and secondary schools, promote students' quality in K12. Cultivate a large batch of high level AI talents who possess creativity and team spirit for the country through AI education.

Two: Main challenges for introducing AI into primary and secondary schools

AI is one branch of computer science, and it is a comprehensive discipline that mainly studies and develops theories, methods, technology and application system that could be used to simulate, extend and expand human intelligence. AI has been globally recognized as one of the most promising technologies. However, the challenges of how to introduce AI into primary and secondary schools, accelerate (speed up)the cultivation of AI talents, have become main bottlenecks that are faced with today. The quick arrival of AI era has taken many government officials, schools and teachers by surprise, they haven't prepared well for the challenges brought by AI education, as there are still many difficult problems remain unsolved.

1. Lack mature teaching concepts

AI is a popular research area in recent years, it develops rapidly, covers a wide range, and it is very comprehensive, however there is no successful experience in teaching that can be learned, teachers lack teaching experience and thus mature teaching concepts haven't developed yet.

2. Lack proper teaching mode

Many contents AI involves with are new areas, new technology and new knowledge, so applying traditionally teaching modes is no longer adaptable. Many teachers are now crossing a river by

feeling his/her way over the stones, they teach inconsistently with strong subjectivity and low efficiency, lacking reproducible and effective teaching modes.

3. Lack practical supporting teaching materials

AI education started a bit late in China, thus it is short of accumulation of early experience, and there are few teaching materials of AI education that match with each level of study in primary and secondary schools, proper teaching materials of AI education for primary and secondary schools are seriously inadequate.

4. Lack professionally trained teachers teams

Since AI covers a wide range, its education demands highly of teachers' comprehensive quality and cross-discipline competency, requiring teachers must possess specific qualities of cross-discipline and merging knowledge together. However, a majority of teachers in primary and secondary schools did not take any AI courses in college, meanwhile most information technology teachers play many roles in schools (e.g. teaching, Internet management, multimedia education), hence schools seriously lack professional teachers for AI education.

5. Lack feasible development strategies

AI development has come too strong and too fast, it is a new challenge for some education administration departments, schools, teachers and students, and they are not mentally prepared. There are few early studies of AI, and there is no successful experience to borrow, thus in the journey of introducing AI education many puzzles and difficult problems will be encountered, but practical strategies are in short.

6. Lack specific instructions and perspectives

Though in Syllabus for high school information technology curriculum (2017 edition) that Ministry of Education issued in January 2018 has incorporated "basics of artificial intelligence " into "information technology" compulsory selective model[5]. However standards and guidelines for AI education courses haven't been issued yet in the period of compulsory education. Since there is no sufficient guiding documents published, the responsibilities remain unclear, making it difficult for schools and teachers to start from or to operate.

Three: adaptive strategies for introducing AI into primary and secondary schools

1. Need to construct the teaching concept of "intelligent education"

Introducing AI into primary and secondary schools will bring epoch-making revolution to teachers' teaching and students' study, in Development Plan for a New Generation of Artificial Intelligence, it states the intelligent concept of human-machine hybrid-augmented intelligence and the direction of intelligent education development, carry out the goal of around intelligent education. Develop intelligent education in the era of AI, introduce AI into primary and secondary schools, and to use the concept of intelligent education to guide the practice of intelligent education so that AI can merge in depth with education[6]. With the arrivals of education informatization and AI, the concept of "intelligent education "needs to be constructed,

and intelligent education projects will promote the progress of Education Modernization 2035 plan, and cultivate intelligent talents for AI era.

2. Construct teaching mode that promotes AI education

The author has 17-year of working experience in the field of intelligent robots, and has cracked prominent problems that existed in intelligent robot education and its popularization in primary and secondary schools, has created the teaching mode of "learn-do-create", as it shows in figure 1. This research outcome is awarded the second place in 2018 Second Prize of National Teaching Achievement Award for Basic Education [7], Best Prize for Educational and Teaching Achievements (Basic Education) in Guangdong ,2017 [8].The research outcome has been experimented and verified on a large scale, it is helpful to enhance students' core qualities, and to cultivate students' all-round abilities like hands-on design, practice and create, engineer mind, programming mind, computing mind, communication and collaboration. Intelligent robot is an important supporter of the application of AI technology, this mode is also suitable for AI education, thus the teaching mode of "study-do-create" can be borrowed and learned, and to popularize and disseminate this outcome in AI education in primary and secondary schools nationwide will better allow the outcome to play the roles of guiding, demonstration and radiation.

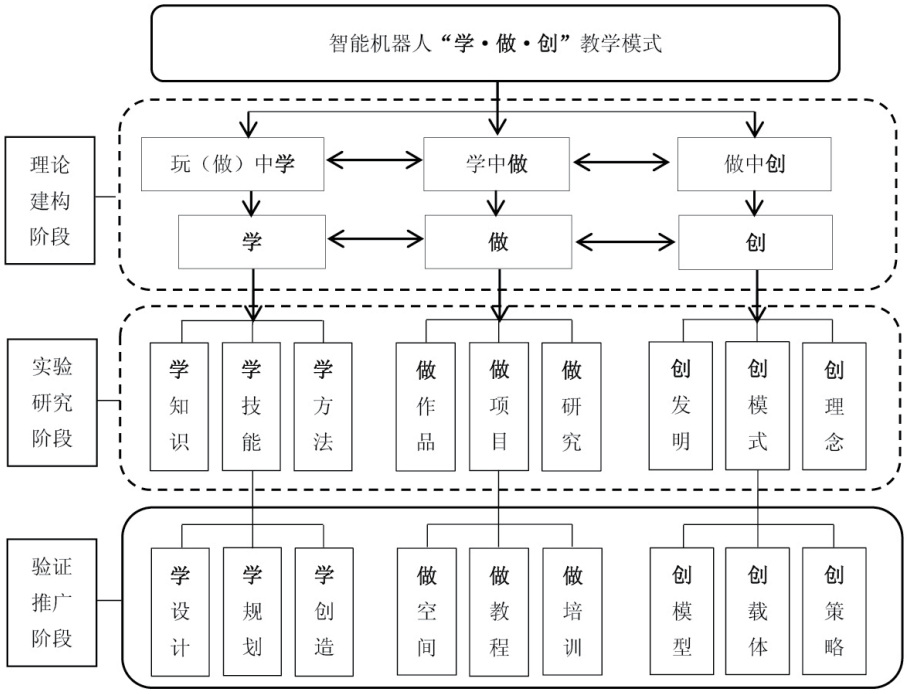


figure 1 Learn-do-Create-teaching model for AI Robots

3. Design supporting practical AI teaching materials

In April 2018, East China Normal University Press and the Commercial Press published in collaboration of China's first edition of AI teaching materials Fundamentals of Artificial Intelligence (High school Edition), which symbolizes AI education has officially entered the stage of basic education[9]; in July 2018 Iflytek Co.,Ltd, Northwest Normal University and Beijing Normal University together published the first AI education textbook of junior edition in

the world, named Artificial Intelligence (junior edition)[10]; in May 2019 Ministry of Education printed and distributed 2019 Notice of the Catalog of Textbooks for Primary and Secondary Schools, and there are five collections of senior high school edition of Introduction to AI models provided for Chinese high schools to choose from. The author participated in the work of designing and editing Selective Compulsory Module of "Preliminary Artificial Intelligence" for Senior High School Information Technology in Guangdong Educational. In the meantime, the author has collaborated with other experts in editing Artificial Intelligence (High School Edition) based on the hardware develop of Internet of things and it is published by Guangdong Education Publishing Hous in March 2019. The publication and distribution of these textbooks make the problem of AI teaching material deficiency possible to settle. Hopefully there will be more science books of Artificial Intelligence published, with the purpose of solving the problem of lacking AI teaching materials for each study level in primary and secondary schools, thus helps the work of AI education and popularization start with children.

4. Train outstanding teachers teams for AI education

In order to solve the problem of schools lacking teachers in AI education, Ministry of Education departments guides with the collaboration of National Institute of Education Sciences, National Centre of Educational Technology, Centre for Teacher Education and AI enterprises, and apply multiple ways to train teachers, including continuous education, training for specific programs, further study in higher education institutes, internships in different companies. Teachers will be cultivated as a batch of core teachers that possess excellent theoretical knowledge, abilities to practice and operate, eligible for AI education, thus helps to solve schools' problem of lacking teachers in AI education.

5. Build and construct strategies for AI education development

The author has been exploring and practicing in developing Maker education on the basis of intelligent robots and STEAM education, six major development strategies has been developed with off-line and online [12]. These development strategies have been used in the forms of special seminars everywhere in the country to train teachers, students and parents, up to the number of 11,460, these seminars held receptions to Chinese experts, international experts and scholars, up to the number of 5,560, gaining excellent social benefits. with the arrival of AI era, upgrading and promotion of developing Maker education have been made, further constructed strategies for AI education development, as it shows in figure 2. Refer to the successful cases in Maker education, hopefully these strategies could also be successfully used in the dissemination and popularization of AI education.

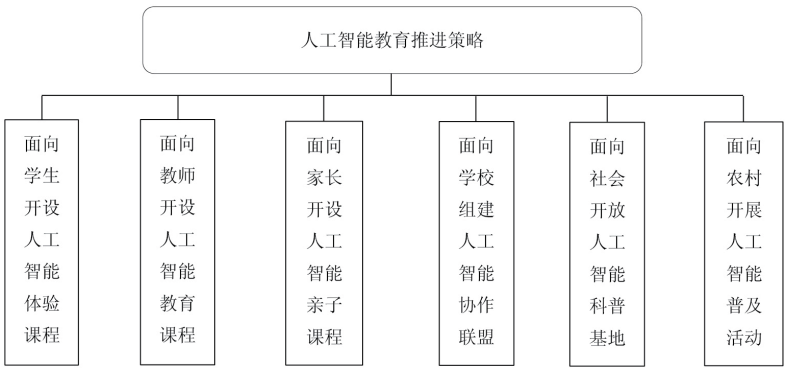


figure 2 Implementation strategies for AI education

6. Issue highly operative guidelines in time

Administrative departments of Education of Ministry should issue detailed and highly operative guidelines for introducing AI into primary and secondary schools, state clearly the responsibilities of educational administrative office, educational supporting organizations, higher education institutions, companies, primary and secondary schools and teachers, working in cooperation with a due division of work, innovate collaboratively. Via a variety forms such as in class teaching, extracurricular activities, science experience, company visiting and competitions, helping students to grasp basic theories of AI technology and possess basic skills to develop AI products, helping students to build abilities to appreciate, understand and apply AI. Cultivate a batch of intelligent, inter-disciplinary, and innovative talents that master AI technology.

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Implementation of Stealth Assessment to Career Interest Test for Elementary Student

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Abstract: The purpose of this study was to develop an augmented reality(AR) program ofcareer interest test for elementary students with the stealth assessment. It is crucial todiscover individual interest and achieve positive self-concept by providing systematic careereducation for young learners. For this reason, various career interest tests have been used for elementary students. Among them, the most commonly used career interest test method is asubjective survey form. However, the questionnaire requires a considerable level of readingskills and it may not befor the young to answer all ofthe questions.

In order to solve these problems, this study applied a stealth assessment method to ARapplication which is to motivate children's attention. To apply the stealth assessmenttechnique, the Evidence-Centered-Design Model was applied as a theoretical framework andthree models (i.e. Competency Model, Evidence Model, Action Model) were developed. A Competency Model was developed by adopting Holland's RIASEC model as a core competency. To develop the Evidence Model, the core characteristics of the RIASEC modelwere investigated in the literature review. Furthermore, a Stat Model was developed with thecorrelation coefficient matrix of RIASEC. The Action Model consisted ofAR environments,including gaming elements such as providing missions and rewarding users. The ARinterface was developed in this study with 12 AR markers. In addition, when users activateeach marker,audio narration was provided

The development of this career interest test AR program has two implications. First,

theproblems of the questionnaire career interest test tools were complemented by applyingstealth assessment and augmented reality interfaces. This takes into account the interests ofelementary students and allows to evaluate users' performance in the optimal condition where they are fully occupied. Second, this research is meaningful because it introduces thedatabase function ofAR interface to realize stealth assessment that needs to collect learner 's performance data in real-time.

Key words:Augmented Reality, Stealth Assessment, Holland's RIASEC Theory, Elementarystudent

INTRODUCTION

It is important to be able to discover and develop career interest early. In this context, career education for elementary students is progressing in various ways. Elementary students correspond to the career awareness stage in each stage of career development. In other words, career education at this time should be able to grasp the career interests, abilities, personality, etc. and to develop proper career awareness ability (Hong, 2012). According to Namgung (2010), elementary students can find career interest early, which can help to enhance individual's self and positive self-concept. However, the perception of career interest in Korean elementary students is not so high (Seo, Kim, & Song, 2013). Therefore, elementary students should be provided with appropriate career interest test tools sothat they candiscover their own career interests anddevelop their career awarenessskills.

According to Seo , Kim , and Song (2013), Holland's RIASEC model is the most preferred model for measuring the child's career interest. Holland 's RIASEC model has been an important clue to understanding career interests, career choice, and career satisfaction since the 1950s, and it has a theoretical background to initial type studies and personal environment theory of individual interests and characteristics. Research on the individual differences of career interest has recently emerged,and many studies have beenconductedbased onHolland's RIASEC model.

A variety of career interest testing tools have been developed to measure career interest based on Holland's career theory. The most common way to investigate career interest is using questionnaires (Joe, Park, & Lim, 2018). The questionnaire method has the advantages of being able to express test contents relatively broadly and being easy to carry out, but there are limitations in using those who have difficulties in understanding sentences or have limited communication. In addition, the majority of questionnaire career interest tests require reading ability at least at the 5th grade level of the elementary school, and in some cases, they require comprehension at the college level (Joe, Park, & Lim, 2018). Therefore, the verbalized test tool may give the child a feeling of rejection or burden in the process of the test. Furthermore, it is more useful to provide audiovisual data because children tend to be more sensitive and interesting to image stimuli than to textual stimuli. In this respect, there is a need to develop more useful measurement tools that take into accountthe child's developmental level.

The application of stealth assessment can be considered to solve the problems of the career interest test tools using the questionnaire. A stealth assessment is intended to assess the performance of a learner when he or she is fully engaged in learning in the game and maintains the flow in an optimal state. According to Shute (2011), stealth assessment can stimulate

students' interest and motivation through factors such as games. Furthermore, it is possible to evaluate the future-oriented ability which is difficult to be evaluated by the existing evaluation method, and it is possible to eliminate the test anxiety of the learner because the learner is evaluated without knowing the assessment. This can prevent the learner's test anxiety from decreasing the effectiveness and reliabilityof the evaluation.

Also, applying the same interface as the augmented reality(AR) can help to induce users' interest. Augmented reality contents provide a new learning space that mixes reality and virtuality. In addition, elementary students tend to be more engaged in educational contents with new information and communication technologies, so the augmented reality has a great educational effect(Kim, Lee, 2018; Kim, 2018). In the study of Roh (2009), it was found that the augmented reality-based English class is effective for the immersion and interest of the elementary students. As a result, augmented reality contents have been recently produced in various ways as children's experiences and educational contents (Seo, 2015). Therefore, the development of augmented reality contents as a career interest test tool will be useful for promoting the immersion and interest of elementary students.

According to the above, this study question is: a) Can stealth assessment apply to career interest test? b) How canwe applythe stealth assessment to the augmented reality program?

The purpose of this study is: a) To develop a stealth assessment model applying the career interest test model. b) To develop AR game contents for career interest test applying developed stealth assessment model.

BACKGROUND

1. Holland's RIASEC Model

1)The Concept of Holland's RIASEC Model

Holland classifies individuals' characteristics and environments into six types according to individual interests and expresses these six types as hexagonal models. The six types are Realistic type (R), Investigative type (I), Artistic type (A), Social type (S), Enterprising type (E) Conventional type (C), and the first letter of each type is also called RIASEC. The distance between adjacent types of interest in the hexagon model is the same, and the correlation between types of interest is inversely proportional to the distance in the hexagon model. Holland hypothesized that based on this hexagonal model, individuals would be more satisfied, more stable, longer working, and more fulfilled when working in an environment consistent with their occupational interest type. Holland's RIASEC model (Holland, 1985) has been extensively used in career guidance for over 25 years in that it facilitates the linkage between personal and occupational characteristics. As a result of studies related to the Holland RIASEC model so far, this model is generally considered to be appropriate for thepeopleof Korea.

2) Career Interest Test for Elementary students

Currently, various career interest tests are being conducted for elementary students using the RIASEC model. This is because systematic and practical career education during elementary school years is the basis for achieving more mature and efficient career development later on,

and can help enhance understanding of oneself and form positive self-concepts by discovering individual talents and interests. career interest tests may include using questionnaires and using slides or pictures, depending on the feature of the questions you use. The most common test of career interest is using questionnaires. Although the questionnaire method has the advantage of being relatively broad and easy to implement, it has limitations in that it requires a considerable level of reading ability. In addition, children may find it more useful to present pictorial stimuli rather than verbal examinations because they are not only in the process of developing thinking and cognitive skills, language comprehension, and expressiveness, but also tend to be more sensitive and interesting to image stimuli than text stimuli. Therefore, several occupational interesting inspection tools have been developedto solve thesequestions.

3)Examples of the CareerInterest Test Toolapplying the RIASEC model

In the study of Cho, Park, and Lim (2018), the research of the career interest picture for elementary students was developed. First, based on the theoretical basis of Holland's RIASEC model, the original items were selected by exploring elementary school textbooks, career net, Korean occupational dictionary, research and measurement tools related to domestic and foreign career interests, andreflecting the results of investigating elementarystudents' desired careers. The 100 selected items were made with the illustrations of the career activities so that the students at the 3rd grade level of the elementary school can understand the contents of the career activities presented in the occupational dictionary. A total of 60 items were finally selected after reviewing the questionnaire for careercounseling specialists, elementary schoolteachers, andelementarystudents.

Also, in the study of Kang (2018), based on Holland's RIASEC model, a Web-based career interest-type test was designed. Youth occupation cards used for development are based on Holland's RIASEC model, which allows users to search for interest types through color-coding of six types (RIASEC) career cards after each of them is classified to three levels of interest. In the screen showing the results of the career interest test, the type of the user's six types (RIASEC) is shown in the form of a summary guide, career guide, and type guide. However, Kang(2018) suggested that future research should develop a method to induce the interest of testers and proceed with the examination.

2. Stealth Assessment(SA)

1)The purpose of the stealth assessment

The purpose of the stealth assessment is to evaluate the learner in an unrecognized way. In other words, it is a process in which the learner's performance data is continuously collected during the learning process and the level of core competence is inferred. According to Shute (2011), a stealth assessment can best assess future-oriented competencies that are difficult to assess with existing assessment methods and can help motivate students through factors such as games. Furthermore, the learner 's performance can be evaluated in the optimum state in which the learner is fully engaged in learning, and the learner' s test anxiety can be eliminated. Such a stealth assessment should be able to collect learner performance data in real time and provide feedback to learners. Recently, with the development of computer and video recording technology, it is becoming easier tocollect data,andvarious applicationsof stealth assessment techniqueare beingstudied.

2)Evidence-Centered Design (ECD) Model

Evidence-centered design is a comprehensive assessment design framework introduced by Mislevy, Steinberg and Almond (2003). It constitutes and organizes the criteria for evaluation by the development of technology or statistics. By designing systematic evaluation structure and consistent evaluation criteria, the ECD can promote consistency and efficiency in the evaluation process. Behrens, Mislevy, DiCerbo and Levy (2012), Mislevy et al. (2014) and Shute (2011) discussed how to apply these ECD to simulations and game-based evaluations. In particular, Shute (2011) discussed theapplication ofECD to astealth assessment as anevaluation technique.
Evidence-centered-design starts with defining competencies to be evaluated (development of Competency Model). Because competencies are not directly observable, you need to figure out what behavior these competencies appear in. In other words, evidence for competence should be defined (development of Evidence Model). The final step is to define an action that can derive such behavior (development ofAction Model).

3)Application of the Stealth Assessment

Shute and Masduki (2010) applied stealth assessment to the game named 'Taiga park'. Taiga park is a 3D immersive role play game that allows junior high school students to learn about ecological and scientific inquiry. In this game, students can learn to explore in the environment of the game. They set systematic thinking as a core competency and wanted to evaluate it in the course of the game. Through extensive literature reviews, they created competency model, evidence model, and action model related to systematic thinking skills. Based on this ECD model, when a user performs an action, the behavior is stored in a data format on the network (Bayesian network), and this data is propagated to all Nodes so that estimates of the top Node, that is, estimates of systematic thinking capabilities, are evaluated.
Also, Shute (2009) applied stealth assessment to the game called 'Oblivion'. Oblivion is a first-person 3D role-playing game based on the Middle Ages. In this game, users can solve various missions and raise their rankings. The stealth assessment of the game is intended to evaluate creative problem solving skills. Shute (2009) cited novelty and efficiency as a node of competency model of creative problem solving skills. Several behaviors have been selected as evidence model for this, and Oblivion experts have measuredthe novelty and efficiencyof eachaction.

3. Augmented Reality(AR)

1) The Concept of Augmented Reality

Augmented reality is a technology that provides immersive and realistic feeling by providing the real world and the virtual world seamlessly to the user in real time. In addition, it provides virtual information to the real world of the user in 2D or 3D, thereby enriching the information about the scene (Yang, & Ryu, 2018). There is a difference in virtual reality and augmented reality. In the virtual reality, the virtual world completely replaces the real world, whereas augmented reality maintains informationabout the real world of theuser (Genebo,2007).

2) Educational Advantages of the AR

The educational advantages of AR are as follows. First, the augmented reality helps the learners

actively participate in the learning process because the learners make the actual manipulation activities (Yang, & Ryu, 1988). Second, the AR contents can provide auditory and visual materials together. By using various sensory information, learners can be more immersed in the learning situation. Thus, AR has a positive effect on learners' immersion in the learning situation and further on interest and attention. In addition, research has shown that when the AR learning program is applied to elementary students, the learner's attentiveness, confidence, satisfaction, and relevance have been enhanced(Lee, Sim, Kim, & Lee, 2010). Also in the study of Roh (2009), it was found that the AR-based English class is effective for elementary students' learning interest, learning immersion andlearningachievement.

THEORETICAL FRAMEWORK

1. Evidence-Centered-Design Model

Based on the study of Shute (2011), we adopted the Evidence-Centered-Design Model as a theoretical framework[see Figure 1]. Accordingly, a Competency Model, an Evidence Model, and an Action Model were developed.

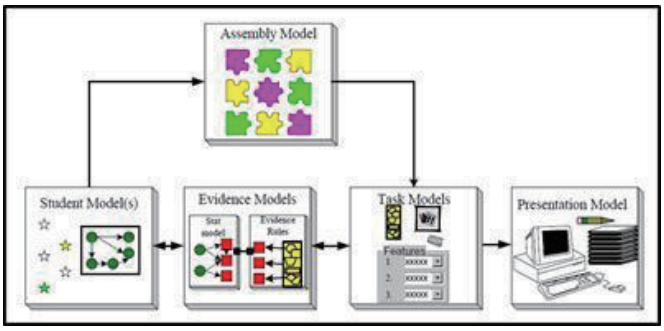


Figure 1. Evidence-Centered-Design model of Mislevy, Steinberg and Almond (2003).

1) Competency Model

According to Shute(2011), the Competency Model is about ‘What collection of knowledge and Skills should be assessed?’. The variables in Competency Model are called ‘Node’. In order to create a Competency Model, the variables(Node) at the core of the competency should be identified through a literature review. A key competency in our study is Holland's RIASEC model. In other words, the Realistic type (R), Investigative type (I), Artistic type (A), Social type (S), Enterprising type (E), Conventional type (C) was set to Node[seeFigure 2].

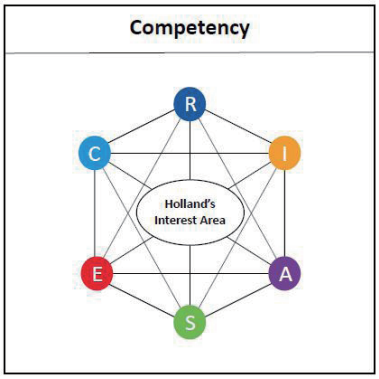


Figure 2. Competency Model.

2) Evidence Model

According to Shute(2011), the Evidence Model is about 'What behaviors or performances should reveal those constructs?'. That is, it defines what behaviour or performance the Competency Model can be found in. We have studied the core characteristics of RIASEC(i.e. Competency Model), and selected two core actions for each area[see Figure 3]. Two core actions were chosen to reflect the characteristics of elementary students subject to the program. For example, the core action of a type R is 'correcting a broken object' and 'doing well with the body." was chosen. Users are required to resolve only five of the selected 12 core actions. We assume that users will choose the actionthat corresponds to their area ofinterest.

Furthermore, we developed a Stat Model. The Stat model is a model that determines which evaluation scores will be given depending on the user's action. We developed the Stat Model to reflect the RIASEC correlation of Artosandi(2015). When a user selects a mission, the correlation coefficient score of the type of RIASEC that the mission reflects will be given to the user's score of each area of RIASEC. For example, if a user selects a mission of the type R, the R area is given a scoreof 1,I area 0.84,A area0.56,S area 0.59,E area 0.57andC area 0.76[see Table 1].

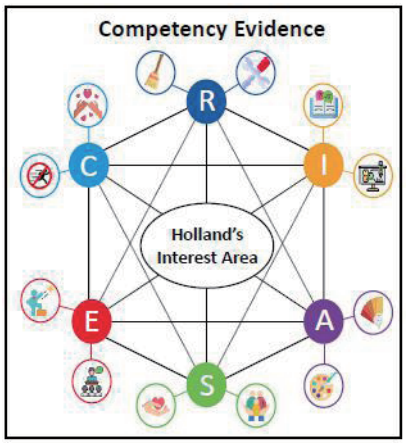


Figure 3. Competency Evidence.

Table 1. Stat Model.

RIASEC Corrleational Table						
	R	I	A	S	E	C
R	1	0.84	0.56	0.59	0.57	0.76
I	0.84	1	0.88	0.85	0.77	0.82
A	0.56	0.88	1	0.73	0.77	0.63
S	0.59	0.85	0.73	1	0.82	0.74
E	0.57	0.77	0.77	0.82	1	0.66
C	0.76	0.82	0.63	0.74	0.66	1

3) Action Model

According to Shute (2011), the Action Model is about ‘What tasks should elicit those behaviors that comprise the evidence?’. That is, the Action Model defines the environment in which the Evidence Model can be observed. More specifically, the Action Model defines a number of

considerations, such as what tasks users should perform and what tools they can use. In this study, users will play game in an AR environment[see Figure 4]. The user can sense 12 markers of AR tool with his or her device and solve the mission. To add game factors, The program gives users a mission to 'solve five problem situations at school' and users get a reward for each performance. The game is over after five performances and five reward are received. At the same time, in the database of a system that the user cannot see, each time the user performs a action, the RIASEC score is recorded according to the Evidence Model. A total of five scores are accumulated and the total score is provided Output. The AR program used in this study were developed through the Unity 3D game engine andthe Vuforia Engine.

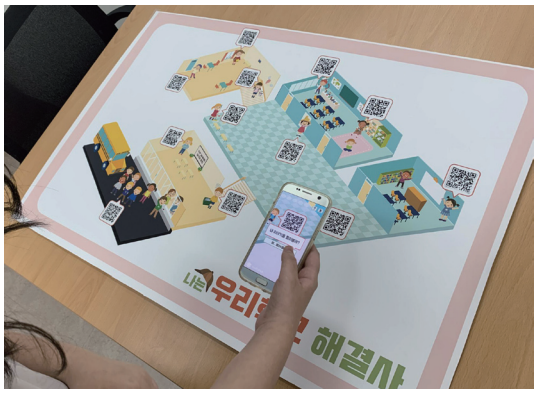


Figure 4. A user sensing AR marker with her device.

RESULTS

Referring to the Evidence-Centered-Design Model of Mislevy, Steinberg and Almond (2003), we created a model as shown in Figure 5. This model reflects Competency Model, Evidence Model, andAction Model. The CompetencyModel represents Holland's RIASEC model as Node. The Evidence Model consists of the Competency Evidence and the Stat Model. Competency Evidence has selected 12 core actions by exploring the features of Holland's RIASEC model. Users choose actions that match their area of RIASEC. The Stat Model was developed to reflect the RIASEC correlation(Artosandi,2015).

The Action Model is divided into User screen and In-system screen. The user screen is a screen that is visible to the user. When a user senses an action that match their area of RIASEC among the 12 core actions, the mission is provided. The user performs a total of five missions. The in-system screen is not visible to the user. At the same time that the user completes a mission, the RIASEC scoreis recordedin the databasebasedonthe Stat Model of the Evidence Model.
When a user performs five actions, an Output is provided to the user's device. Based on the RIASEC scoredata accumulated within the system, the user's RIASEC score is provided.

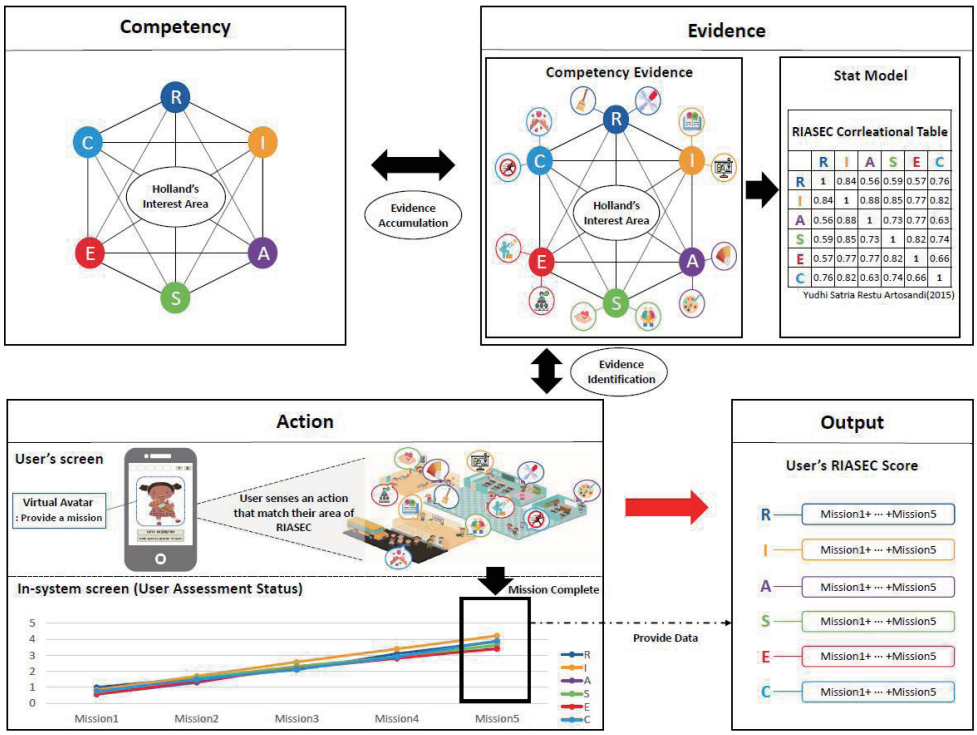


Figure 5. Evidence-Centered-Design Model for Job Interest test

CONCLUSION & DISCUSSION

The purpose of this study is to develop an AR program of career interest test for elementary students applying the stealth assessment. It is important to discover the individual's interest in the elementary school age and to discover the self and form a positive self-concept. The current curriculum emphasizes career education for elementary students and various career interest test tools have been developed. The most commonly used interest tests are questionnaires (Joe, Park, & Lim, 2018). The questionnaire method is simple and systematic in practice, but it requires a considerable level of reading ability and can't take into account the interests of elementary students. As a method tosupplement this, theAR program ofcareer interest test for elementary studentswas developed.

This study applied the stealth assessment and the augmented reality interface as an approach to consider elementary students' interest factors. Stealth assessment can help motivate students because it is an evaluation based on game elements rather than using traditional paper-based measures and items. Based on the research of Shute (2011), this study adopts the Evidence-Centered-Design Model as a theoretical framework for applying the stealth assessment and develops three models (i.e. Competency model, Evidence model, Action model). In particular, previous research on key features of the RIASEC model was conducted to develop Evidence Model. In addition, we developed a Stat Model based on RIASEC as a criterion of the evaluation score, thereby enhancing the reliability of the model. Since the augmented reality interface can utilize various sensory information, it can stimulate the interest of elementary students who are more sensitive to image stimulation than to text stimulation. In addition, it helps the active participation of learners by helping them to do practical manipulation activities (Yang, & Ryu, 2018). In order to apply the function of AR interface, AR marker and image data which can be freely sensed by user's device are provided, and the user can directlyoperate the program bytouching, dragging and dropping.

It is meaningful that the development of the AR program for the Career Interest Test is complemented by applying the new technique and interface to the disadvantages of the conventional Questionnaire Career Interest Test tool. This reflects the interests of elementary students and can be carried out relatively easily at the school site, and the learner's performance can be evaluated in an optimal state where the student is fully engaged. In addition, we can find a meaning in that we introduced the database function of the AR interface in order to realize the stealth evaluation in whichthe learner's performance datashouldbe collected inreal time.
The following points should be considered in the follow-up study. First, in this study, the usability test was not performed on the actual users. A usability evaluation will be carried out using a benchmarking test to identify problems by classifying and selecting representative tasks among the 12 problem situations. Second, expert verification of educational psychology should be done on evidence model. The 12 key behaviors of Holland's RIASEC model and the expert evaluation of the stat model were selected for this study. Through expert evaluation in the field of educational psychology, the 12 core actions and the stat model will review whether RIASEC scores are correctly assessed.

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Finnish Media literacy Education in Basic Education and Upper secondary education and Its implication to China

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Abstract: Finland is a forerunner in media literacy education. Media literacy education has gone hand in hand with the development of media technology. The article analyzes the changes in the concept of Finnish media literacy education, summarizing the features of Finnish media literacy education in basic education, and upper secondary education. In exploring these good practices in Finland, the paper makes some recommendations to media literacy education in china.

Key words: media literacy, education, Finland, China,

INTRODUCTION

In the times of new digital age, the media has penetrated into people's life. People are surrounded by massive media information all the time. Media and media information are shaping people's thoughts and cognition. Internet, TV, Phone, and so on have entered thousands of households. Media becomes the fourth major factor affecting children's growth, juxtaposed with schools, families, and peers. Children spend a lot of time on emerging media electronics. They acquire new knowledge, build new perceptions, and develop emotion through various media. Meanwhile some media information about violence and pornography enters children's vision, which has a huge impact on children's values and outlook on life. Because of the lack of media literacy competence, children cannot think critically and are easily confused, misled, and deceived by massive information. The problems exposed from children in the process of using the media in China have become increasingly serious. Violence, deception, abuse and other acts have occurred repeatedly. How to cultivate children's correct access to the media, understand the media information language, critically analyze the media information, and master the media technology of communicating information are an urgent task. Media literacy education is vitally important.

Media literacy education in China was still in the early stage. There is no clear media literacy education guideline. Even media literacy education is not included in the school curriculum system. Generally, the level of media literacy education in China is relatively low.

In Europe, media literacy education started earlier, and implemented a series of media literacy policies at the national level, and established a media literacy development system led by the government and supported by various departments. Among Europe, Finnish education is recognized as "the best education in the world". Finland has always been the top countries in the PISA (International Student Assessment Program), and its media literacy education has a good foundation for development. Compared to a relatively developed media literacy education of the United States and UK, Finnish media literacy education is still in development. It also faces

many problems, such as the lack of effective policy evaluation mechanisms, not stable funding, and teacher training to be strengthened. Therefore, the practical problems encountered in Finnish media literacy education have a high reference value for the Chinese media literacy education.

Concept of media literacy and media literacy education

Media literacy is "the ability to use, understand and create media and communications in a variety of contexts" (Ofcom, 2006). In US, Media Literacy is the ability to access, analyze, evaluate and create media in a variety of forms(Center for media literacy,1992)

In contemporary digital sphere, media literacy education is the integration of media literacy, media skills, communication and multiple literacies. It is a multidisciplinary area, bounded up with social, institutional and cultural relationships and as situated practices. (Lankshear & Knobel, 2006).Media literacy education is associated with practice based action in everyday life of people from kids to senior citizens, which empowers citizens to possess better skills for dealing with everyday life, participate in society and develop better as individuals in the information society.

A brief History of Media literacy education in Finland

The history of Finnish media literacy education experienced four phases from Mass Media to Digital Age, closely interrelating to the independence of Finland, the development of Finnish Language and the construction of Finnish identity (Kupiainen, Sintonen, & Suoranta, 2008).

The beginning of Finnish media literacy education dates back to 1950s, when media literacy education research were to be found in "Audiovisuaalinen kansansivistystyö" (audiovisual popular liberal education). At that time, the mission of audiovisual popular liberal education is to teach the audience to understand "the difference between art and entertainment" and to "make the art of film, radio and TV clearer, to comprehend and appreciate these and to enjoy them" (Miettunen, 1954).It is more about film critical thinking education. In the 1970s. Finnish media literacy education is transferred from film teaching to conscious mass media literacy education. A systematic Finnish mass media literacy education appears. According to Minkkinen's (1878) model, Mass media literacy education is divided into 3 sections, which is cognitive, aesthetic and ethical. In the 1990s, media literacy education encountered a new change, turned from mass media to communication and communication education, including more dimensions of expression and creation. Communication education is more about communicative capabilities and the use of communication information and information technology. Creativity education and media literacy education were educational orientations manifesting within communication education(Härkönen,1994).In the new millennium, Finnish media literacy education came to a muti- modality stage, the winds of emerging new technology shaped media literacy education. The new Internet options include games, picture galleries, blogs, podcasts YouTube. The importance of media literacy education is strongly realized by the whole society. Finnish media literacy education was aiming at building a strong connections between research and practical media literacy education (Kupiainen, et. al,2008). Since the beginning of the 21st century, the position of media literacy education has been strengthened in a national-wide level. The focus of media literacy education is on civic participation and information society skills and a safe media environment.

In conclusion, development of Finnish media literacy education from audiovisual popular liberal education through mass media literacy education and communication education to media literacy education has gone in hand in hand with the advent of new media technology. Nowadays, Media literacy education is more about media culture, the generation of meaning, its exchange and reception, instead of merely sending and receiving of messages.

Joint national efforts and good collaborations from multiple actors in Finland.

The strength of Finnish media literacy education stems mainly from the efforts of various actors. More than 100 key media literacy stakeholder were identified in Finland representing six different sectors, promoting media literacy education together. The government and the regional and local authorities work together and collaborate with each other tightly, going hand in hand with polices, projects, and plans, to promote media literacy education and a safe media environment. Meanwhile, large and small companies in the media sector, and representative professional organizations, schools, institutions and NGOs are keys actors in media literacy education. They have a tight collaborations with government as well. Finnish media literacy education policy has explicit links with several NGO organizations; some of these promote media literacy education in cooperation with the ministry as part of main duties or even as main duties, like the Finnish Society on Media literacy education, Media literacy education Centre Metka and Koulukino– School Cinema Association, which are funded by the Ministry of Education and Culture. Other NGOs include the Mannerheim League for Child Welfare, Kerhokeskus – the Centre for School Clubs, Save the Children Finland and the Finnish Parents' League (Kotilainen& Kupiainen,2014). Overall all actors in the field of media literacy education cooperate together.

At school, Media literacy education has been a part of the Finnish school curriculum since 1970. The content of media education can be incorporated from various angles into teaching and child education, but all specified in the national core curriculum. The national core curriculum do not refer to media literacy education as a specific subject, but integrated in other subject matters ad multidisciplinary modules. Finnish school has implemented cross-curricular theme, mainly into subjects of visual arts, history, social science and mother tongue. The aim of media literacy for basic education in the national core curriculum is 'to improve skills in expression and interaction, to advance understanding of the media's position and importance, and to improve skills in using the media' (POPS, 2004).When coming to upper secondary school, elective media course are provided, such as photography and videography. An upper secondary school diploma in media can be acquired. Media education as a part of everyday tasks with children and adolescents is offered in day-care, pre-primary and basic education and general upper secondary education, provided by teachers, youth workers and instructors.

Media literacy education in Finland is wide with multiple actors and projects. Strongest actors can be found outside school system. Besides the great effort from governmental level, the contribution to media literacy education from the third sector, like non-governmental organizations, public cultural services, and other operators is indispensable. These play an extremely role in media literacy education work. Cultural services such as libraries, museums and youth services, are particularly active in promoting and providing media literacy education. Media literacy education has also increasingly found its place in public libraries. Public libraries is one of the most important public cultural services. The duty of media literacy education in libraries is to help people, especially in children and youth, develop information management

and media literacy skills, also support the utilization of social media, as well as the critical evaluation of information (Lundvall, 2009).Projects, training events, media literacy education activity packages, production of materials, and web portal for media literacy education are all carried out by libraries, contributing to developing media literacy education work.

Its implication to China

Compared to well-developed Finnish media literacy education, Media literacy education started lately in mainland China. Initial development in media literacy education is from higher education, instead of basic education. Even some research and exploration in media literacy education has been made, it is still in some primary stage. There are a lot of problems in the development of Chinese media literacy education. The key problem is less attention paid to media literacy education from the whole society. Furthermore, the lack of young children as target groups in media literacy education, the lack of clear learning and teaching guideline, not many powerful policies, not much social support, and marginalized media literacy course at school (Tan,Xiang,Zhang,&Yao,2012)all lead to slower development of media literacy education in china. Consequently, Finnish media literacy education practices and exploration to some extent can provide valuable reference and implication to china.

1) Government-steered media literacy education

The various administrative sections of the different ministries promote media literacy education through many projects, policies and plans with supportive of each other. Finland is one of very few countries with governmental media education authority. The majority of Finnish media literacy education projects are promoted by government, which guarantees the funding and effectiveness for various project implementations (耿益群, 2014). If much significance in media literacy education is attached by government through policies, the whole society would gradually realize the importance of media literacy education. Then promoting media literacy would become widespread. Government-led media literacy education project overcomes fragmentation and unsystematic problems. Promoting media literacy are achieved through legislation, financial resources, and national steering.

2) Learning through cross-curricular themes and multidisciplinary module

Media literacy education are emphasized in terms of social inclusion, active citizenship, critical thinking, creativity and self-expression. Media literacy education is the development of multiliteracies abilities. Multidisciplinary orientation is rooted in the media literacy education. The focus is on “knowledge coherence” (Lawrence & Després, 2004), not much on subjects. Media literacy education is often practice-based. Cross-curricular themes and multidisciplinary module bridge the connections between theoretical approach and professional practice, helping students to better understand actual world and practices in depth.

3)Effective cooperation from different actors

The strength of Finnish media literacy education is various actors promoting media literacy education together (孙珏 , 2014). Media literacy education can operate on a broad basis. It is far from enough for just the government to support media literacy education through policies. Schools are the key to the curriculum implementation of media literacy education. Social forces,

like NGOs are the promotion institutions for media literacy education. Government and third sectors work together to develop media literacy education resources to ensure adequate media literacy teaching and learning resources.

4) Emphasis of media literacy education on younger children

Media literacy education of young children has gained a lot of attention from Finland, due to the changing media environment and especially high use of internet, TV, video games from children. Children are easily exposed to diverse school-aged inappropriate media content. Media Muffin project was a famous national project, part of Children and Media Program. The great contributions from this project is series of media literacy education guides for early childhood education, which could further the municipalities' and day-care centers' ability to adopt media literacy education as part of the early childhood education work as well as to support the planning, implementation and evaluation of media literacy education(Lundvall, 2009).Children are at the stage of development of cognitive, aesthetic, ethical and values. media literacy education on children is very vital. Media literacy education will help children to analyze and assess media critically and to use media for learning, self-expression. All children and adolescents will enjoy a safe media environment.

Conclusion

In brief, the specialty of Finnish media literacy education shows different active actors contributing to the development of media literacy education. Polices, funding, projects, and national curriculum all escort the processing of media literacy education. Highly attention has already been paid to younger children of media literacy education in Finland. However, there are still some crucial problems existing in Finnish media literacy education. The lack of a specific school discipline and the voluntary status of media literacy education could lead students to learn media literacy in an unsystematic way. The implementation and practices of media literacy education depend on the activity of individual teachers and schools (Kupiainen, 2011). Therefore, there are huge disparities across schools and teacher training programs. Although teacher training in Finland is of quite high quality, it's still possible to graduate without having basic knowledge about media literacy education.

Those good measures involved in Finnish media literacy education are good example to China who is still in the initial ages of media literacy education. Those improved areas could serve as a warning. In the temporary multimodal culture context, It is widely believed that media literacy is important to economic growth and social welfare (Rantala, 2011). The investment and contribution to media literacy education attach the great significances.

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Application of Artificial Intelligence in the Study of Secondary Vocational School Students

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Abstract: The development of artificial intelligence has caused great changes in future jobs. Some jobs will be replaced, and vocational education will occupy a disadvantage in the new job market. In response to the above challenges, the traditional vocational education has been unable to adapt to the development of the times. It is necessary to change the teaching model, focus on the students, design personalized learning, and cultivate new skills with core literacy.

Key words: Artificial intelligence; secondary vocational students; learning style;

Introduction

Since the 21st century, with the breakthrough of new theories and new technologies such as big data, cloud computing, Internet, and brain science, artificial intelligence technology has also entered an accelerated leapfrog stage, showing deep learning, self-manipulation, human-machine coordination, and open-mindedness. Such new features lead the development of a new round of technology and industrial revolution in the world. Artificial intelligence has become the "new engine" of global economic development in the current era, and has become a new hot spot in global science and technology competition[1]. In order to cope with the trend of artificial intelligence, on April 2, 2018, the Ministry of Education issued the "Artificial Innovation Action Plan for Higher Education Institutions" in the talent training column, to build a multi-level education system for artificial intelligence, and introduce artificial intelligence in the primary and secondary schools. Education for all; continuously optimize and perfect the construction of professional disciplines, and build a college education system integrating artificial intelligence professional education, vocational education and university basic education[2]. Then in February 2019, the National Vocational Education Reform Implementation Plan promulgated by the State Council also pointed out that vocational education should focus on the development trend of the docking technology and market demand, and improve the vocational education and training system[3]. At present, modern information technology represented by artificial intelligence is profoundly transforming the way of production, life and learning of human beings. Talking about artificial intelligence in the field of education is to talk about educational informationization[4], The advent of artificial intelligence has brought unprecedented opportunities for the development of vocational education. We should seize the opportunity to promote the development of vocational education.

The development status of artificial intelligence

In terms of artificial intelligence, it is customary to study computers and let computers do some high-intelligence work that humans can do to get them done faster and better. In 1956,

Dartmouth College held the first artificial intelligence seminar and proposed the concept of "artificial intelligence". The 1969 International Joint Conference on Artificial Intelligence was established, marking the recognition of the emerging discipline of artificial intelligence worldwide. With the development of cognitive science and neural network learning and began to enter the public eye, artificial intelligence research has ushered in spring. 20 In the 1990s, the rapid development of the network and the popularity in people's lives, artificial intelligence technology was widely used, and artificial intelligence entered the third development period. In recent years, China's artificial intelligence research has gradually matured and is used in various industries, such as Alibaba's e-commerce system, using robots for goods distribution; Baidu's driverless cars have been successfully piloted in Beijing. And the deep learning technology of the University of Science and Technology. In education, data mining is used to track students' learning status, data image processing is used to identify the state of students' classes, and smart classrooms are created to create a personalized learning environment for students. Understand the development of artificial intelligence, clarify the location of vocational education, and have a positive effect on the training objectives of relevant personnel designing secondary vocational students.

The realistic challenge of secondary vocational students

The development of artificial intelligence has replaced many industries in the future, which will certainly bring about a certain unemployment rate, and the normal life of some families will be chaotic. Those who do not need creativity and imagination, mechanical and repetitive work are most easily replaced by robots, such as the company's ordinary clerk, typist, assembly line workers, drivers, security guards, construction workers, couriers, meter readers, cashiers. Staff and so on. At the same time, a large number of work robots that require creativity and imagination are incapable, and a large number of "personalized", "humanized", "interpersonal interaction emotional", "unexplored experimental" and "innovative creative" jobs Will be created[5]. As a successor to the new era, we must consider cultivating people who can survive in the age of intelligence. This is starting with our education. According to the research conducted by the Research Institute of Vocational and Technical Education Center of the Ministry of Education, if the production and application positions of industrial robots require 100 people, then the middle level is 31, the higher vocational school is 39, and the undergraduate is 30. This shows that vocational education is artificial intelligence. Development plays a vital role[6].

Therefore, in the actual teaching, we need to carry out industry training for secondary vocational students. In the course of professional talent training, we should combine vocational education with future career development trends, strengthen innovation and entrepreneurship education, and focus on cultivating students' practical ability and innovative ability. In addition to cultivating students' relevant skills, it is necessary to expand the students' horizons and improve the students' comprehensive ability. Cultivating students' comprehensive ability requires schools to change traditional teaching concepts, and make reforms in teaching content, teaching forms, teaching evaluation, etc[7]. Secondary vocational students only know where they are in the era of artificial intelligence, understand the elimination of old industries and the emergence of new industries, and enhance their sense of urgency.

Actively learn basic subject knowledge, strengthen cultural literacy, and cultivate their own innovative ability, enhance students' professional competitiveness in society, and of course, cultivate students' sense of responsibility and practical ability, so that they can better adapt to the ever-changing society. Students should choose the industry that suits them according to their

own interests, and actively learn relevant basic knowledge, strengthen their own skills training, keep up with the pace of the times, and be a person who contributes to society.

Changes in the learning styles of secondary vocational students

Artificial intelligence has had a tremendous impact on people's lives and work. It has also rapidly penetrated into the field of education, bringing subversive changes to education. A new round of technological change will be guided by intelligent education and injected into teaching. New ideas provide more advanced teaching tools to promote the effectiveness of teaching. The "New Generation Artificial Intelligence Development Plan" issued by the State Council [8] proposed that "the use of intelligent technology to accelerate the promotion of talent training models, teaching method reform, and the construction of a new education system that includes intelligent learning and interactive learning." Under the circumstance, the education field should follow the development of artificial intelligence, promote its own teaching reform and innovation, build an education system that realizes individualized learning and lifelong development, and promote the transformation of education from low-level and extensive to high-level and precise.

METHODS

The secondary vocational teachers in the intelligent era must change their teaching ideas. The traditional "indoctrination" teaching can no longer adapt to the current social development. Fixing students in a closed space will only obscure their horizons and blind their views on the world. . We need to respect each student, take the students as the center, guide students to actively think about problems, explore, design personalized teaching, and give play to the uniqueness of students. In the era of artificial intelligence, with the application of educational big data collection and artificial intelligence, it is possible to realize the full scene process data collection of the student learning process, life process and education process, and analyze and fully image the collected data to the student intelligence. Recommend and provide personalized services, personalized teaching, personalized counseling and personalized learning to reduce students' ineffective time and study time [9].

The greatness of mankind is the invention of tools. The intelligent era provides advanced tools for teaching.

We are no longer single-minded in the teacher's classroom. Various online resources open a new supply method for students' learning. Students can choose the course that suits them according to their actual situation, and solve the problem in time through the intelligent interactive platform. The problems encountered in the process, using big data to record the entire process of learning, and push the best learning resources. Virtual reality technology is used to learn the real situation of students, promote students' knowledge transfer, and learn the virtual cyberspace learning plan, so that high-quality educational resources are applied to the students' learning process. Using a variety of media of images, sounds, words, and videos to present knowledge according to different levels of each learner in different organizational structures and ways, it will be more conducive to learners' learning and mastery, thereby improving learning efficiency. [10].

Traditional education focuses on summative evaluation, ignoring the students' learning process, and students' development has become unbalanced. In the era of artificial intelligence, students' procedural evaluations can be realized. By recording the characteristics of learners and the learning process, the evaluation results are more diverse, fairer and more scientific.

Feedback evaluation results can guide learners to a new round of learning. The procedural evaluation makes it possible for the individualized learning of the students to understand the learning characteristics and knowledge structure of the learners, so as to better promote their development.

CONCLUSION

The development of artificial intelligence brings challenges and opportunities for vocational education. Only by changing its teaching model can vocational education seek progress in the turbulent rapids. We must constantly explore the development methods suitable for secondary vocational students, actively respond to challenges, and strengthen the core literacy of secondary vocational school students, firmly grasp the opportunities for development, and continuously input high-skilled talents for the country's development.

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Can 'A.I. Teacher' Teach Creativity in the Classroom? - Analysis of Creativity, Teaching Expertise, Teacher Motivation and Creative Teaching Behaviors of Elementary School Teachers in Korea

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Abstract: The purpose of this study is to research the level of creative teacher competences of elementary school teachers in Korea. We investigated how different teacher's creative competences are by gender and years of teaching career. In addition, we examined the structural relationship among teacher creativity, teaching expertise, teacher motivation, and creative teaching behaviors of elementary school teachers in Korea. The subjects of this study were 153 Korean elementary school teachers in Seoul metropolitan area. The survey asked respondents' competency levels in 4 areas including 'teacher creativity', 'teaching expertise', 'creative teaching behaviors', 'teacher motivation'. T-test and ANOVA were conducted to compare group differences by gender and years of teaching career. We also investigated structural relationships among the variables using AMOS.

The partial results are as follows. First, among different variables, Korean elementary teachers showed the highest level of competencies in 'teaching expertise' followed by 'creative teaching behavior'. On the other hand, the Korean teachers' motivational level to cultivate their own 'creatively teaching competency' was the lowest. Second, there was no significant difference in creative teacher competences according to gender, but there was a significant difference in the level of competencies between teachers with 3-5 years of teaching career and teachers with 11-15 years and more. Interestingly, teachers with 3-5 years of teaching career showed the lowest level of 'creative teaching behavior' among all groups. Third, teacher creativity and teacher motivation had a significant impact on teaching expertise, and in turn, teaching expertise had a significant effect on creative teaching behaviors. In addition, teacher motivation had an indirect effect on creative teaching behaviors through teaching expertise.

Based on the results of this study, we will discuss implications for teachers' professional development issues in Korea. The results of this study will help us to understand what and how 'human teachers' perform to foster students' creativity and this will have further implication for 'A.I. teacher' research.

Key words: Korean Elementary School Teachers, Creativity, Teaching Expertise, Creative Teaching Behaviors, Teacher Motivation, Structural Equation Model

1. INTRODUCTION

Since the emergence of 4th industrial revolution era, many teachers, educators and researchers have debated whether 'A.I. teacher' will replace 'human teachers' or not. Of course A.I. can already perform better than human in certain areas like collecting and memorizing facts/data and process those data in nano seconds. Intelligent tutoring systems have been shown to be highly effective at increasing students' performance and motivation (Shute, Glaser, & Raghavan, 1989). Many other studies also have suggested using artificial intelligence technology as an auxiliary role in teaching and learning in a certain environment (Kaufmann, Schmastieg, 2003; Matcha & Rambli, 2016). However, other areas like emotional or affectional domains and higher order thinking skills still need further research for A.I. to perform at a reasonable level. Regarding the question whether 'A.I. teachers' can replace 'human teachers' in the future, we first need to identify to what extent human teachers equipped with what competencies to foster students' creativity and higher order thinking skills.

In order to foster students' creativity, teachers themselves should be taught and have opportunities to develop their own creativity and knowledge about how to make a creative learning environment for their students. Nevertheless, the studies in teachers' creativity that can enable them to be confident in teaching and cultivating students' creativity in the classroom are still rare.

Amabile (1998) addressed that creativity contains creative thinking ability, motivation, and expertise. Therefore, the concept of creative teacher refers to a teacher who possesses teaching expertise and thinks and behaves creatively in teaching and learning environments. In this case, teaching expertise refers to professional capacity, such as knowledge, skills, attitudes, and traits teachers must be equipped with for student learning. It can be inferred that there is a significant relationship between teacher creativity and teaching expertise.

In Lee et. al.'s (2016) work, through regression analysis it was verified that teacher creativity and teaching expertise have a meaningful effect on creative teaching behaviors for pre-service teachers. As a fallow-up the previous studies, this study is to investigate how different teacher's creative competences are by gender and years of teaching career, and examine the relationship among creativity, teaching expertise, creative teaching behaviors, and teacher motivation of elementary school teachers in Korea.

2. RESEARCH DESIGN & METHODS

2.1. Subjects

The research subjects consisted of 153 Korean elementary school teachers in Seoul metropolitan area (Seoul and Gyeonggi province). Of the 153 teachers, 25(16.3%) were male while 128(83.7%) were female.

2.2. Measurements

The main variables of this study were teacher creativity, teaching expertise, teacher motivation, and creative teaching behaviors, as seen in Table 1. The questionnaires have a total of 129 items composed of four major categories and 26 sub-categories. The items measured using the 5-point Likert-type scale.

Table 1. Items of Creative Teacher Competences Questionnaire for Elementary School Teachers in Korea

Category		Subcategory(Number of items)
Teacher Creativity	Thinking Ability	Inference(8), Questioning(8), Critical thinking(8), Integration(8)
	Imagination & Originality	Openness(5), Fluency(5), Elaboration (5), Divergent thinking(5)
Teaching Expertise		Subject knowledge comprehension(4), Instructional design(5), Instructional technical adaptability(11), Student assessment(3), Instructional attitude(10)
Teacher Motivation		Grit(12), Mastery goals(5), Performance-approach goals(5), Performance-avoidance goals(5)
Creative Teaching Behaviors		Independence(5), Integration(5), Motivation(5), Judgement(5), Flexibility(5), Evaluation(5), Question(5), Opportunities(5), Frustration(5)

2.3. Data Collection and Analysis

Data regarding Creative Teacher Competences were collected using an online questionnaire (Google Form) from June 5, 2018 to June 28, 2018. Descriptive statistics, correlation analysis, reliability, t-test and ANOVA were conducted using SPSS Statistics 23.0. We also investigated structural relationships among the variables using AMOS 23.0.

3. RESULTS

3.1. Descriptive Statistics

In order to check for the presence of outliers in the sample, descriptive statistics were analyzed. In the results, as seen in Table 2, outliers were not detected in mean or standard deviation. Among different variables, Korean elementary teachers showed the highest level of competencies in ‘teaching expertise’ followed by ‘creative teaching behaviors’. On the other hand, Korean teachers’ motivational level to cultivate their own ‘creatively teaching competency’ was the lowest.

Table 2. Descriptive Statistics

Category	N	Mean	S.D	Skewness	Kurtosis
Teacher Creativity	153	3.88	0.51	-0.30	-0.16
Teaching Expertise	153	4.25	0.49	-0.26	-0.74
Teacher Motivation	153	3.47	0.41	-0.17	-0.07
Creative Teaching Behaviors	153	4.15	0.52	-0.39	-0.16

3.2. Reliability Analysis and Correlation Analysis

The result of the reliability analysis revealed that Cronbach's α was reasonably high (from .783 to .964) for all the items of Creative Teacher Competences. The Pearson’s correlations coefficient of all categories showed .538 to .769, which means that there was a considerable positive correlation between each of the factors. In addition, this also confirmed that there was no multicollinearity among the factors because there were no coefficients of 0.90 or higher (Kline, 2011).

3.3. t-test and ANOVA

t-test was conducted to examine the difference in latent variables according to gender. As seen in Table 3, there was no significant difference in latent variables according to gender.

Table 3. t-test for gender differences

	gender	N	Mean	S.D	t	p
Teacher Creativity	male	25	3.99	0.44	1.206	.230
	female	128	3.86	0.52		
Teaching Expertise	male	25	4.22	0.49	-.329	.742
	female	128	4.25	0.49		
Teacher Motivation	male	25	3.49	0.38	.184	.855
	female	128	3.47	0.41		
Creative Teaching Behaviors	male	25	4.09	0.53	-.608	.544
	female	128	4.16	0.52		

1-2 years experienced teacher's creative competences level was the highest, while 3-5 years experienced teacher's creative competency level was the lowest as seen in Table 5. In addition, teachers' creative competence levels for 11 years or more were similar to those of 1-2 years. ANOVA indicated that there was a significant difference by the year of teaching career in ‘teacher creativity’ and ‘creative teaching behaviors’, as shown in Table 4.

Table 4. Descriptive statistics and ANOVA for teaching career differences

	teaching career	N	Mean	S.D		Sum of Squares	df	Mean Square	F
Teacher Creativity	1-2years	11	4.09	0.53	Between Groups	2.557	4	.639	2.570*
	3-5years	36	3.72	0.51					
	6-10years	42	3.83	0.47	Within Groups	36.799	148	.249	
	11-15years	29	4.06	0.50					
	More than 16 years	35	3.88	0.52	Total	39.356	152		
Teaching Expertise	1-2years	11	4.28	0.53	Between Groups	2.092	4	.523	2.288
	3-5years	36	4.11	0.46					
	6-10years	42	4.18	0.46	Within Groups	33.818	148	.228	
	11-15years	29	4.43	0.49					
	More than 16 years	35	4.32	0.50	Total	35.909	152		
Teacher Motivation	1-2years	11	3.56	0.39	Between Groups	1.298	4	.324	2.024
	3-5years	36	3.37	0.43					
	6-10years	42	3.42	0.44	Within Groups	23.724	148	.160	
	11-15years	29	3.63	0.38					
	More than 16 years	35	3.49	0.35	Total	25.022	152		
Creative Teaching Behaviors	1-2years	11	4.31	0.42	Between Groups	4.503	4	1.126	4.557**
	3-5years	36	3.91	0.54					
	6-10years	42	4.05	0.44	Within Groups	36.559	148	.247	
	11-15years	29	4.33	0.50					
	More than 16 years	35	4.30	0.53	Total	41.062	152		

*p < .05, **p < .01

3.4. Structural Equation Model

As shown in Figure 1, the fit statistics indicate that the research model provides a reasonably good fit to the data ($\chi 2$ = 453.259, df = 265, CFI = .931, TLI = .921, RMSEA = .068). In Table 5, it was found that teacher creativity and teacher motivation had a significant positive effect on teaching expertise. And teaching expertise had a significant positive effect on creative teaching behaviors. Both of teacher creativity and teacher motivation did not have a significant effect on creative teaching behaviors, but teaching expertise had a significant positive effect on creative teaching behaviors. The conclusion could be drawn that teacher creativity and teacher motivation have a significant impact on teaching expertise and teaching expertise have a significant effect on creative teaching behaviors.

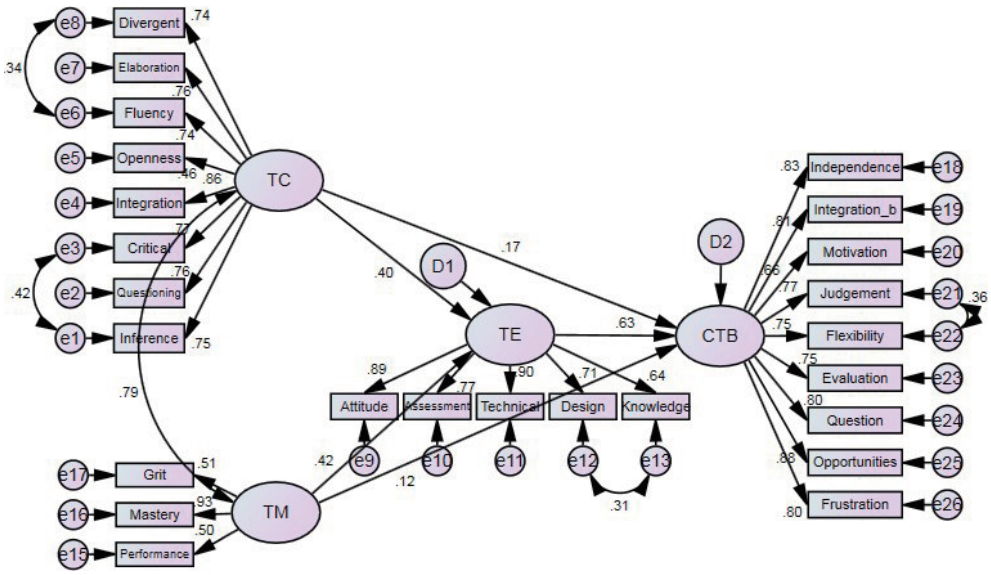


Figure 1. Structural Relationships among Teacher Creativity, Teaching Expertise, Teacher Motivation and Creative Teaching Behaviors

Table 5. Parameter Estimates

Path	B	S.E.	C.R.	β
Teacher creativity →Teaching expertise	.452	.154	2.938	.403 **
Teacher creativity →Creative teaching behaviors	.193	.124	1.556	.166
Teacher motivation →Teaching expertise	.425	.149	2.856	.416**
Teacher motivation → Creative teaching behaviors	.130	.118	1.100	.122
Teaching expertise →Creative teaching behaviors	.661	.104	6.341	.635***

*p < .05, **p < .01, ***p < .001

4. Conclusion and Discussion

Through the Structural Equation Model, it was confirmed that teacher creativity and teacher motivation had a significant impact on teaching expertise and teaching expertise had a significant

effect on creative teaching behaviors. In previous research for pre-service teachers (Lee, Choe, & Kim, 2016), teacher creativity had a direct positive effect on creative teaching behaviors. On the other hand, in the present study for in-service teachers, the creativity did not affect the teaching behavior. Moreover, the results concluded that teacher motivation had an indirect effect on creative teaching behaviors through teaching expertise. Creative teaching behavior is a necessary attitude for students' creative competence, but teacher motivation did not directly affect creative teaching behaviors. Teacher motivation, on the other hand, indirectly influenced creative teaching behaviors through teaching expertise. Although high motivation alone cannot increase creative teaching behaviors, if teaching expertise is applied, high motivation will have a positive effect on creative teaching behaviors through mediation of teaching expertise.

From these results, important implications can be expected to specifically target and improve the programs to cultivate creative teacher competences of in-service teachers as well as A.I teachers. We can also inform the research of 'A.I. teachers' about the types and levels of skills and performances 'A.I. teachers' should have in the future.

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The Use of Spatial Augmented Reality Technology for Children's Programming Activity in Traditional Subject Courses

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Abstract: Introducing programming education is an increasing trend around the world. In Japan, the learning of programming will be adopted in the national primary education curriculum in 2020. However, the programming activity is incompatible with the traditional primary education that puts high priorities to real experience and collaborative learning because the programming tends to be a virtual and individual experience on a computer screen.

To cope with this problem, this study proposed utilizing Spatial Augmented Reality (SAR) technology and implementing a tangible collaborative programming table. SAR is the methodology of superimposing computer vision on objects in the real world with projection mapping. As tangible objects are involved, the use of SAR can make the programming activity suitable for children in the concrete operational stage. Additionally, SAR on the table can promote collaborative learning, as it allows several children to carry out programming together. Operations done on the SAR environment are captured with the depth camera, converted to a planar, multitouch operation, and processed as operations on the general desktop program. This design allows for the development of coding and program processing modules on non-SAR environments and adoption of the external developments of them, which is expected to accelerate the improvement of visual programming language that satisfies the new requirements of this study.

Key words: Programming, Concrete operational stage, Tangible Interface, SAR

INTRODUCTION

Programming education has attracted much attention in this past decade, as information dominant social infrastructure and rise of Artificial Intelligence (AI) is said to cause the transition of required competencies for the new generations (British Academy and The Royal Society, 2018). This programming education is different from the conventional one for human resource development nurturing ICT engineers. A good grounding in computation is required for everyone in all fields as Wing (2006) claimed in the concept of computational thinking. Like computing becoming a school subject in England, programming has started to become a compulsory content in school curriculum in some countries.

Also in Japan, programming was decided to be compulsory in primary education by the revision of national curriculum in 2020, and programming education for children especially drawing interest. As Matsuda, principal of Maehara Elementary School, said "Programming is a new media of dynamic expressions for children's imagination" (Matsumura, 2018); therefore, the

role of programming as media for expression of idea and arts is expected in educational field.

Despite children having acquired the computer's power of expression with programming, its difficulty for children has been reported. Generally, programming is an activity in an abstract world and handling programming language is a kind of experience with verbal symbols and may be placed at the top of Edgar Dale's the Cone of Experience. To achieve success in educational activities, considering children's developmental stage is indispensable.

Primary education (grade 1-6) corresponds to the concrete operational stage of Piaget's theory of cognitive development (Huitt & Hummel, 2003), and real experience through actual objects and collaborative learning activities through communication between peers has been considered effective there. In contrast, a programming activity is generally conducted facing a personal computer screen. Therefore, it tends to be a virtual experience only relying on visual information and isolated engagement from the other learners. This situation is considered incompatible with traditional primary education.

Programming education for children has been studied before, but those conventional approaches may be less adequate due to the emerging concerns in introducing programming. This study is tackling this problem through developing new programming environment in which recent improvements of interface and technology of virtual / augmented reality (VR/AR) is applied. This paper explains the technical overview of the new programing environment and proposes its architecture that promotes improvement of programming language for children.

PROGRAMMING AND CONCRETE OPERATIONAL STAGE

As to successful approaches to programming for little children, there are robot programming and tangible programming (Bers & Horn, 2010). For the children in the concrete operational stage, operating tangible objects and making concrete objects move around is an attractive activity. Many little children like to watch a robot vehicle driving as they programmed in the real world. Operating tangible command blocks are easy for children to construct their program as they like. You can see many products related with programming robots and tangible programming tools at the educational exhibition.

But these solutions are getting unsuitable for the new aim of programming, especially for the Japanese situation in schools. An unconventional point of introducing programming into the Japanese school education is programming being positioned in learning traditional subject courses. The programming is used not only for understanding computing or making students' creative works, but also for developing students' understanding of the specific subject.

There is a great difference between the educational aim of programming robots and the contents of the subject. Furthermore, robotics programming is exposed to the uncertainty of the real environment and dealing with this uncertainty is essential for the learning of robotics. In contrast, the important aim of the new programming for subjects is examining the process to reach a goal and the uncertainty becomes an obstacle for the aim where the students want to concentrate on the rightness of their algorithms. Because of these reasons, applicable robot programming activities are considered few. Tangible programming also has a disadvantage over this aim — that is, comparing several algorithms is difficult because the program may be lost when reconstructing due to the physical restriction on limited numbers of command blocks.

RE-INTERPRETATION OF TANGIBLE PROGRAMMING AND TECHNOLOGY OF SPATIAL AUGUMENTED REALITY

As evident from the previous studies mentioned earlier, tangibility is essential for the children; hence, this study tried to reinterpret the tangibility in programming activities. Robot programming can be considered as the methodology making "an execution subject" of the program tangible. Similarly, tangible programming can be considered as the methodology making the "program code" tangible.

The execution subject should be operated accurately for the new aim of programming. The program code should be easily copied and traced for its modification. The virtual representation has an advantage in achieving these targets.

This study focused on the remained "object" tangibility. The "object" means an object interacted by the execution subject. For example, it can be shapes for measuring area, and a layout of a house for considering a convenient daily life. The programmed execution subject will interact with these objects and programmer can get the result they targeted from their algorithms.

This study's approach is considered suitable for the new programming education like one introduced in Japan. The example themes of programming in the traditional subject courses described in Japanese new national curriculum are the following:

Mathematics: In the unit of "figures" such as regular polygons, students are expected to understand constituent elements of figures, like the length of sides and the degrees of an angle, as well as to understand that a computer is good for repeating similar operations and for the operation to run accurately.

Science: In the unit of "electricity and its application", students are expected to understand the mechanism of familiar electrical appliances that operate by adapting to a changing environment, such as temperature and brightness, and to construct a logic about the operation using sensors and actuators.

Applying this study's object-tangible idea, in mathematics, a specimen figure will be a tangible object given physically by a teacher. The virtual robots, in which the execution subject of the programs will be written by students, will interact with the object by tracing and examining it. In science, the peripheral environment such as a miniature house or an outdoor setting will be given as tangible object. Students will make a program sensing the phenomenon simulated of the real world (such as an approaching of a human, getting dark) and making action of virtual equipment (such as opening an auto door, turning on a light).

This object-tangibility that exchanges between conventional real and virtual targets can be implemented with employing the technology of Spatial Augmented Reality (SAR). Augmented Reality is a technology supplementing the real world with superimposed computer visions, and its virtual objects seem to coexist in the same space with the real world (Azuma et al., 2001). Due to its educational effect, there have been increasing applications of AR to educational settings (Bacca et al., 2014; Saltan & Arslan, 2017). Spatial AR that superimposes computer vision with projector images has a benefit for a natural collaborative activity without head-mounted displays (Schmalstieg & Höllerer, 2016, p. 78).

The component of the SAR programming environment is shown in Figure 1. SAR is realized with projector mapping on the table (A). With the tangible object (B) on the table, the projectors (C) overlap the virtual image of a programmed execution subject (D).

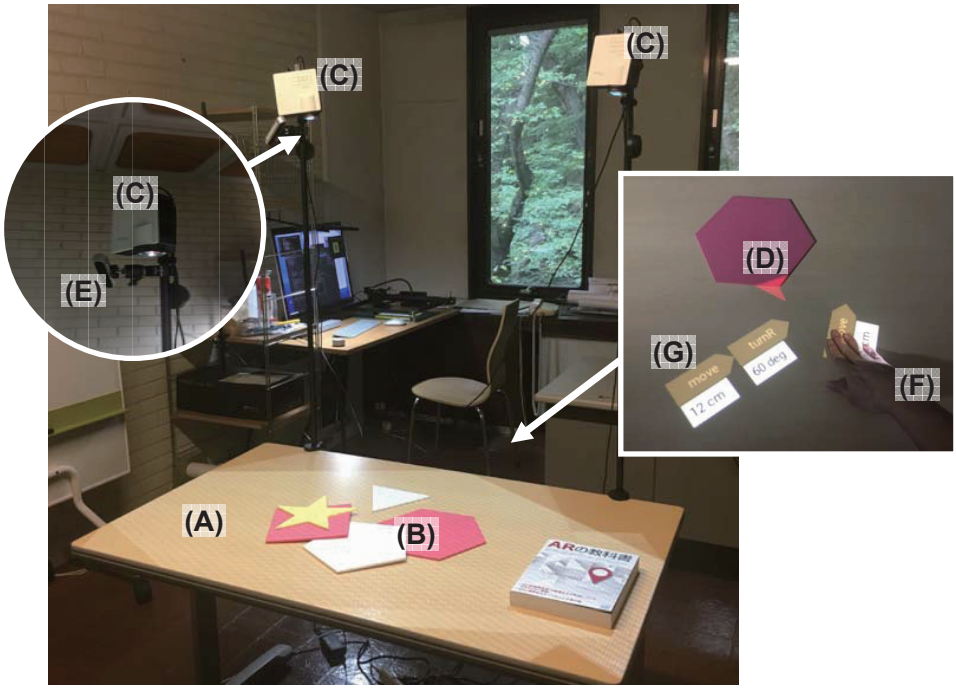


Fig. 1 Programming table with Spatial Augmented Reality

With motion capture technology, a depth camera (E) captures gestures of programmers (F) and let the execution subject moved manually. The virtual program codes (G) are also overlapped at the remained space on the table and modified and executed with programmers' gesture.

SEPARATED ARCHITECTURE OF LANGUAGE EXECUTING SYSTEM AND ITS INTERFACE

In order to incorporate a new emerging interface like tangibility and SAR, new programming language and good operability are required, however, the design of the interface for conventional visual programming languages is reflected by the legacy usage of the computer with a mouse and keyboard. New programming languages should be free from the legacies and pursue an intuitive operation for children. For the ideal, various programming languages must be proposed and refined through their practice.

This study proposes an approach adopting script language platform and separating SAR interface from the program executing system.

For the development of rich interface, an approach of native development is generally provided to bring out the best performance and functionality of its platform. On the contrary, adopting script language that creates benefits of rapid development through trial-and-error, and acquisition of cooperation from open source community is considered suitable for this study development.

The SAR interface development is not common and there is few available equipment. Therefore, this study proposes an architecture converting between the action in the SAR environment

captured with a depth camera and the 2D multitouch screen operation on the desktop application. With this approach, the program executing system will be allowed to be developed in the conventional multitouch application.

From these approaches, this study is advancing in development with Kivy, a Python GUI framework (Phillips, 2014). Kivy is available for multi devices such as Windows tablet, Android and iOS devices and provides multitouch operations. The mechanism of developing the system is the following: Depth information captured from the depth camera (Intel Realsense D415) is acquired through the Realsense library, pyrealsense2, then is recognized as objects on the table with OpenCV, a popular library of computer vision. Recognized objects are handled as GUI objects (subclass of Scatter widget) on the Kivy, and the program execution system can interact with the objects on the table. The window image of the Kivy program execution system will be projected on the table being transformed according to the setting of the projectors.

RESULT AND CONCLUSION

Projection images interacted with motion-captured gestures can implement large-scale responsive environment, and its playful and educational effect has been presented (Mandanici et al., 2018). This study allows to extend it to programming activities.

An example of object-tangible programming for learning figures in mathematics is following: Students get a sample polygon made of a wooden board and they are given the task of drawing the same figure as the sample with their programmable virtual characters. Students can measure the lengths and the angles of the polygon using their popular tools of a ruler and a protractor. When a student put and keep his/her hand on the table, the command palette appears, and he/she build a program according to the result of the measurement. When the completed programs are dragged into their character, and the characters get started to move. Students can check whether their characters trace the edge of the polygon rightly. Students may feel a little meaning if they asked to trace a figure shown on the screen because it is already drawn. Because the figure is a real thing, they can feel the significance of interaction with the object.

This study aimed to cope with the difficulty of the successful programming activity for the traditional subject courses in primary education by developing the architecture of the SAR programming environment. To put it into practice, it is required to progress the development of teaching materials corresponded to the specific teaching contents, as well as to progress the development of programming language that is suitable to the teaching contents of traditional subject courses.

ACKNOWLEDGEMENT

This work was supported by JSPS KAKENHI Grant Number JP18H05750, JP19K20946.

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An Investigation of Factors Related to Techno-stress Perceived by Elementary school Teachers

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Abstract: The purpose of this study was to explore factors that affect the technostress of elementary school teachers. To achieve the purpose, the following research questions have been established: First, what are the factors related to technostress perceived by elementary school teachers? Second, how do the factors affect the perceived technostress of elementary school teachers?

The participants were 207 elementary school teachers, and they responded to a set of questionnaires to measure their perceived attitude of technology, teacher efficacy, school's support, and technostress. Data were analyzed using an independent two-sample t-test, one-way ANOVA, and multiple regression analysis. The result of this study was significant in that the technostress-related factors perceived by teachers were investigated. In addition, it will provide practical methods for reducing the technostress perceived by teachers and for operating technology-based classes effectively. This study has an implication for planning and operating teacher training programs to develop teachers' capability to select and to use technology in their instruction.

Key words: technostress, attitude of technology, teacher efficacy

INTRODUCTION

The development of information and communication technology (ICT) provides the basis for creating the characteristics and culture of 21st century learners, called the digital native generation (Kim & Chung, 2017). In the case of Korea, about 90% of the population aged 3 years or older is using smart devices, with smart device usage rates for children aged 3 to 9 rising by about 13% compared to 2016 (Korea Internet & Security Agency, 2018). In education, efforts to utilize technology such as digital textbooks, SNS, and interactive APP based on smart devices

are continuing. As part of these efforts, The Ministry of Education, Science and Technology (2011) has established a 'Smart Education Strategy Implementation Plan' and is making efforts to improve classroom instruction. Specifically, smart education means self-regulated learning methods, motivated learning methods, adaptive learning methods, and learning methods with resource-enriched technology-embedded learning (The Ministry of Education, Science and Technology, 2011). In other words, smart education is not simply learning based on smart devices. Smart education's objective is to provide learners with meaningful learning experiences based on technology.

Teacher is important for successful technology-based instruction (Ertmer, 2005; Kiraz & Odmir, 2006; Knezek & Christensen, 2008). No matter how good contents or textbooks are, they are ineffective without teacher's effort and creative instruction (Lim, 2010). In fact, previous studies have found that teacher is crucial to the success of ICT-based instruction (Cuban, 1986; Ertmer, 2005; Kiraz & Odmir, 2006; Knezek & Christensen, 2008; O'Dwyer, Russel, & Bebell, 2004; Park & Ertmer, 2007). Nonetheless, changes in school education such as introducing digital textbooks, tend to be initiated primarily by higher-level administrative agencies such as the Ministry of Education (Sung & Cho, 2012). Therefore, the implementation of the teacher objective and in some cases, the policy making process may be delayed after introducing the policy (Kim & Chung, 2017).

As technology begins to apply to classrooms, teachers experience a variety of changes (Joo, Chung, Choi, & Yi, 2015). The teacher may have difficulty in modifying existing teaching methods or strategies as they become exposed to technology and apply to instruction (Pamuk, 2012). In addition, as information and communication technology develops, it becomes difficult to learn how to use smart devices and technologies that are newly introduced and to apply them to instruction. Therefore, in order to increase the utilization of technology in instruction, it is necessary to strengthen the capacity of teachers (Jo & Cho, 2012; Yuen & Ma, 2008). For this reason, teachers experience stress in the application of technology to instruction, which is called technostress (Al-Fucail & Mellar, 2008).

Techno-stress is a combination of technology and stress. Technostress occurs when a new technology environment causes an individual or organization to have difficulty adapting to new technology (Brod, 1984). There are two types of technostress. One is the anxiety or worry experienced by the individual. The other is too much reliance on technology. Technostress can be broken down into techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2007).

Teachers experience technostress in the following situations (Al-fudail & Mellar, 2008; Joo, Lim, & Kim, 2016; Lim, 2012;): First, there is not enough time for real instruction because it takes a lot of time to install and use the materials needed for technology instruction. Second, there is a fear of the occurrence of technical errors during class. Third, there is a lack of knowledge about the use of technology to teach. Fourth, there is a lack of awareness about the use of technology by peers or schools. Fifth, there is a lack of physical and administrative support from the school to operate technology-based instruction. Sixth, there are many other tasks for teachers besides instruction.

In other words, teachers perceived technostress through technological knowledge and attitudes, school support, and the physical environment of the school (technology affordance). In addition,

teachers with high teaching efficacy tend to use new teaching methods, and student achievement is also high (Huang, 1999). From this point of view, it is necessary to consider examining the relationship between teacher efficacy and technostress.

Therefore, the purpose of this study was to investigate the factors of techno-stress perceived by teachers. To achieve the purpose, the following research questions have been established: First, what are the factors related to techno-stress perceived by elementary school teachers? Second, how do the factors affect the perceived techno-stress of elementary school teachers?

RESEARCH DESIGN & METHODS

The purpose of this study was to examine the factors of technostress perceived by elementary school teachers. The questionnaire consisted of six parts. More specifically, it was made up of categories for attitude and knowledge of technology (Archambauit & Crippen, 2009), support of school (Lam, Cheng, & Choy, 2010), technology affordance (Lee, Lee, & Eom, 2018), teacher efficacy (Tschannen-Moran, & Hoy, 2001), technostress (Ayyagari, Grover, & Purvis, 2001), and demographic information. The questionnaire was composed of 75 items with the Likert 5-point scale. Each question used the Likert 5-point scale, with responses from 1 as “never” to 5 as “extremely”. A survey was conducted to gather data for the analysis with a sample of 207 elementary school teachers. The Cronbach’s α was presence .94, attitude and knowledge of technology .98, support of school .94, technology affordance .89, teacher efficacy .93, and technostress .93. Data were analyzed using Cronbach’s α, frequency analysis, t-test, one-way ANOVA, and multiple regression analysis.

RESULTS

<Table 1> shows the perceived knowledge and attitude of elementary school teachers according to their teaching career. According to <Table 1>, teachers who had 11 to 15 years of career perceived higher attitude and knowledge of technology than those of over 21 years.

<Table 1> Attitude and knowledge of technology by career

Index	-5(*N*=40)	6-10(*N*=47)	11-15(*N*=4)	16-10(*N*=26)	21- (*N*=46)	*F*	Scheffé
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*		
technology attitude	3.53(.87)	3.54(1.27)	3.84(.78)	3.22(.85)	3.02(.81)	5.14**	
TK	3.34(.89)	3.40(1.07)	3.77(.86)	3.11(.92)	3.05(.94)	3.53**	
TCK	3.57(.79)	3.73(.84)	3.84(.80)	3.48(.80)	3.34(.83)	2.74*	11-15 > 21 -
TPK	3.48(.88)	3.54(.92)	3.72(.83)	3.37(.80)	3.25(.82)	1.91	
TPACK	3.50(.80)	3.58(.92)	3.80(.73)	3.34(.78)	3.18(.77)	3.68**	11-15>21-

* p <.05., ** p <.01.

The one-way ANOVA was conducted to examine the teacher efficacy by career. <Table 2> shows the results. As <Table 2> shows, teachers who had 11 to 15 years more than over 21 years.

<Table 2> Teacher efficacy by career

Index	-5(*N*=40)	6-10(*N*=47)	11-15(*N*=4)	16-10(*N*=26)	21- (*N*=46)	*F*	Scheffé
	M(SD)	*M(SD)*	*M(SD)*	*M(SD)*	*M(SD)*		
educational support	3.76 (. 68)	3.76(.56)	3.88 (.55)	3.80 (.61)	3.78 (.70)	.69	
instruction management	3.69 (.64)	3.63(.70)	4.00 (.53)	3.74 (.79)	3.74 (.78)	1.32	
instruction strategy	3.84 (.64)	3.84 (.62)	4.03 (.52)	3.71 (.82)	3.73 (.74)	1.09	
task difficulty	3.31 (.66)	3.44 (.59)	3.76 (.64)	3.43 (.63)	3.49 (.58)	1.27*	11-15>21-
teacher efficacy	3.76(.62)	3.73(.57)	3.94(.49)	3.74 (.60)	3.75 (.71)	.95	

* p <.05.

The one-way ANOVA was conducted to examine the attitude and knowledge of technology by education level. <Table 3> shows the results. As <Table 3> shows, teachers who had a higher education level perceived more technology knowledge, technology contents knowledge, technology pedagogy knowledge, and technology pedagogy contents knowledge.

<Table 3> Attitude and knowledge of technology by education level

Index	bachelor (*N*=136)	MA or higher (*N*=71)	*t*
	M(SD)	*M(SD)*	
technology attitude	3.37(.98)	3.56 (.90)	-1.35
TK	3.22 (.96)	3. 62 (.92)	-2.88**
TCK	3.47 (.83)	3.85 (.71)	-3.31**
TPK	3.36 (.87)	3. 69 (.80)	-2.66 * *
TPACK	3.38(.84)	3.69 (.75)	-2.57*

* p < .05., ** p < .01.

The t-test was conducted to examine the teacher efficacy by position. <Table 4> shows the results. As <Table 4> shows, manager teachers perceived more task difficulty in teacher efficacy.

<Table 4> teacher efficacy by position

Index	general teacher (*N*=121)	manager teacher (*N*=86)	*t*
	M(SD)	*M(SD)*	
educational support	3.76 (.61)	3.86 (.63)	-1.21
instruction management	3. 71 (.65)	3. 83 (.75)	-1.21
instruction strategy	3.82 (.66)	3.86 (.69)	-.34
task difficulty	3.39 (.59)	3.63(.67)	-2.75**
teacher efficacy	3.74 (.58)	3. 84 (.64)	-1.02

** p < .01.

<Table 5> shows the result of technology affordance and school support by technology leading school. According to <Table 5> shows, technology leading school teachers in technology affordance and support of school.

<Table 5> Technology affordance and school support by technology leading school

Index	yes(*N*=149)	no(*N*=58)	*t*
	M(SD)	*M(SD)*	
environment support	3.84 (.69)	3.31 (.83)	4.66***
career support	3. 86 (.88)	3. 26 (.88)	4.43***
school support	3.85 (.73)	3.28 (.81)	4.85***
technology affordance	3.86 (.83)	3.28 (.96)	4.31***

*** p < .001.

The t-test was conducted to examine technostress and support of school by technology leading school. <Table 6> shows the results. As <Table 6> shows, technology leading school teachers in techno- overload and techno-complexity.

<Table 6> Techno-stress and support of school by technology leading school

Index	yes(*N*=149)	no(*N*=58)	*t*
	M(SD)	*M(SD)*	
techno-overload	3.52 (.65)	3.30 (.75)	2.16*
techno-invasion	3. 13 (.82)	2.93 (.86)	1.54
techno-complexity	3.16 (.80)	2.85 (.91)	2.43*
techno-insecurity	3.05 (.95)	2.93 (.98)	.86
techno-uncertainty	2.75 (.95)	2.63 (.93)	.83
technostress	3.12 (.68)	2.93 (.70)	1.86

*p < .05.

The multiple regression analysis was performed to examine the significant effect of presence technology-related in technostress. The result was presented in <Table 7>. As <Table 7> shows, environment support and technology affordance have an effect on technostress.

<Table 7> The effect of technology-related techno-stress

	Index	*R*	R^2	*F*	*B*	*β*	*t*
techno-stress	attitude and knowledge of technology	.72	.52	24.01 ***	.80	.71	-4.90 ***
	school support	.60	.36	14.77	.56	.60	-3.84
	technology affordance	.11	.03	2.64	2.75	.11	1.62
	teacher efficacy	. 18	. 03	7 .19 **	.49	- . 18	-2.68 **

** p < .01., *** p < .001.

Conclusion

The purpose of this study was to examine the variables of technostress perceived by elementary school teachers. The results of the study were as follows: First, the techno-stress's factors are conducted of technology knowledge, technology pedagogy contents knowledge, task difficulty, technology affordance, school support, techno-overload, and techno-complexity. Second, environment support, technology affordance affect satisfaction in flipped learning environment.

The result of this study was significant in that the technostress-related factors perceived by teachers have been investigated. In addition, it will provide practical methods to reduce the technostress perceived by teachers and to operate technology-based classes effectively. This study has an implication for planning and operating teacher training programs to develop teachers' capability to select and to use technology in their instruction.

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Analysis on Korean Elementary Teachers' Stage of Concerns about Maker Education

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Abstract: This study was aimed to examine Korean elementary teachers' concerns in practicing Maker education based on Concerns-Based Adoption Model (CBAM). For this, a questionnaire survey was conducted targeting 180 elementary teachers. Percentile analysis, T-test and ANOVA were carried out. As a result, in general the Korean elementary teachers' concern level was identified as a non-user pattern. The highest percentage of the respondents showed either 'Stage 0: Unconcerned' to Maker education or 'Stage 1: Informational concerns' showing limited awareness of Maker education. The analyses of differences by gender, years of teaching, educational level, and position in a school revealed that statistically significant differences depending on the years of teaching and position. Also, there were significant differences in concern levels depending on the degree of implementation of Maker education in their teaching practice.

Based on the results, we will discuss implications for follow-up research in Maker education and teacher professional development for Maker education which can be customized by teacher characteristics such as years of teaching or their position in a school.

Key words: Maker Education, Maker Movement, Concerns-Based Adoption Model (CBAM), Stages of Concern

INTRODUCTION

Maker education derived from the Maker Movement provides students with various opportunities for making creative outputs through problem-solving thinking and trial-and-errors(Kafai, Fields, & Searle, 2014). Maker education is an emerging paradigm of education requiring the use of new and diverse teaching media and digital devices. Maker education can be effective teaching and learning approach that can foster students' collaboration, communication, creativity, critical thinking, problem- solving skills, computational thinking, etc(Halverson & Sheridan, 2014; Martinez & Stager,2013).

In spite of those positive expectations for Maker education, since the Maker education is still a new approach in schools in Korea, many teachers are quite reluctant to employ this new approach in their classrooms. As for many other innovative approaches in schools (such as introduction of computers in the classroom in the past), reluctance or resistance of teachers to the innovation can be a big barrier to the success of the innovation. While Maker education has many potentials for students to be more active and engaging learners and to develop important and diverse core competencies, it has to be accepted and practiced by the teachers in order for the educational potential to be accomplished.

Recently, Korean national and regional governments have invested huge money to construct Maker spaces in and out of elementary schools (Ministry of Education, 2016). As usual, the money for such innovation has been first spent on hardware including devices (i.e., 3D printers, robots, drones, etc.), interiors, and even buildings. However, it is more critical to consider to what extent those expensive spaces and devices can be effectively used by learners and teachers. In this study, we intend to use the Concern Based Adoption Model (CBAM) model to find the teachers' interest in the Maker education and the degree of implementation. The CBAM model shows typical changes in the level of interest and is used as a model that is useful in predicting the user's interest in the new policy and innovation (Hall, 1979, Hall & Hord, 2006).

RESEARCH DESIGN & METHODS

The survey discerned the answers from these three research questions: 1) “What are the elementary school teachers' stages of concerns about Maker education?”, 2) “Is there a significant relationship between the elementary school teachers' stages of concerns and gender, years of teaching, educational level, and position in a school?”, and 3) “Are there significant differences in concern levels depending on the degree of implementation of Maker education in their teaching practice?” We analyzed 175 elementary school teachers' stage of concerns based on CBAM model.

The CBAM model was developed according to the Hall & Hord(2006)'s the Stages of Concern Questionnaire (SoCQ) to identify respondents’ stages of concerns and the data were analyzed with SoCQ quick scoring devices. Because of its value in helping to explain patterns of concerns and attitudes, the SoCQ is widely used. It consists of 35 items, using a seven point Likert scale.

[Table 1] The Stages of Concern About an Innovation(George, Hall & Stiegelbauer, 2006)

Stages of Concern		Explain of Concern
6	Refocusing	The individual focuses on exploring ways to reap more universal benefits from the innovation, including the possibility of making major changes to it or replacing it with a more powerful alternative.
5	Collaboration	The individual focuses on coordinating and cooperating with others regarding use of the innovation.
4	Consequence	The individual focuses on the innovation’s impact on students in his or her immediate sphere of influence. Considerations include the relevance of the innovation for students; the evaluation of student outcomes, including performance and competencies; and the changes needed to improve student outcomes.
3	Management	The individual focuses on the processes and tasks of using the innovation and the best use of information and resources. Issues related to efficiency, organizing, managing, and scheduling dominate.

2	Personal	The individual is uncertain about the demands of the innovation, his or her adequacy to meet those demands, and/or his or her role with the innovation. The individual is analyzing his or her relationship to the reward structure of the organization, determining his or her part in decision making, and considering potential conflicts with existing structures or personal commitment. Concerns also might involve the financial or status implications of the program for the individual and his or her colleagues.
1	Informational	The individual indicates a general awareness of the innovation and interest in learning more details about it. The individual does not seem to be worried about himself or herself in relation to the innovation. Any interest is in impersonal, substantive aspects of the innovation, such as its general characteristics, effects, and requirements for use.
0	Unconcerned	The individual indicates little concern about or involvement with the innovation.

For statistical analysis, the raw data were entered in the Statistical Package for Social Sciences (SPSS), version 21.0. The overall Cronbach's alpha for the Korean SoCQ was 0.94, showing that the survey questionnaire had a strong internal consistency. Each stage's Cronbach's alpha was greater than 0.6, confirming that each stage has good internal consistency.

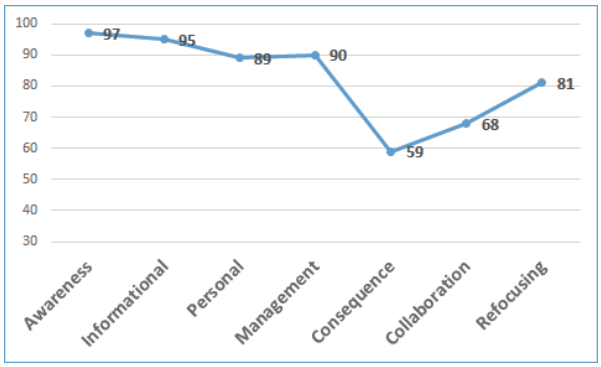
RESULTS

<

Table1> and <Figure 1> indicates that the percent of teachers in Stages 0(Unconcerned) and 1(Informational) was higher than the other Stages. This signifies a typical non-user profile (Hall & Hord 1987). CBAM model analyzes this pattern as Korea elementary school teachers have little concern about Maker education and were not yet involved with the transition (George et al. 2013). And the pattern in which Stages 5 and 6 appear relatively high compared to Stages 4 represents some similar characteristics to the 'Renewing User' pattern. But It was called tail-up pattern and it implies that respondants might be resistant to digital textbooks. Overall, this is in the early stages of interest in the Maker education, but it also shows that there is a willingness to organize and implement classes in cooperation with other teachers and experts, as well as a desire to apply them in various ways.

[Table 2] Stages of concern about Maker education

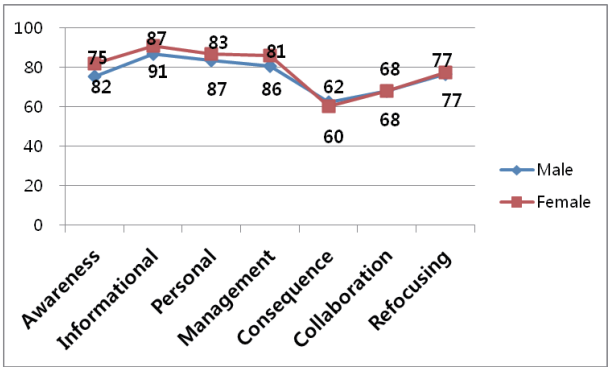
Stages of Concern		M	Relative Intensity (%)
Unrelated	Awareness	19	97
Self	Informational	28	95
	Personal	27	89
Task	Management	25	90
Impact	Consequence	26	59
	Collaboration	25	68
	Refocusing	24	81



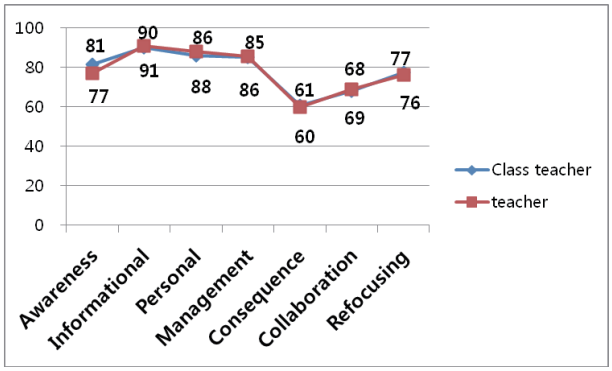
<Figure 1> Stages of concern about Maker education

In the analysis of significant differences among groups according to demographic factors, there was no difference between gender, academic background and teaching experience, but the significant differences were found depending on the years of teaching and position. In other words, teachers who were not senior teachers were more indifferent to the Maker education than

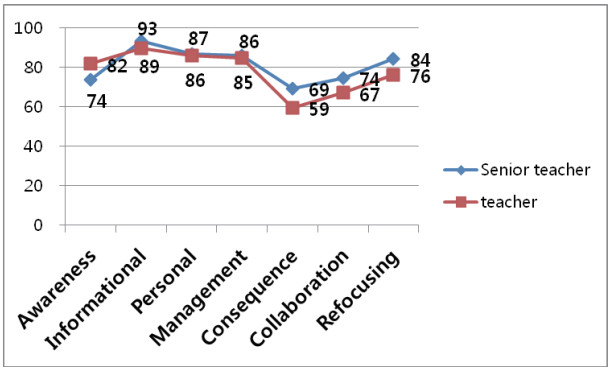
those who were senior teachers, and teachers who had less teaching experience were the most indifferent. On the other hand, senior teachers and teachers of more than 16 years showed an upward pattern in the fifth and sixth stages of cooperation in Maker education and exploring new alternatives.



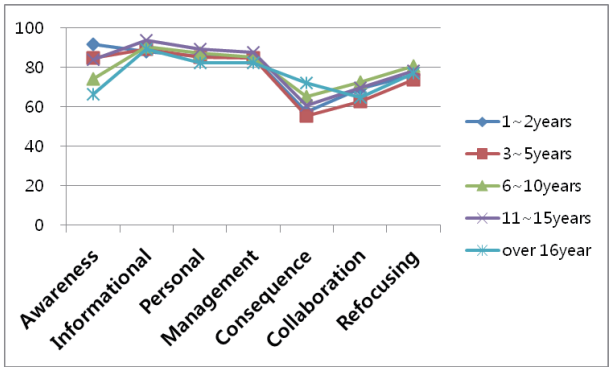
<Figure 2> Stages of concern by Gender



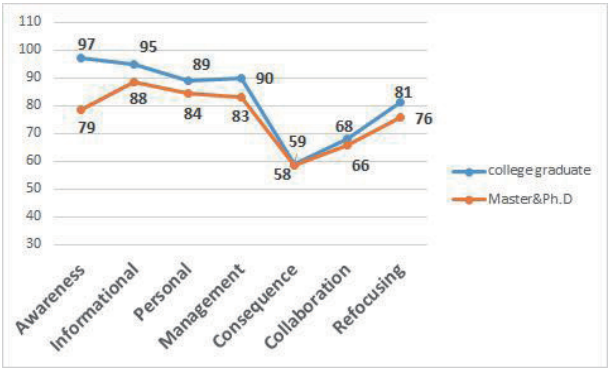
<Figure 3> Stages of concern by Classroom teacher



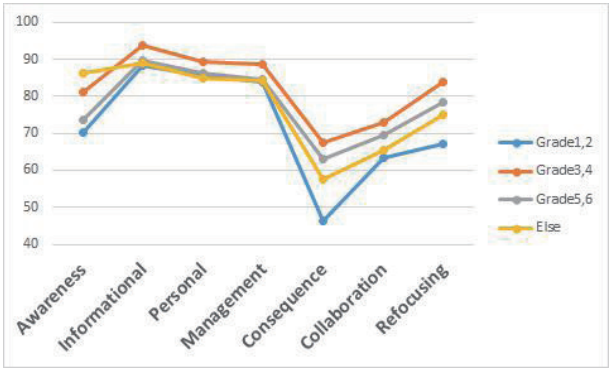
<Figure 4> Stages of concern by Position in school



<Figure 5> Stages of concern by Teaching years



<Figure 6> Stages of concern by Educational level



<Figure 7> Stages of concern by Grade

Also, there were significant differences in concern levels depending on the degree of implementation of Maker education in their teaching practice. According to the analysis results, the interest in the Maker education and implementation are correlated. According to the analysis, male were more likely to prepare for implementation than female. In addition, teachers with master's or Ph.D prepare or already implement the Maker education. Finally, the teacher with the position in school is preparing to implement the maker education at a rate greater than other teachers.

<Figure 2> Concern levels depending on the degree of implementation

		the degree of implementation				
		No-implementation	preparation for implementation	implementation		
Gender	Male	7 (22.6%)	22 (71.0%)	2 (6.5%)	31 (100%)	$\chi2$=7.101* df=2 p=.029
	Female	70(48.6%)	69(47.9%)	5 (3.5%)	144 (100%)	
	All	77(44.0%)	91 (52.0%)	7(4.0%)	175 (100%)	
Educational level	college graduate	51(48.1%)	54 (50.9%)	1 (0.9%)	106 (100%)	$\chi2$=7.371* df=2 p=.025
	Master&Ph.D	26(37.7%)	37 (53.6%)	6 (8.7%)	69 (100%)	
	All	77(44.0%)	91 (52.0%)	7 (4.0%)	175 (100%)	
Classroom Teacher	Yes	65(43.6%)	77 (51.7%)	7 (6.0%)	149 (100%)	$\chi2$=1.274 df=2 p=.529
	No	12(46.2%)	14 (53.8%)	0 (0%)	26 (100%)	
	All	77(44.0%)	91(52.0%)	7(4.0%)	175 (100%)	
Position in a school	Yes	3 (14.3%)	16 (76.2%)	2 (9.5%)	21 (100%)	$\chi2$=9.294* df=2 p=.010
	No	74(48.1%)	75 (48.7%)	5 (3.2%)	154 (100%)	
	All	77(44.0%)	91 (52.0%)	7 (4.0%)	175 (100%)	

Conclusion and Suggestions

New technologies change society and bring innovation to education. School teachers are expected to play a leading role in these changes. Compared with the pace of innovation, however, top-down innovation continues for schools without paying attention to whether teachers are ready to accept it. Using the CBAM model, this paper analyzed the stages of elementary teachers' interest in maker education and confirmed that most teachers were in ‘Stage 0: Unconcerned’ to Maker education or ‘Stage 1: Informational concerns’. Based on these results, the following conclusions can be discussed:

First, since elementary school teachers are generally indifferent or remain in the information gathering stage of interest, they should focus on changing their own. To this end, it is required to actively guide the understanding and necessity of the Maker education and provide teachers with specific consulting activities and participatory training programs. Second, research on the educational effects of Maker education needs to be expanded. To this end, efforts should be made to visualize the educational value and expected effects of the maker education and to prepare a Maker Space that can be experienced in practice. Third, as the teaching experience is high and the senior teachers are more interested in the Maker education, it will be possible to support sharing the practical experience of implementing a maker education activity with senior teachers or highly experienced teachers to help them enter the Maker education. They will also be able to use their instructors or use them as exclusive teachers to expect the spread of Maker education at each school level. Finally, Maker education requires attention and support at the school administrator level because it costs a lot of initial money to make up the environment, and must have a will to implement it.

Finally, since Maker education often requires the use of digital devices and emerging technology,

teachers' decision to accept or refuse to employ Maker education can be affected by teachers' individual concerns and preferences to emerging technology itself. For example, a teacher who is an early adopter of technology can be more ready to employ new innovation including Maker education. The follow-up study will examine whether teachers' stage of concerns about Maker education can differ by the level of individual preference of emerging technology.

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UX Design of Augmented Reality for the Elementary School Students

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Abstract: The purpose of this study is to examine how Augmented Reality (AR) platform, avatar design, and additional materials should be presented in AR learning contents based on smartphone application for elementary school students. The AR technology can provide rich multimedia based information that fit the cognitive development stage for elementary school students. For this advantage, recently many applications for elementary school students are being developed, but the user interface of some applications is not likely to be designed for the target users. Therefore, to develop a proper application for elementary school students what interface elements should be considered for them is need to know. For this study, we developed an AR-based learning contents application about 11 environment terms. For analyzing the user experience of AR application, three components are considered; AR platform, avatar design, and additional materials. And three times of user experience assessment were conducted. In the first and second assessment, the evaluators were university students and graduated students. And the final assessment was conducted with five end users, 5th-grade elementary school children. As modifying the low scored factors, AR-based application was revised. As a result, we identify that the portrait version is more convenient to use than the landscape version. The size of an avatar should be considered based on the height at which children can lift their smartphone.

Key words: Augmented Reality, User Experience, Interface Design, Elementary School Students

INTRODUCTION

The augmented reality (AR) technology is to augment three-dimensional virtual objects in the context of the real world to provide additional information to learners (Kim & Lee, 2018). The learning contents applications with AR technology have the advantage of providing meaningful and interesting information to the elementary school students. Due to these media characteristics, many AR based learning content applications for elementary school students have recently been being developed (Kang & Jo, 2016). Without considering the cognitive state of elementary school students who are relatively less focused and less interested in learning, AR-based applications can rather interfere with learners' attention. In other words, the interface should be designed so that elementary school students can make cognitive efforts in learning rather

than operating the application interface. Therefore, it is necessary to develop an application interface to reflect students' cognitive characteristics and their usability experience. Base on this, it is necessary to find out what interface elements will be useful to develop augmented reality-based learning content applications suitable for elementary school students. Through this study, important elements of interface design of AR would be identified.

The purpose of this research is to examine the usability factors of three components of AR application which are AR platform, avatar, additional material design. For this study we applied the usability factors of three components when we developed the mobile AR based learning application about environment terms for elementary school students. We conducted user experience assessment three times. Based on the revising the low scored factors, the conclusion comes up with some usability factors for designing AR learning contents application for elementary school students.

THEORETICAL FRAMEWORK

1. Augmented Reality (AR)

Augmented Reality (AR) provides the rich and contextual information in reality through meaningful virtual information, objects or interaction (Billinghurst, Kato, & Poupyrev, 2001; Sorko & Brunnhofer, 2019). AR applications are used in mobile(smartphones), wearable devices (AR smart glasses), or stationary (AR mirror in retailing) (Rauschnabel, 2018). Especially, smartphone apps using AR is widely used for the learning environment. AR smartphone apps are highly accessible because most learners have their own smartphone or tablet device. In addition, they can provide learners with various multimedia materials. For example, the 3D pictures, sound, and animation are presented in the learning environment (Lindner, Rienow, & Jürgens, 2019).

Based on these advantages, smartphone apps using AR could provide an effective learning environment with elementary school students. Various multimedia materials like sound or 3D pictures can help elementary school students understand complex topics. Also, they can be motivated on learning because the visual materials act as an attention grabber. (Rambli, Matcha, & Sulaiman, 2013). Kim and Lee (2018) explained that sound, amusing characters, realistic visual motions, and 3D effects made elementary school students actively interact with learning contents and feel interested on them.

In order for smartphone apps using AR to have positive effects on students properly, AR program should not increase the cognitive load of learners. In particular, elementary school students lack motivation, interest, and concentration on learning contents (Kim &Lee, 2018). Thus cognitive load is necessary to be considered when developing smartphone apps using AR. To minimized cognitive load, learning contents should be explained with easy words. And also the interface design of smartphone apps should be easy to control.

2. AR app interface design

AR user-interface design is used for users to exchange the information. The interface design is divided into three categories; user logic interfaces, physical user interfaces, and graphical user interfaces (Xing, 2016). But user-interface designs are commonly referred to as the graphic user

interface. It consists of window mode, menu box, and an input box. They should be considered not only in visual perspective but also interactive perspective with the users (Yan, 2019).

In an online environment, learners are given the initiative to actively and freely explore and select useful information or knowledge based on their needs and characteristics through the interface. However, most smartphone apps are targeted at adults. It was difficult to find relevant research on the principles or components of the interface for elementary school users. For this reason, an app interface that does not fit the cognitive processes of elementary school students can interfere with understanding learning content, thus hindering effective learning. Therefore, interface design for elementary students is needed to be developed (Lee, & Jun 2007).

3. User experience assessment

User experience(UX) refers to the total experience of how the users feel and think when they use a certain system, products or services. And UX assessment is for an in-depth understanding of user's needs and psychology for the system (Yan, 2019). These are essential to make good quality app interface which fully reflects the user's requirements. The principles of UX assessment are diverse. And each of the principles has its advantages and disadvantages, so there is no absolute standard of evaluation. Also, some experts have a somewhat different understanding of user experience (Yan, 2019). But the common elements from ISO9241's UX assessment, Brian Shackerl's, and Jakob Nielesn's are accuracy (or error), time to learn, comfort (or satisfaction).

UX assessment plays an important role in smartphone app development. Because based on the UX assessment, developers can identify the direction of the app interface. Quality interface design can increase learning effectiveness and reduce the negative impact on learning.

The methods of UX assessment on the interface design are various but the most common way is the investigation method. This method is mainly conducted in the form of surveys and user interviews. On a survey, the evaluator is relatively familiar with the system. And they can find out the error or problems. And after a survey of the questionnaire, the researcher interviews the users and can identify the needs of the users. Based on them the app developer can design quality interface designs.

METHODS

1. Participants

The participants in this study are shown in <Table 1>. In the first user experience assessment, panel evaluation was conducted by three university students. The three evaluators identified the errors that could be detected intuitively. In the second user experience assessment, 6 evaluators were selected by snowball sampling, including three evaluators who participated in the first user experience assessment. 4 university students and 2 graduate students participated. The purpose of the first and second user experience assessment is to find out the errors intuitively, reevaluate and improve the interface design based on the result of the assessments. And the participants are required to write down at the bottom of the questionnaire about what they think inconvenient functions are and what another function they want to add. Lastly, in the end, user experience

assessment, 5 elementary school students evaluated the improved interface design.

Table 1. participants and purpose in three user experience assessments

	First iteration	Second iteration	Third iteration
Purpose	Identify critical errors	Reevaluate and improve the design	Diagnose problems finally
Participants	3 university students	4 university students, 2 graduated students (Snowball sampling)	5 elementary students
Method	Panel Assessment	Panel Assessment	End User Assessment

2. Materials

1) Learning contents

In this study, environmental terms were used as learning contents. 11 terms related to elementary school environmental textbooks were selected among the environmental terms proposed by the Ministry of Environment of Korea in 2018. 11 worklists are as following: renewable energy types, renewable energy, fine dust, yellow dust storm, and fine dust, instruction to manage fine dust, global warming, Climate Change, sick house syndrome, radon, marine dumping, and marine litter.

2) User experience criteria

User experience criteria are divided into 3 factors (the AR platform, avatar, additional material) and each factor has 3,3,2 subcategories, respectively: the AR platform (response to touch, button size, button location), avatar (avatar voice volume, avatar size, avatar location), additional material (additional material size and additional material location). Table 2 presents the three factors. A five-point Likert scale was used for user experience evaluations.

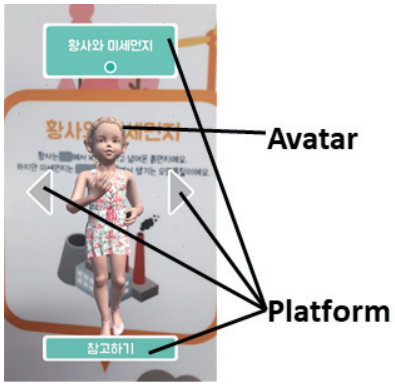
Table 2. User assessment criteria of three factors

AR platform	Avatar	Additional material
button location	avatar location	additional material location
button size	avatar size	additional material size
response to touch	avatar voice volume	

3) AR application development

The AR learning content application of this study was developed considering the three major user interface design principles. First, in the AR platform responses to touch, button size, and button location is considered. For example, in Figure 1, the button is made larger to make easy for elementary school students to access the button. In addition, the number of buttons is minimized to lessen the elementary school students' cognitive load. In order to increase consistency, user interface elements such as buttons are placed in a consistent location and designed to perform various tasks in a consistent manner. Second, about the avatar, we used a young age avatar to raise attention to the learning contents. You can see the size and location of the avatar in Figure 1. Third, in terms of additional material which is additional information to

the learning topic, we added 3D visual additional materials to provide meaningful and contextual information about learning contents. You can check the location and size of the image for additional material in Figure 2. Help was not needed in order to make interfaces simplified and the buttons minimized. Even, first-timers were able to understand how to control the interface enough without help. Lastly, in order to raise the esthetics, the user interface elements are designed similarly to the color combination of the AR card. Figure 3 shows the scene of playing AR application. In Figure 4, the 11 learning contents consist of various colors which were used in the AR plate to raise users' interest.



Figu re 1. Avatar platform.

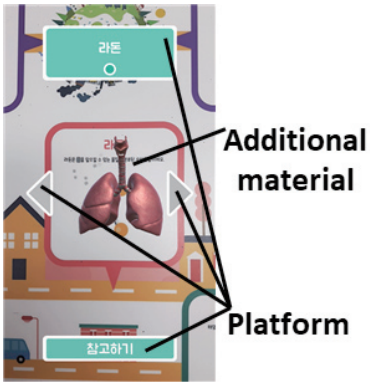


Figure 2. Additional material platform.

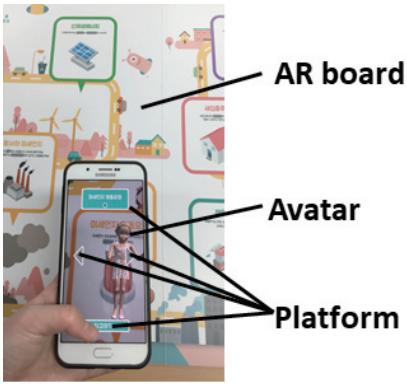


Figure 3. the scene of playing AR app.

Figure 4. AR Card.

4) Devices

The devices used in the first and second user experience evaluations are shown in <Table 4> and <Table 5>.

Table 4. Devices in first user assessment

No.	rater	device
1	A	Galaxy Tab A 10.1 (2016)
2	B	LG Optimus G Pro (2013)
3	C	Galaxy S8 (2017)

Table 5. Devices in second user assessment

No.	rater	device	sequence
1	A	Galaxy Tab A 6.0(2016)	landscape->portrait
2	B	Galaxy Tab A 6.0(2016)	portrait->landscape
3	C	Galaxy Tab A 10.1(2016)	landscape->portrait
4	D	Galaxy Tab A 10.1(2016)	portrait->landscape
5	E	Galaxy Note 5(2015)	landscape->portrait
6	F	Galaxy Note 5(2015)	portrait->landscape

3. Data Analysis

Results are represented in a radial graph using an average analysis.

RESULTS

1. First User Experience Assessment Results and Revised

<Table 6> shows the results of the first user experience assessment. Most work lists derived similar evaluations from 4.00 to 4.67. But 'Instruction to Manage Fine Dust' scored low points to 3.5 in button location, avatar location, and volume criteria. Especially 'Global Warming' got the lowest score to 2.33.

Table 6. Means and standard deviation of the first user experience assessment

	work list	The AR Platform			Avatar		
		Button Location	Button Size	Response to Touch	Location	Size	Volume
1	Renewable Energy Types	4.00 (1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)
2	Renewable Energy	4.00(1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)
3	Fine Dust	4.00(1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)
4	Yellow Dust Storm and Fine Dust	4.00(1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)
5	Instruction to Manage Fine Dust	3.50(2.12)	4.50(.71)	5.00(.00)	3.50(2.12)	4.50(.71)	5.00(.00)
6	Global Warming	4.00(1.73)	4.67(.58)	2.33(2.31)	4.00(1.73)	4.67(.58)	2.33(2.31)
7	Climate Change	4.00(1.73)	4.67(.58)	4.00(1.73)	4.00(1.73)	4.67(.58)	4.00(1.73)
8	Sick House Syndrome	4.00(1.73)	4.67(.58)	3.67(2.31)	4.00(1.73)	4.67(.58)	3.67(2.31)
9	Radon	4.00(1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)
10	Marine Dumping	4.00(1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)
11	Marine Litter	4.00(1.73)	4.67(.58)	5.00(.00)	4.00(1.73)	4.67(.58)	5.00(.00)

Note. Standard deviation is in parentheses

The AR program was modified based on the first user experience assessment result and the comments about the inconvenient function and necessary functions. Firstly, the activated button was expressed as blue color, and the inactivated button was expressed as a gray color. It helped the user recognize the button activation state intuitively without redundant touch. Second, in addition to the existing version, the landscape version, a new portrait version is developed. The landscape version is reported to have problems that other markers next to the target marker were tracked. Third, the avatar lip sync was added to make an avatar to talk vividly. Fourth, the location and size of the additional materials were modified to enhance perceived stability. Additional materials with 3D objects are added to help learners understand the topics. And the device B used in this study was decided to be excluded for the next evaluation because it is too old to be compatible with the AR program.

2. Second Usability Assessments Results

Table 7 shows means and standard deviations of the second user experience assessment results

in portrait version. And table 8 shows means and standard deviations of the second user experience assessment results in landscape version. User experience assessments for landscape and portrait versions were conducted respectively. The results on platform and avatar were an overall high score from 3.89 to 5. However, additional materials which is added newly got low score. Especially 'Radon' got 1.17 and 2.00 score on location and size of additional material respectively. In addition, the user interface of the portrait had absolutely a higher preference and more satisfied than the landscape version. Based on the result, it was decided to use only the portrait version. And the errors caused by the additional materials were corrected.

Table 7. Means and standard deviations of the second user experience assessment in portrait version

	work list	The AR Platform			Avatar			Additional Material	
		Button Location	Button Size	Response to Touch	Location	Size	Volume	Location	Size
1	Renewable Energy Types	4.50(.84)	4.00(.89)	4.17(1.17)	4.33(.82)	4.50(.84)	5.00(.00)	4.33(.82)	4.50(.84)
2	Renewable Energy	4.67(.52)	4.00(.89)	4.17(1.17)	4.17(1.17)	4.17(1.33)	5.00(.00)	3.20(1.48)	3.80(1.79)
3	Fine Dust	4.67(.52)	3.83(1.17)	4.17(1.17)	4.17(1.17)	4.17(1.33)	5.00(.00)	3.17(1.33)	4.00(1.10)
4	Yellow Dust Storm and Fine Dust	4.33(1.21)	3.83(1.17)	4.17(1.17)	4.17(1.17)	4.17(1.33)	5.00(.00)	3.50(.84)	4.00(1.10)
5	Instruction to Manage Fine Dust	4.25(.96)	4.25(.96)	4.75(.50)	4.00(1.41)	3.75(1.50)	5.00(.00)	3.67(1.16)	3.67(1.16)
6	Global Warming	4.50(.84)	4.17(.98)	4.00(1.27)	4.33(.82)	4.50(.84)	3.67(2.07)	-	-
7	Climate Change	4.50(.84)	3.83(.98)	4.00(1.27)	4.17(1.17)	4.50(.84)	5.00(.00)	3.00(1.00)	3.00(1.00)
8	Sick House Syndrome	4.33(1.21)	4.17(.98)	5.00(.00)	4.17(1.17)	4.17(1.33)	5.00(.00)	3.50(1.52)	3.17(1.72)
9	Radon	4.50(.84)	4.17(.98)	5.00(.00)	4.17(1.33)	4.17(1.33)	5.00(.00)	1.17(.41)	2.00(.89)
10	Marine Dumping	4.40(.89)	4.20(.84)	5.00(.00)	4.00(1.23)	4.00(1.41)	4.00(1.41)	3.60(1.34)	4.33(1.03)
11	Marine Litter	4.50(.84)	4.05(.92)	5.00(.00)	4.17(1.17)	4.17(1.33)	4.17(1.17)	3.83(1.33)	3.72(1.34)

Note. Standard deviation is in parentheses

Table 8. Means and standard deviations of the first user experience assessment in landscape version

	work list	AR Platform			AR Avatar			Additional Model	
		Button Location	Button Size	Response to Touch	Location	Size	Volume	Location	Size
1	Renewable Energy Types	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.03)	4.00(1.10)	5.00(.00)	4.50(.84)	4.33(1.03)
2	Renewable Energy	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.03)	3.67(1.37)	5.00(.00)	2.67(1.97)	2.50(1.76)
3	Fine Dust	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.03)	3.67(1.37)	5.00(.00)	4.00(1.10)	3.83(.98)
4	Yellow Dust Storm and Fine Dust	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.03)	3.67(1.37)	5.00(.00)	4.00(1.10)	3.83(.98)
5	Instruction to Manage Fine Dust	4.25(.96)	4.50(.58)	4.75(.50)	3.50(1.29)	3.50(1.73)	5.00(.00)	3.50(1.00)	3.50(1.00)

6	Global Warming	4.50(.84)	4.67(.52)	4.00(1.27)	4.00(1.10)	4.00(1.10)	3.83(1.84)	
7	Climate Change	4.50(.84)	4.67(.52)	4.00(1.27)	4.00(1.10)	4.00(1.10)	3.83(1.84)	
8	Sick House Syndrome	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.37)	3.67(1.37)	5.00(.00)	3.50(1.64)	4.00(1.55)
9	Radon	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.37)	3.67(1.37)	5.00(.00)	2.00(.71)	1.20(.45)
10	Marine Dumping	4.50(.84)	4.67(.52)	3.67(1.37)	3.67(1.37)	3.67(1.37)	5.00(.00)	4.00(1.55)	4.17(1.33)
11	Marine Litter	4.50(.84)	4.67(.52)	4.17(1.17)	3.67(1.37)	3.67(1.37)	5.00(.00)	4.17(1.33)	4.17(1.33)

3. End User Assessment Results

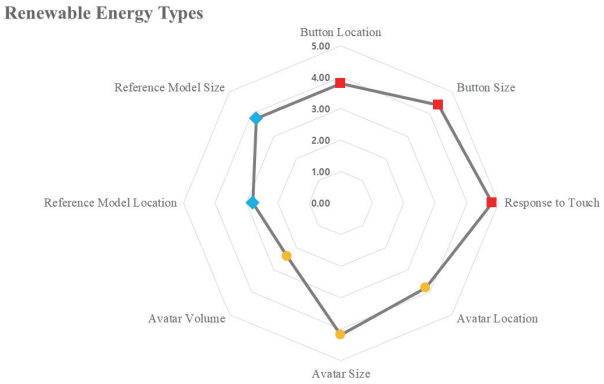


Figure 5. Renewable Energy Types.

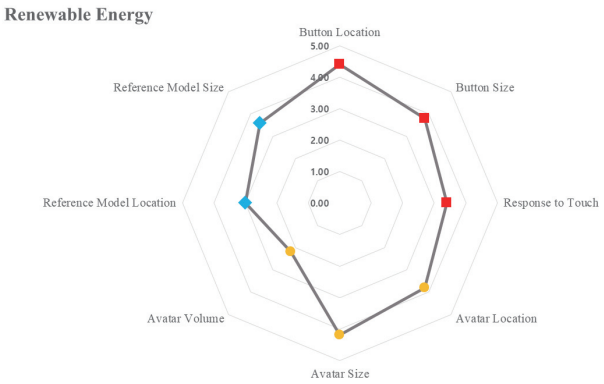


Figure 6. Renewable Energy.



Figure 7. Fine Dust.

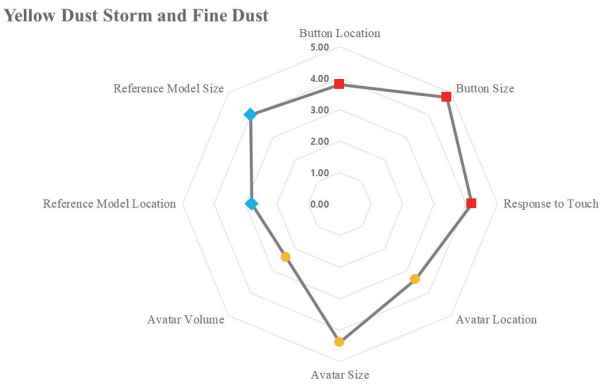


Figure 8. Yellow Dust Storm and Fine Dust.

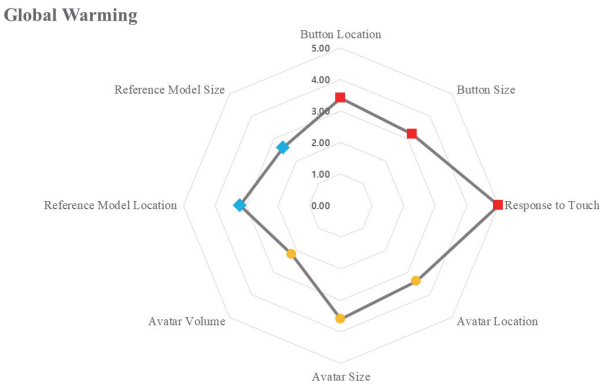


Figure 9. Global Warming.

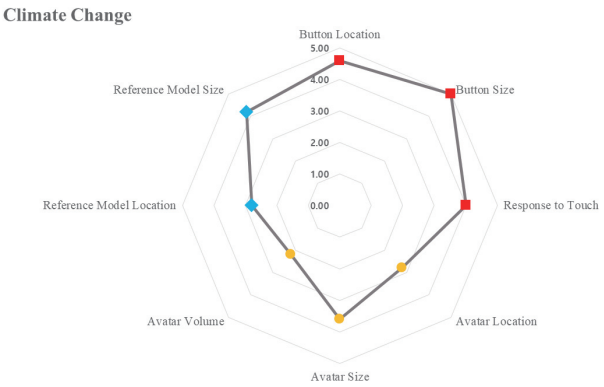


Figure 10. Climate Change.

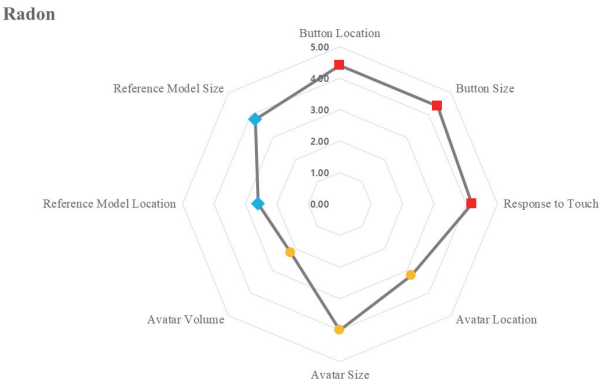


Figure 11. Radon.

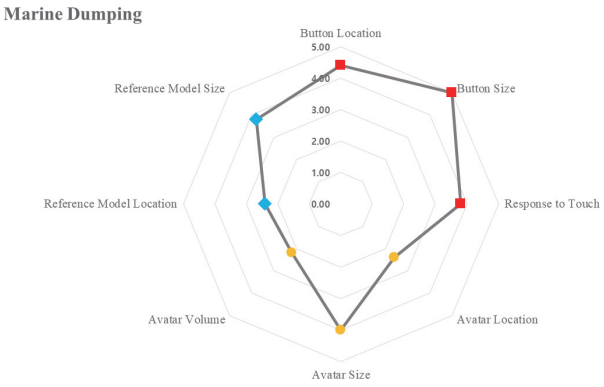


Figure 12. Marine Dumping.



Figure 13. Marine Litter.

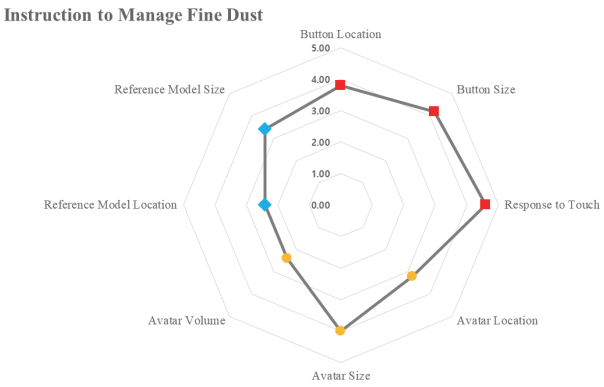


Figure 14. Instruction to manage fine Dust

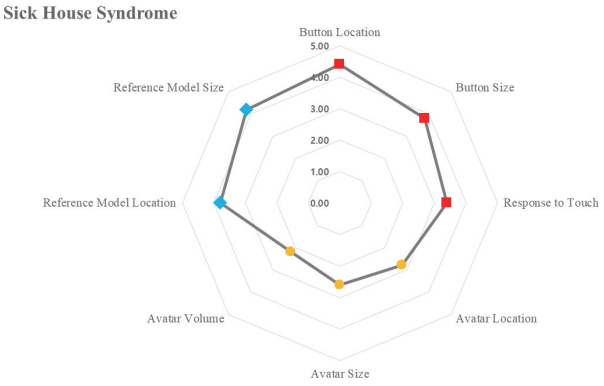


Figure15. Sick House Syndrome

Total 11 Radial graphs in figure 5 to 15 show the results of the third user experience assessments. The participants were 5 elementary school students who are end users. They found out many problems that were not found in the first and second user experience assessment. First, the avatar and additional material looked bigger than expected, because the students couldn't lift enough higher for the avatar and the model to look proper from the AR card due to lack of strength in their hands. The evaluation of the avatar's voice also got a low score. This problem would occur because many students played the program at the same time within a close distance, disturbing each other. Using the earphones could help to solve the problem.

DISCUSSION

The purpose of this study is to examine how the AR platform, avatar design, and additional material design should be presented in order to develop AR based learning content for elementary school students. For this study, we applied three factors of the user experience assessment when we developed the smartphone AR application about environment terms for elementary school students. We conducted user experience assessment three times. Based on the results, some discussions on developing AR application interfaces for elementary school students could be proposed.

First, the portrait version of the user interface was more usable than the landscape version, even for elementary school students. The first design of the AR interface was the landscape version because of the weight of the smartphone for elementary school students. However, the problem that identified in the first user experience assessment was that the angle of the landscape version was so wide that it is easy to track next to AR markers simultaneously. In addition, evaluators responded that while the landscape version interface is inconvenient because they have to use both hands, and the portrait version is more convenient because it can be operated with one hand. Reflecting this feedback, two versions were evaluated separately by adding a portrait version interface to the second assessment. As a result, the user interface of the portrait version was more satisfying.

Second, colors can be used to intuitively distinguish whether user interfaces are active or not. Evaluators said that they want to distinguish activated and deactivated buttons intuitively. Based on this, the deactivated buttons were greyed out. This use of color reflects the user's mental model, enabling intuitive use of programs.

Third, help can be replaced and minimized through the picture button. Since elementary school students have relatively low motivation and concentration on learning, buttons other than learning materials are needed to minimize to reduce cognitive load and disturbing elements. To minimize the number of buttons users can see on the screen, the buttons were designed using intuitive illustrations, eliminating the function of the help. Minimizing the number of buttons reduces the exogenous cognitive load on learning and allows users to focus on learning content more.

Fourth, the size and location of avatars should be selected considering the characteristics of users. Elementary school students could only lift up to 10 centimeters from the AR card because of the weight of a smartphone. Because of this, avatars and additional materials were shown bigger on the screen. The size and location of avatars and additional materials are needed to adjust because the height of the device's lift varies depending on the characteristics of users. That is, the AR application's model and avatar's location and size should be designed, considering that the change of avatar size is depending on the distance between the AR marker and the device.

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Chapter 13:

Others

Perspective on the Deficiency of Rural Teachers' Trainings from the Application programs

-- Taking 141 Programs of Rural teachers' Trainings in Province J as the Analysis Objects[1]

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Abstract: Post-service training of rural teachers is an important link to strengthen the construction of rural teachers, and a significant means to balance urban and rural education resources. However, there are some problems in the trainings of rural teachers, such as quasi - urbanization tendency and weak pertinence. ROST was used to analyze the data of 141 training application in J province, and the main problems were found in the following aspects: the lack of discourse power of rural teachers in the training team and the dominance of urban teachers; The weakness of local culture leads to the lack of local culture in the training curriculum content and resources and weakens the centripetal force of rural teachers for the local spirit. Training and practice bases rarely exist in rural schools; Most of the training demand surveys are too simple, and teachers are not given hierarchical training. No teachers choose courses independently, ignoring their shortcomings. Therefore, it is necessary to establish the inner cultural
confidence of rural teachers, and strengthen the research on training needs and hierarchical training.

Key words: rural teachers' trainings; training programmes; quasi-urbanization; weak pertinence

RESEARCH DESIGN & METHODS

The connotation of countryside is hidden under the framework of taking urban development as the center. But as the main body of rural culture communication and development, rural teachers should be given higher expectations. Therefore, the training for rural teachers not only needs to meet the vocational needs, but also should reflect the spirit of urban-rural integration and the cultural self-confidence and also the rural development spirits advocated by the 19th national congress. In order to improve the effectiveness of teacher trainings, the training advice

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Foundation:2019年度教育部人文社会科学研究一般项目“乡土文化视域下乡村教师整合研修学习研究”（项目编号:19YJA880035）的研究成果之一；
江西省高校人文社会科学研究2018年度项目“创新融合视域下乡村教师整合研修模式研究”（项目编号:JY18116）的研究成果之一.

emphasize the need to constantly improve the pertinence and effectiveness of trainings. Since the issuance of the Rural Teacher Supported Plan (2015-2020) in 2015, the Ministry of Education has focused on strengthening the training of primary and middle school teachers in rural areas by adopting the application system to select institutions to undertake the task. The scientificity and rationality of the training programs determine the success of the training activities, which is the concentrated embodiment of the essence of training ideas, the deeper understanding and grasp of the national training direction and the guidance for the selected institutions. In the programs' design, the common problems mainly focus on the training needs, training contents and training resources. However, the analysis of training teams and training practice bases should also be added for the regional differens in the main body of rural teachers.

By using the data statistics analysis to analyze the training needs, training team, training contents, training practice base and a few items mentioned in 141 J provincial rural teacher training schemes submitted by 17 institutions, including 4 high quality distance education network services and 13 well-known colleges and universities, the characteristics of class declaration plan urbanization and weak pertinence were found among those schemes.

1. Rural teachers' training programs present the tendency of quasi-urbanization

Extracting training content and resources of declaration programs as a text , using the ROST Content Mining System Version 6.0 to analyze the collected information,and analyzing the proportion of urban and rural experts in training teams' and training bases ' statistical data, we found that, in view of the tendency of quasi-urbanization in rural teachers ' trainings, it mainly reflected in the following four aspects.

(1) Urban teachers dominate the whole training teams and the rural has no discourse right

In order to a better teacher training, the national document clearly stipulates that, in principle, there should be no less than 60% outstanding first-line teachers and teachers ' trainers in the training expert teams. Rural teachers also hope that hiring experts could base on whether they have rural teaching experience and their familiarity with local conditions. Both trainers and trainees prefer localised training teams. Among the 141 application programs, there are 3,688 experts with teacher titles and units, including 964 teachers from colleges and universities, and 2,724 from primary and middle schools. First-line teachers accounted for 73.9%, meeting the requirements. However, according to the statistics of the proportion of front-line teachers in urban and rural areas, 95.8% of the teachers are from urban primary and middle schools, and only 4.2% from rural areas, which shows that the front-line teachers in the expert teams tend to be urbanized.

Most cases of urban front-line teachers trainings are based on urban school conditions, without thinking of the situation of rural teachers. Due to the different cultural environments between urban and rural teachers, urban teachers or trainers naturally teach and train rural teachers from an outsider's perspective. It finally comes out that after training it is difficult for rural teachers to apply what they have learned to practical teaching. Therefore, the knowledge presented by the urbanized training faculty is beyond the reach of many students.

(2) Training courses are short of local contents and centripetal force

Training content is the key factor of training activities, which is directly related to the training

effect. The training content in the "national training plan" is generally represented by course contents. The course content texts in the application programs are extracted to draw the co-word network of high-frequency keywords in FIG. 1, where the connection data of nodes represents the strength of their correlation and different course contents involved in nodes are classified according to colors. The content of the training course is centered on teaching and teachers, supplemented by teaching case analysis, teaching practice training, teaching problem research, teaching discussion, teaching method, teaching design and other courses, cultivatingz the ability of the participating teachers to find out , analyze and solve problems.

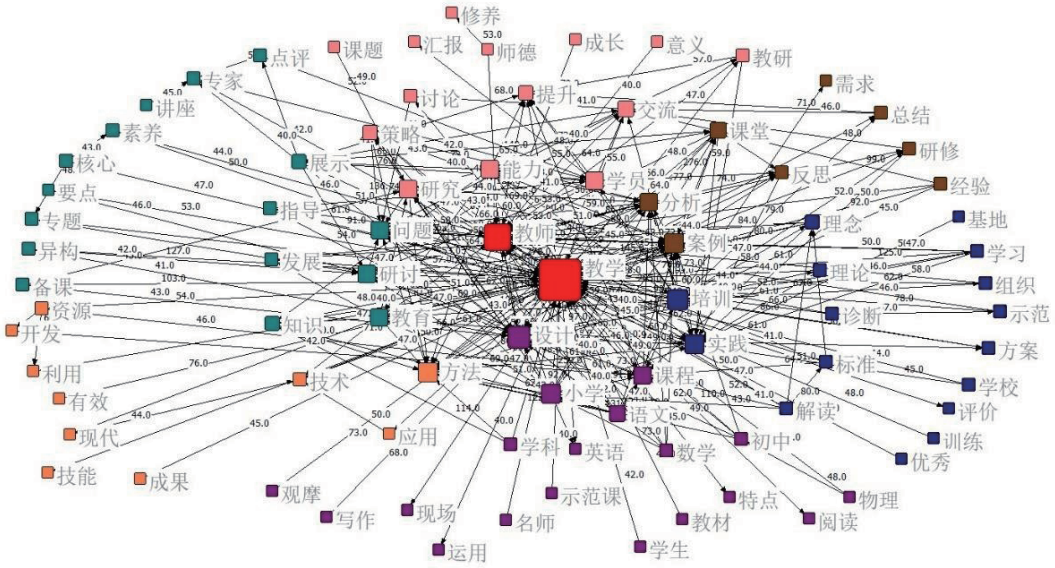


Figure 1 co-word network diagram of high-frequency keywords of course content

According to the statistics of the class hour ratio of course contents, there are totally 50,761 class hours of the 141 programs. Among them, teaching philosophy and teaching strategies which account for 22.1% and 20% respectively make up a large part. Next is the teacher ethics training courses , accounting for 13.6%; the proportion of the next five items that are training courses of scientific research ability , modern educational technology, teachers' professional quality, training ability and quality development are successively 13.3%,11%,9.7%,8.5% and 1.8%.Throughout the whole diagram and data, no key words related to local cultural elements and course schedule were found. As for update of educational concept, mastery of teaching skills and methods to the teaching guidance of information technology, urbanization concept runs through all of these. The training contents are wanting in the attention to the characteristics of rural education and the growing environment of rural students.

No matter in the national curriculum standard or the training application program courses contents, the rural element proportion is very low or non-existent. Only 7 of the 141 application programs contain one or two types of courses related to rural cultural construction, such as campus cultural construction of rural schools and case studies of rural school development, and the rest does not involve rural culture and characteristics at all In fact, the integration of urban and rural areas requires maintaining their own characteristics. In other words, while transplanting urban mainstream culture, it is more necessary to inherit traditional local culture, rather than regarding urban culture as the sole benchmark of modernization. Local culture' s deficiency of training courses, and quasi-urbanization of the training overall lead rural teachers into a cultural journey of catching up with urban teachers with almost no end. The difference between urban

and rural areas makes rural teachers not only unable to understand urban mainstream culture, but also gradually lose their sense of identity and confidence in local culture.

(3) Training courses and resources have ignored the choice of local resources, which resulted in cultural weakness

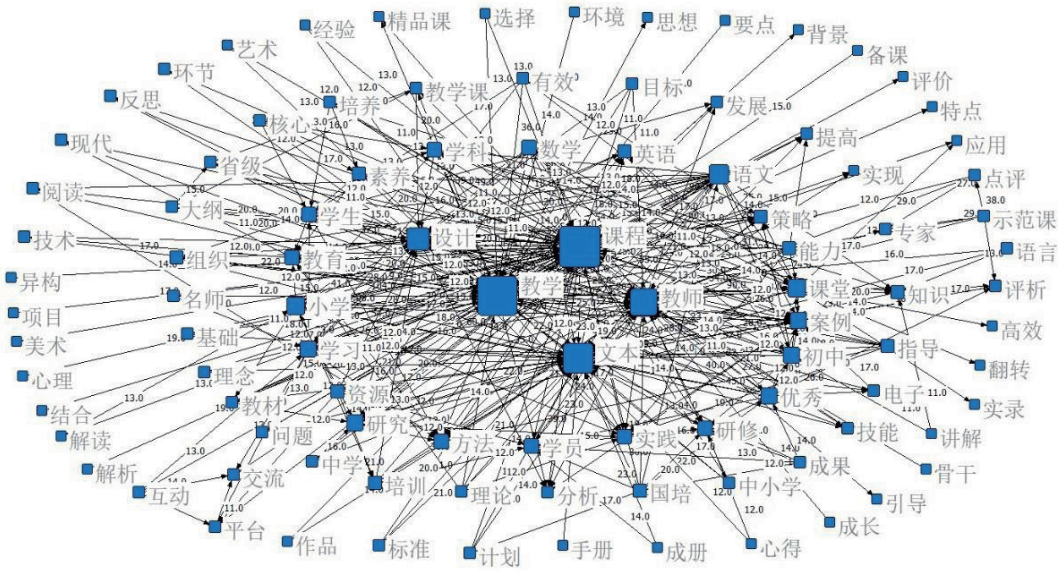


Figure 2 co-word network diagram of high frequency keywords of course resources

The main learning carrier in teacher training activities is curriculum resources. To some extent, the quality of course resources determine that of teacher training. After reviewing the list of course resources in the training application programs and drawing the key words network diagram, it is found that the teaching resources such as excellent teaching design, teaching cases, and teaching courses of various disciplines provided are all universal, lacking the resources with local and regional characteristics. The training course resources of rural teachers are insufficient, the contents are vague, and the course resources are short of pertinence. Trainers focus on the introduction of external resources, ignoring local forces and resources.

Urban and rural civilization is the common heritage of mankind. When people grant privileges to a certain form of knowledge, they actually grant privileges to a certain power system, which is not conducive to promoting communication and understanding between different world views. Traditional culture and urban culture which are two different cultural systems have their own advantages, but the values advocated by the two are fundamentally different. The neglect of resource selection is a disregard for local culture, which leads to the fact that rural teachers no longer judge things based on whether they meet the needs of the countryside, but on whether they conform to the value orientation of the city.

(4) That the practice bases take the city school as the main field means that the field domain is absent and wrong

Among the 141 training application programs, 14 programs are from elite schools, and 40 contain team studies and principal training in the "follow - up training" stage. There are 116 practical base schools, but only 11 rural schools involved, which shows that most programs include only one or even no rural school practice bases. The practice base schools set by the

programs are all urban schools, which leads to the deficiency of rural field in rural teacher training environments. In the training, theoretical courses are mainly studied in colleges and universities, and it is understandable that they are separated from the specific rural environment. However, there are a few rural factors designed in terms of visits, observation or field trips. There is a great shortage of theoretical courses, even in suburban areas, which are basically conducted in urban primary and middle schools. In the almost completely urbanized environments, it is difficult for these teachers to love countryside, to root in the rural and to serve the countrysides willingly.

2. Weak pertinence in the design of rural teacher training programs

I

n 2011, the Ministry of Education proposed to strengthen the training of primary and middle school teachers, to enhance the pertinence and effectiveness of the training, and to carry out stratified training for all primary and middle school teachers in a planned way. However, the current training programs do not carry on stratified trainings for teachers, which highlights the weak pertinence.

(1) The weakness lies in the absence of prominence in the stratification of rural teachers

Throughout the application programs, most of which are full staff trainings. With the different development stages of teachers, the job tasks and occupational perplexities faced by them are different, so the needs for vocational training are also different. For old teachers who have rich experience in education and teaching, we should focus on summarizing and improving practical experience. For middle-aged teachers, it is necessary to stimulate their innovative spirit and teaching ability. For young and new teachers, the main focus is on how to improve the practical ability of education and teaching activities. Teachers at the same stage of development in different regions have different professional quality and training needs, and teachers in the same region and stage of development have different development status in different dimensions of teacher professional standards, so it is not scientific to provide the same training programs in any case. Full stuff training cannot meet teachers' differences and needs for professional growth.

(2) The weakness lies in teachers in rural areas are unable to independently select courses

The premise of on-demand training is to conduct professional training needs research and design targeting training courses. Among the 141 application programs, the pre-training demands surveys of many programs are too simplified and formalized, without truly integrating into the environment of rural teachers, and failing to express the development demands of participating teachers. By comparing the training needs, it is found that some training institutions only make overgeneralization based on years of training experience, but do not carry out actual demand researches. In addition, most of the training programs applied by the same institution for different subjects and classes have the same training needs without obvious changes. Training courses designed under such training needs always fail to reach the pain points, and it is difficult to accurately meet the needs of both individuals and groups.

(3) The weakness lies in the absence of ability vulnerabilities

According to the latest statistics provided by province J, the overall age of rural teachers is relatively old. Because the average age of them is higher than 40 years old, and the age structure

is not reasonable. They all have theoretical basis and solid professional knowledge, and prefer practical training contents and participatory training methods. Therefore, in the primary and middle school teachers trainings, these rural teachers hope to have experts to guide teaching, to have teaching and research activities, and to have targeted training and good learning atmosphere. However, the trainings in the form of lectures account for 65.1% of the total 50,000 course hours. The trainers are so self-centered that they mostly talks about theories or experiences. Rural teachers are easily susceptible to grand theories, but they also find that such kind of learning methods has no effect in teaching profession. Rural teachers need more practical strategies and skills, which can be imitated in practical work.

RESULTS

1.Thoughts on training measures for rural teachers

The above problems have been affecting the effectiveness of rural teacher trainings. In order to the better implement of the rural teacher supported plan, it is necessary to strengthen the rural teachers' cultural confidence in the local culture, and strengthen the demand surveys and hierarchical trainings.

(1) Building up the inner cultural self-confidence of rural teachers

Firstly, in the selection of teachers, let "local experts" do the leading role in the light of the problems. These teachers with typical exemplary educational significance who grow up in the local teaching line of their hometown know the needs and perplexity of rural teachers best, understand the problems and difficulties encountered in the growth process of rural teachers, and can get closer to the actual needs of rural teachers.

Secondly, local culture should be integrated into the training courses. When local culture enters the classroom, it is not simply to browse the general knowledge about texts or to store knowledge on books. Training contents can be based on local culture to form regional folk characteristics which are the focus of cultural heritage of the courses. As the diggers and constructors of rural culture, rural teachers should play a important part in the cognition, emotion and self-confidence of rural culture.

Thirdly, training course resources should pay attention to the use of local cultural elements. In terms of the content setting of training course resources, in addition to the general contents, we should also select resources corresponding local culture, explore the localized "educational knowledge" of rural teachers, and develop then into training resources, All of these can ensure the effectiveness and practicability of course resources, so that rural teachers can put what they have learned into action.

Fourthly, the choice of training bases should also be considered and explored from rural prestigious schools. Campus and classrooms that are the real places where education takes place are the main front of teacher trainings. While paying attention to the choice of elite schools in urban areas, we cannot ignore the quality schools in rural areas. Only when a teacher is in a place similar to his own environment can he puts the experience and knowledge that he has learned into practice.

(2) Strengthening the surveys of rural teachers' training needs and hierarchical trainings

Rural teachers should be given individualized assessment and stratified trainings according to their different abilities. Therefore, the training department should regularly conduct field visits to rural teachers, in order to ensure the comprehensiveness and authenticity of the needs. Before training, the teachers are tested and evaluated, and are divided into different classes according to different starting points.

The implementation of training courses should adopt diversified teaching methods according to the characteristics of the objects. Creating personalized training methods. For example, using actual training methods for young teachers; for teachers with weak teaching abilities, case-based training is often adopted; for the key teachers, special or thematic training mode is adopted. The training content also needs to be classified according to different levels of teachers, so that they can choose their own courses independently.

2.Conclusion

Tao Xingzhi, a famous educator, once proposed that "rural schools should be the center of transforming rural life, and rural teachers should be the soul of transforming rural life". For rural teachers, the rural culture experience formed in the local breeding and precipitation of years is silent and implicit, which is not easy to be detected. Rural teacher trainings should also focus on cultivating rural teachers' sense of identity and self-confidence in traditional local culture, infiltrate local cultural elements from five aspects: demand investigation, teacher selection, content design, resource construction and site selection, improve the pertinence of training, so that rural teachers could gradually form cultural consciousness in the process of training, by which the value and dignity of the local culture can be rebuilded. At present, only by paying attention to the construction of the countryside and its contingent and improving the quality of rural teachers, can rural basic education be developed, the implementation of quality education be truly implemented, the level of rural education be improved, and the difference between urban and rural education be narrowed.

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Achievements and issues by accepting external human resources in the administration of education in depopulated areas

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Abstract: The purpose of this study is to clarify the achievements and issues to use external human resources to education services for high school students in the administration of education in depopulated areas.In this study, I interviewed the two staffs of the Board of Education in Kuzumaki-town. As the result, categories of utilization results have generated 《Trigger of change of human relations》, 《Providing exchange opportunities with people outside the town》and《Proposal of recruitment strategies for new students》.Ploblem category have generated 《The fact that the activity did not continue》and 《Training of outside human resources》.

Key words: External human resources, Educational administration, Regional education

INTRODUCTION

The purpose of this paper is to clarify the achievements and issues to use external human resources to education services for high school students in the administration of education in depopulated areas.

Depopulation is becoming a social problem in rural areas. According to Ota (2017), it is stated that there are many achievements in the education related field in regional development.

In particular, It is important to develop high school students in regional human resource development, and it is indicated that it is necessary to develop high school students with basic academic ability of community improvement.

Local community activities are premised on the initiative and independence of the people in the community, and it is important for local adults to take charge of community activities voluntarily

by the Ministry of Education (2017). Based on these facts, it is necessary to develop young human resources in the local area in order to live up to the local area, and the government grasps the local issues, it is required to provide appropriate educational services to solve the issues.

On the other hand, It is said that acquiring young human resources to maintain regional strength is an important issue in rural areas where the progress of population decline and aging is remarkable by Ministry of Internal Affairs and Communications.

Related to this, active recruitment of outside human resources from outside the area and establishment of their settlement and retention are considered to be effective measures, and acceptance of volunteers by service learning by university students is becoming active. According to Tokito(2015), With regard to the service learning acceptance of college students of the community in the depopulated area, the influence on the community attachment of the community and the acceptance of field work acceptance indicates the possibility of meeting the community attachment of the community by accepting field work It indicates that university students' activities may contribute to regional activity. Moreover, according to Mitate(2016), based on the tourist information of "Nakama Foot Pass", we extract the factors for regional activation caused by the university students 'efforts, and based on the sustainable activities, the university students' unique heterogeneity, youth, and immaturity make the local residents learn again. Thus, we have accumulated knowledge on the effects of using external human resources such as university students and community revitalizers in community development. The continuity of university students' activities is not guaranteed. In other words, it is necessary to incorporate the use of external human resources into the local education system. However, knowledge about this has not been fully accumulated. Therefore, it is expected that analyzing the influence of the use of external human resources in educational administration can lead to the study of the effective utilization of external human resources in the future of local educational administration.

METHODS

In this paper, the author analyze the influence of outside human resources from the viewpoint of the administration of the town for the board of education in Kuzumaki-Town, Iwate.

The method of research interviewed the staff (Y and I) of the board of education of Kuzumaki-Town.

Y and I have different positions. So, the author checked the background of each staff member before working on the school board. And the author interviewed Y as a person who knows Kuzumaki-Town. Also, the author interviewed I about what is necessary for the education of Kuzumaki-Town from the viewpoint of outside human resources.

The interview dates were analyzed as follows: (1) Writing interview results to text data (2) Open coding to text data (3) Categorization of labels extracted by open coding.

RESULTS&COUNCLUSION

In this paper, the category is described with .., the code with< >, and the quotation of the remark with...

Interview result and conclusion of Y

As a category of utilization cases of external human resources, .Opportunities for changes in human relationships of event participants. and .Providing exchange opportunities with outside the town. were generated from the interview result of Y.

Y describe < decrease in number of students in one class in elementary school > about human relations in the present town. From this, it was found that the number of children in the town was significantly decrease. Also, Y describe < the present condition that human relations do not change because there are many advanced scholars from the town> about K high school. From these things, it can be seen that the change in human relationships is less likely to occur due to the decrease in the number of children in the town through going to school from elementary school to high school.

Y describe < The present conditions that new exchange is born as Sanson foreign student from the out of town > by outside human resources to go to K high school from the town outside.

Interview result and conclusion of I

As a category of issues,《Training of outside human resources》was generated from the interview result of I.

In an interview, I said, "Oh, I have not been trained properly yet."

From this, it became clear that the education committee had not established a training method for outside human resources. It is considered that to establish a training method for the effective use of external human resources is necessary.

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Review of Avatar's Design Factors: Facial Expression and Gesture

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Abstract: The purpose of this study is to review the facial expressions and gestures of avatars in computer-based simulations. In the simulations, avatars perform indispensable roles that guide and help the learner learn effectively. In computer-based simulations, the design components of avatars such as voice, gestures, facial expressions, appearance, learning contexts are mainly considered because these components influence the learner's perceptions. Hence, it is necessary to consider the design factors of avatars so as to maximize the effectiveness of simulations. The facial expressions and gestures are the main interest of the study. Several implications were reported. Expressed emotion, emotion intensity, presence/absence of expression, type of gestures, expression method of feeling, agent's and user's gender, type of agent and user's age intervened in the design of avatar's facial expression. For avatar's gestures, presence/ absence of gesture, types of gestures, presence/ absence of attention guiding, agent's and user's gender, user's age and presence/ absence of PA were found.

Key words: avatar, pedagogical agent, non-verbal communication, facial expression, gesture

INTRODUCTION

In traditional instructional settings, teaching and learning occur by an instructor delivering important knowledge to the learners face to face. For improving learner's engagement and understanding, an instructor uses social cues such as gestures and emotions to guide theirs attentions. In computer-based learning environments, the virtual characters are utilized as tutors or instructors. The virtual character is also named as Animated Pedagogical Agent (APA) or Avatar. Many research showed that APAs /Avatar can promote learners' performance, motivation, presence (Johnson, Rickel & Lester, 2000; Moreno, 2005). As for effective learning and development of learners, social interaction between learners and instructors and among learners

themselves is greatly emphasized by Vygotsky (1978). There are two communications among humans for social interaction: the verbal communication, and the non-verbal communication. The verbal communication is discourses happened among humans. The non-verbal communication includes voice, gestures, and facial expressions and so on. As social interactions among humans plays a vital role on better leaning and better development, the interactions between humans and avatars should also be focused. In terms of facilitating interactions between learners and avatars, well-designed avatars have been shown to be beneficial. When designing avatars, the verbal communication and the non-verbal communication are both needed to take into account for. That is to say, a virtual agent or avatar needs to be capable of showing in a nature language and appropriate emotional and behavioral reactions towards a human interaction partner. Compared with verbal communication, the design of non-verbal communication is more important, especially, gestures and facial expressions. Because gestures and facial expressions are primary means of conveying information for amplifying learners' perceptions of the virtual environment thereby significantly contributing in the learners' achievement and progress.

The main purpose of this study is to review the existing journal articles about experimental study that considering the gestures and facial expressions as independent variables in order to figure out and define the fundamental factors that give an important share in the designing of avatars for learning processes.

LITERATURE REVIEW

When designing avatars, the developers need to consider the verbal communication and non-verbal communication between humans and avatars. Especially, non-verbal communication is indispensable because this kind of communication can help to delivery learning contents in diverse ways or emphasize the importance of the learning content by higher sound pitch, appropriate facial expressions or different gestures. The numerous studies showed that avatars with non-verbal communication skills significantly promote the interactions and content delivery to make the learner understand easily (Baylor & Kim, 2009; Buisine & Martin, 2007; Moreno, Reislein & Ozogul, 2010).

1. Facial expressions

Teacher-student Interaction plays a vital role in any classroom setting (Mohamed Sathik & Sofia, 2011). In such interactions, face-to-face communication is very powerful. The face is rich in information about an individual's identity, as well as information about mood and mental state, so we can access mechanisms that govern our emotions. Studies reveal that the most influential factor in displaying emotions is facial expression. Facial expressions are the primary source of information, next to words, in determining an individual’s internal feelings. Instructors and learners use facial expressions to form impressions of another. The instructors’ facial expressions kept the learners motivated and interested during the lectures (Toby et al., 2008). The teacher can also take benefit the student’s facial expressions as valuable sources of feedback in order to determine whether students are understanding and following him or not, as well as too know when exactly to slow down, speed up, or to choose the appropriate moment to repeat the explanation and so on and so forth. It seems considerably significant to incorporate contextually appropriate facial expressions of emotion in animated pedagogical agents. The emotion can serve as a primary means to achieve the believability of the animated pedagogical agent (Bates, 1994). In this way, learners are able to make comparison between the interactions

with the animated pedagogical agent to the interactions they have in real life with other socially intelligent counterparts during the learning experience (Woo, 2009). Certain researchers focused their investigations on the role of emotions in APA. Bickmore and Picard (2005), Kim et al. (2007), and Veletsianos (2009) conducted research studies that utilized human–like emotionally-expressive animated pedagogical agents while measuring the agent's effect on learning and learners' perception. They came up with significant pedagogical results proving that APAs' facial expressions had positive influence on learners' achievement. Moreover, Mao and Li (2010) found that APA expressiveness influenced students' satisfaction, and Chen et al. (2012) found that an empathic APA increased students' willingness to continue reading and complete exercises. Baylor and Kim (2009) studied the effects of facial expressions and gestures on both attitudinal instruction (changing students' beliefs regarding intellectual property) and procedural instruction (learning how to perform tasks within a software program). Interestingly, they found that for attitudinal instruction, participants learned more when the APA face expressed emotions but deictic gestures was absent, while for procedural instruction, students learned more when the APA gestures were present.

2. Gestures

People's body movements and gestures help communicate their thoughts: They enables effective learning. Instructors who gesture during delivering instruction are particularly likely to help students learn, especially when they speech with gestures. Mayer (2014), Moreno (2005) and Moreno et al. (2001) proved in their studies by proving evidence that when gestures are embodied with high animated pedagogical agent under certain circumstances promote better learning. Empirical studies showed that compared with a static PA, when a PA exhibited social cues such as gesturing and expression, learners performed better (Craig, Twyford, Irigoyen & Zipp, 2015; Lusk & Atkinson, 2007; Mayer & DaPra, 2012). Furthermore, several studies showed that pointing gestures can effectively draw learners' attention and improve performance in multimedia learning (Ozcelik, Karakus, Kursun & Cagiltay, 2009; van Gog, 2014; Wang, Duan & Zhou, 2013; Boucheix & Lowe, 2010; Mautone & Mayer, 2007; Ozcelik et al., 2009). Wang, Li, Liu, and Mayer (2018) found that APA used human-like gestures is very beneficial with growing research base supporting in education. The students who received more specific APA performed better learning score and spent more time on the target material based on eye-tracking measures than the students who received less specific APA. Multiple studies were conducted and showed that the agent's presence is influential but not as much as the agent's decisive behavior. Garau, Slater, Pertaub, and Razzaque's investigation (2005) revealed that only the participants who interacting with a responsive agent to their movements experienced a sense of personal contact with the agent which influenced them to behave more socially attentive as opposed to the participants who interacting with a static of moving but unresponsive agent.

METHODS

This literature study relied on the educational findings of various articles recently published between the last 6 years (from 2014 until 2019) pointed out in three different databases. Google Scholar and Science Direct provided us with 148 and 118 articles respectively, while in PsycARTICLES only 2 articles were found. While browsing through these three databases, multiple keywords were used so as to narrow and significantly focus on articles that relate to this study's topic. For instance, we typed the following keywords: "pedagogical agents", "avatar design", "simulation avatar", "virtual agent" & "social", "virtual agent" & "interaction", "virtual

agent" & "design", "virtual agent" & "simulation." After collecting the appropriate articles relying on the keywords, we filtered the articles according to our study purposes. First, we reviewed the reference types of articles. Among 268 articles, 97 articles were excluded because of the screening rules: a) only Journal Article was sorted, b) Conference Proceedings, Book, Book section, Theses were excluded. Second, we screened the abstract of each article and kept only the ones which related with facial expressions and gestures; from 171 articles, 21 articles remained. Third, the Full-text screening of 21 articles (keeping only the experimental studies and references with facial expressions and gestures) left 9 articles as significant final sample to employ in the study (See Figure. 1).

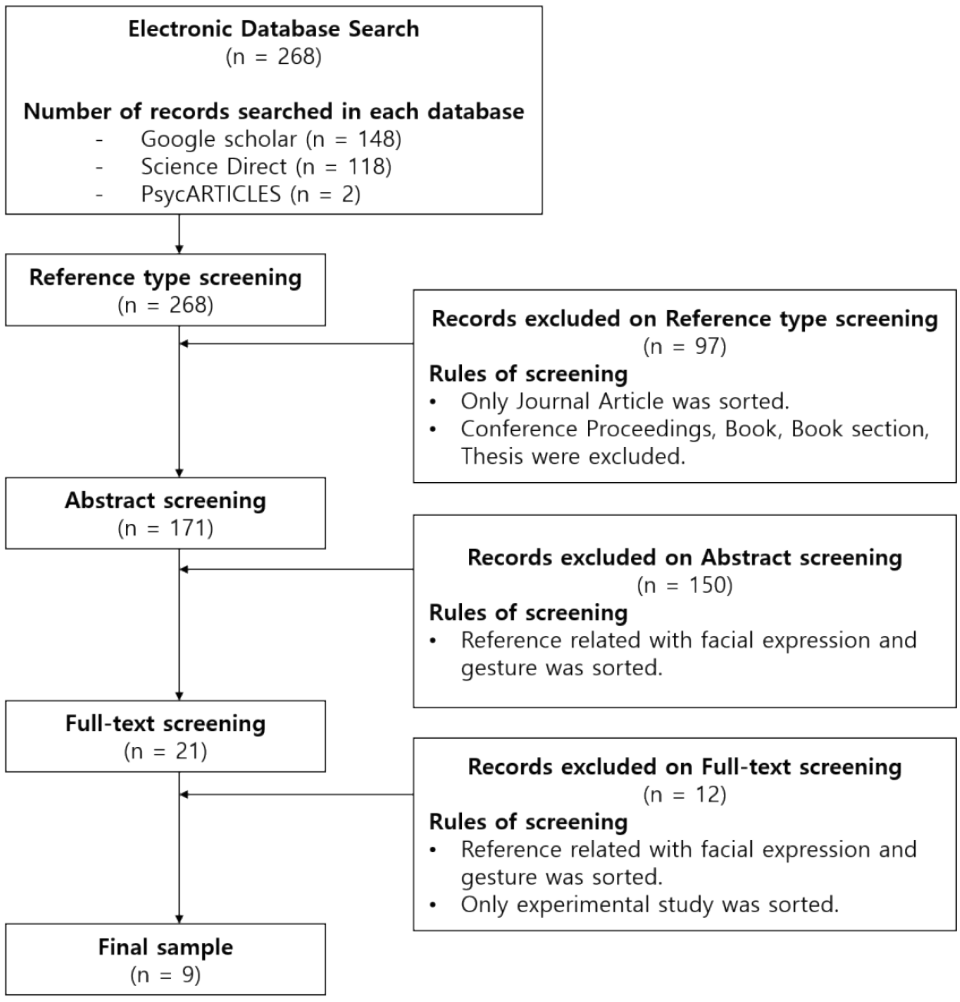


Figure 1. Literature Review Process

RESULTS

1. Distributions of articles

After reference type screening, 171 journal articles were sorted out. Figure 2. shows the distribution of journal articles that dealt with the designing of avatar from 2014 to 2019. From 2014 to 2015, articles dealing with avatar knew a growth in number, 29 articles in 2014 and 42 articles more in 2015. However, during one more year, the designing avatar's articles number declined by more than 50%. Only 18 articles were carried out treating the topic of avatar. Likewise, in 2017, 19 additional articles appeared. Suddenly, 2018-2019 avatar-related articles

saw a big shift in number, which got increased to 63 articles (35 articles in 2018, 28 articles in 2019). This sharp shift reveals a great interest in the designing of avatar for academic purposes.

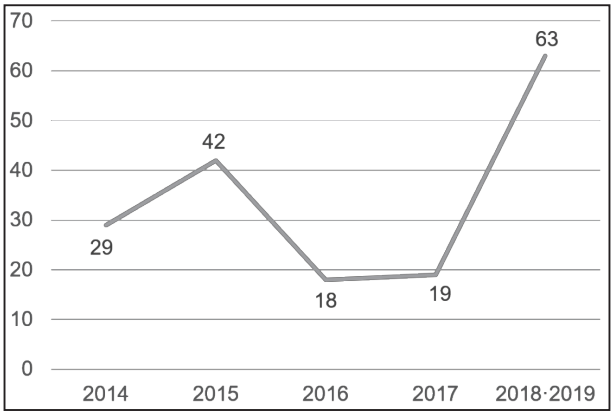


Figure 2. The distributions of journal articles about avatar from 2014 to 2019

With abstract screening and full-text screening, 10 articles were sorted to final sample. Figure 3. shows the distribution of final samples. From 2014 to 2017, only 1 article each was sorted to final sample. Similar with result of reference type screening, the number of article is increased from 2018. There were total 5 articles in 2018 and 2019(2 articles in 2018, 3 articles in 2019).

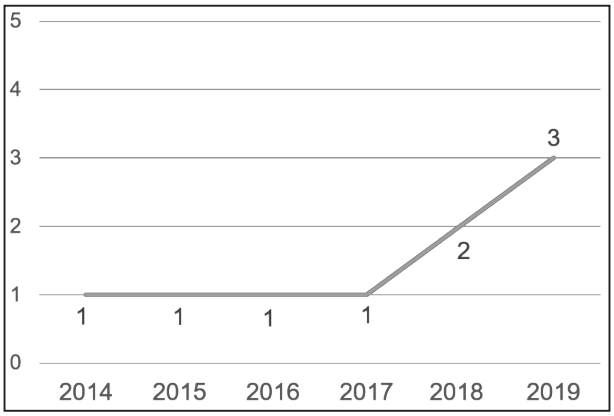


Figure 3. The distributions of final samples

2. Design factors of facial expressions and gestures

We looked through 9 full-text articles which are about experiments and found out the independent variables and dependent variables in these studies (4 articles for facial expressions and 5 articles for gestures, See Table 1 & Table 2). Through the independent variables considered in previous research, we can make sure that when designing avatar's gestures and facial expressions, what fundamental design factor we have to consider. Table 3. shows the frequency at which each design factor was considered. For facial expressions, expressed emotion and emotion intensity were important factors that considered 2 times each. Expression method of feeling, presence/absence of expression, type of gestures, type of agent, agent's and user's gender and user's age were considered 1 time each. Factors considered more than one time in gestures were presence/absence of gestures, types of gestures, and presence/absence of attention guiding. Each factors considered 4 times, 3 times and 2 times respectively. Other factors considered were agent and user's gender, user's age and presence/absence of PA.

Table 1. The design factors of facial expressions and the study outcomes

Study	Independent variables	Dependent variables
RomERo-Hall, Watson, & PaPElis, 2014	- Presence/absence of expression (an emotionally-expressive APA, a non-expressive APA, without an agent)	- Visual attention - Emotional responses - Learning achievement - Perceptions and attitudes of learners
Beer , Smarr, Fisk, & Rogers, 2015	- Expressed emotion (anger, fear, disgust, happiness, sadness, and surprise) - Emotion intensity (20%, 40%, 60%, 80%, and 100%) - Type of gestures(dynamic and static) - User's age (younger and older adults)	- Improvement in performance - Increase in effort - Motivation - Rapport
Mollahosseini, Abdollahi, Sweeny, Cole, & Mahoor, 2018 (Experiment 2)	- Expressed emotion (anger, disgust, fear, happiness, sadness, surprise) - Emotion intensity (15%, 30%, 45%, 60%, 75%, 90%, and 100%) - Type of agent (Virtual agent, Copresent Robot, Telepresent Robot)	- Emotion recognition rates
Tessier, Gingras, Robitaille, & Jackson, 2019	- Expression method of emotion (Action Units onsets) - Avatar's & user's gender	- Realism - Recognition of avatar's feeling - Unpleasantness

Table 2. The design factors of gestures and the study outcomes

Study	Independent variables	Dependent variables
Davis, & Antonenko, 2017	- Presence/absence of gestures (Full, deictic only, no gesture)	- Knowledge retention - Knowledge transfer - PA social acceptance
Pütten, Straßmann, Yaghoubzadeh, Kopp, & Krämer, 2019 (Experiment 1 & Experiment 2)	- Type of gestures (dominance, submissive) - Presence/absence of attention guiding	- Persuasion - Person perception of virtual agent - Communicative abilities - Task difficulty
	- Type of gestures (dominance, submissive) - User's age (young adults, seniors)	
Krämer, Karacora, Lucas, Dehghani, Rüther, & Gratch, 2016	- User's gender (Female, male) - Avatar's gender (Female, male) - Presence/absence of gestures	- Improvement in performance - Increase in effort - Motivation - Rapport
Li, Wang, Mayer, & Liu, 2019	- Type of gestures (Specific pointing gestures, General pointing gestures, Non-pointing gestures, No gestures)	- Learning outcome - Eye movements - Learning perceptions
Wang, Li, Mayer, & Liu, 2018 (Experiment 2 & Experiment 3)	- Presence/absence of PA (PA vs. No PA) - Presence/absence of gestures (Pointing gesture vs. no gesture)	- Performance - Students' eye fixations
	- Presence/absence of gestures (Pointing gesture vs. no gesture) - Presence/absence of attention guiding (having key components change color as they are being described or not)	- Learning outcomes - Visual attention

Table 3. The frequency of avatar design factors

Category	Design factors	Frequency	Study
Facial expressions	Expressed emotion	2	Beer , Smarr, Fisk, & Rogers, 2015 Mollahosseini, Abdollahi, Sweeny, Cole, & Mahoor, 2018 (Experiment 2)
	Emotion intensity	2	Beer , Smarr, Fisk, & Rogers, 2015 Mollahosseini, Abdollahi, Sweeny, Cole, & Mahoor, 2018 (Experiment 2)
	Presence/absence of expression	1	RomERo-Hall, Watson, & PaPElis, 2014
	Type of gestures	1	Beer , Smarr, Fisk, & Rogers, 2015
	Expression method of feeling	1	Tessier, Gingras, Robitaille, & Jackson, 2019
	Agent's & user's gender	1	Tessier, Gingras, Robitaille, & Jackson, 2019
	Type of agent	1	Mollahosseini, Abdollahi, Sweeny, Cole, & Mahoor, 2018 (Experiment 2)
	User's age	1	Beer , Smarr, Fisk, & Rogers, 2015
Gestures	Presence/absence of gestures	4	Krämer, Karacora, Lucas, Dehghani, Rüther, & Gratch, 2016 Wang, Li, Mayer, & Liu, 2018 (Experiment 2 & Experiment 3) Davis, & Antonenko, 2017
	Types of gestures	3	Li, Wang, Mayer, & Liu, 2019 Pütten, Straßmann, Yaghoubzadeh, Kopp, & Krämer, 2019 (Experiment 1 & Experiment 2)
	Presence/absence of attention guiding	2	Wang, Li, Mayer, & Liu, 2018 (Experiment 3) Pütten, Straßmann, Yaghoubzadeh, Kopp, & Krämer, 2019 (Experiment 1)
	Agent's & user's gender	1	Krämer, Karacora, Lucas, Dehghani, Rüther, & Gratch, 2016
	User's age	1	Pütten, Straßmann, Yaghoubzadeh, Kopp, & Krämer, 2019 (Experiment 2)
	Presence/absence of PA	1	Wang, Li, Mayer, & Liu, 2018 (Experiment 2)

2.1. Design factors of facial expressions

Expressed emotion is the factor in which facial expressions avatar makes. Total two studies set expressed emotion as design factor of avatar. Beer et al. (2015), Mollahosseini et al. (2018) considered avatar's expression of various emotions, such as anger, fear, disgust, happiness, sadness, and surprise. Emotion intensity is the factor in how strongly avatars express emotions. Two studies (Beer et al., 2015; Mollahosseini et al., 2018) divided avatar's expression level by more than 5 stages. The presence/ absence of expression also showed the different effects under the different conditions where the one APA is with emotional expression and the other one is without emotional expression. RomERo-Hall, Watson, & PaPElis(2014) conducted the study that one group is an emotionally-expressive APA, one group is a non-expressive APA, and one group is without an agent. Expression method of feeling is a factor in how avatar forms facial

changes that occur in expressing emotions. Tessier et al. (2019) set 7 AUs(Action Units), it is different embodiments of the facial expressions avatar makes during 1600 milliseconds when expressing pain. In this article, expression method of feeling was considered with agent & user's gender. Type of gestures is a factor about gestures that avatar makes with facial expressions. User's age is a factor in the age of users who see avatar's facial expressions. Beer et al. (2015) considered type of gestures and user's age with expressed emotion and emotion intensity. Type of gestures was divided into dynamic and static, user's age was divided into younger adults and older adults. Mollahosseini et al.(2018) divided the types of agents into four, VA(Virtual Agent), CR(Copresent Robot), TR(Teleoresent Robot), and Human. Except for Human condition, the agent had same face and facial expressions. This study considered type of agent with expressed emotion and emotion intensity.

2.2. Design factors of gestures

Presence/absence of gestures is a factor in how strongly avatar express gesture. Three cases (Kr. mer et al., 2016; Wang et al., 2018) have conditioned the presence of gestures, and one case (Davis, & Antonenko, 2017) set 3 levels of gesture. Total three cases set the types of gestures as design factor of avatar. Pütten et al. (2019) conducted two experiment comparing dominance gesture and submissive gesture. Li et al. (2019) considered pointing gestures and divided the gesture types into four: specific pointing gestures, general pointing gestures, non-pointing gestures, and no gestures. Presence/absence of attention guiding is a factor in whether the system provides a guide other than the agent's gestures or verbal clues. Wang et al. (2018) considered presence/absence of attention guiding with agent's level of pointing gesture at experiment 3, and considered Presence/absence of PA with Presence/absence of gestures as a design factor. Pütten et al. (2019) explored relation between dominance of agent gesture and additional attention guiding. Kr.mer et al. (2016) A sets the agent's and user's gender combinations as independent variables, with agent's rapport gestures. Pütten et al. (2019) divided user's age level into young adults and senior. In this study, user's age was considered with dominance of agent's gestures.

DISCUSSIONS

This study has merit in providing focus on future research into avatar's design factors. The study, particularly, identified considerable elements in the design of facial expressions and gestures, which are the main elements of avatar's non-verbal communication. The factors which were considered for avatar's facial expressions were expressed emotion, emotion intensity, presence/ absence of expression, type of gestures, expression method of feeling, agent's and user's gender, type of agent and user's age, while the factors considered for avatar's gestures were presence/ absence of gesture, types of gestures, presence/ absence of attention guiding, agent's and user's gender, user's age and presence/ absence of PA.

The limitations of this study are that the databases used in literature searches were limited (Google Scholar, Science Direct, PsycARTICLES) and did not look at the relationship and significance between the independent and dependent variables of the selected literature. For a deeper understanding of the design elements of avatar, it is necessary to look at more relevant literature and identify the relationships between variables set up in the study.

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