The depth fusion of education in elementary school and information technology - based on the analysis of questionnaires

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Abstract

During February and March 2017, the author surveyed 119 mathematic teachers by questionnaires from more than ten primary or lower secondary schools located in Leshan city, Chendu city, and Meishan city all in Sichuan province in China. The author wanted to know about the teachers’ skills of information technology (IT) and the application of IT during their instruction. Based on the deep analysis of the data from questionnaires, the author resulted from the data as follows: they have recognized the strong impact force of IT in the educational field, that is to say, IT could promote or accelerate the development of education; on the other hand, the teachers always have many good ideals in their instruction but can’t implement them for lacking some necessary advanced skills of IT; coming to the proper application IT, namely, the aspect of the depth fusion of education and IT they think it is difficult in looking for the connections between IT and education. Based on the analysis above the author gives some suggestions on carrying forward the depth fusion of IT and education from two aspects: Firstly, we should go on training the advanced IT skills of the teachers based on the basic skills of IT; we should emphasize the importance of changing models in learning and teaching, highlight the transforming the role of the teachers, and guide students to independent, cooperative and inquiry-based learning in IT situation.

Keywords: Basic Education, Math Education, Math Teacher, Information Technology, Educational Informatization.

1 INTRODUCTION

Since the Ten Years Planning of Educational Informatization (2011-2020), especially, the Planning of 13th Five Years were introduced, there have been tremendous change in Chinese education field. By the middle of last year, there are 87 % primary and secondary schools accessing Internet, and 80 % classrooms equipped multimedia equipment of all the primary and secondary schools in China (MoE, 2016). The National Public Educational Resources Service Platform and the National Public Management of Education Service Platform have been applied for years. There are more than 5 million teachers who actively take part in the event “One Teacher One Excellent Course, One Course One Famous Teacher”. For example, 4 million excellent courses were uploaded to the public platform in the year of 2016 (Chen Lin et al. 2017). More than ten millions teachers had attended the training of IT skills at the end of 2016.

As you know, there is wide gap between different site for China is a large country, of course including education field, which is digital gap named usually at present. The digital gap is significantly different in the region development unbalance, such as rural comparison with urban, east comparison with west in China, the normal schools comparison with the key schools, and so on. Actually, the difference in hardware or infrastructure is more apparent than in software or the quality of the teacher’s. Although most of teachers attended the training of IT skills, how much the competency of information and communication technology (ICT) is enhanced, and how many ICTs are implemented. I think it is another thing. The even worse case is untouched equipment covered by dust in some rural schools of the west of China. Additionally, as for the equipment, there is another phenomenon, namely two pieces of skins, one of which is normal education in daily work; the other is coped with public course in the estimate or competition. All of us understand the importance of the ICT in education and hope to implement ICT in instruction and in learning. However, what should they do and how to give full play the function of the ICT, which are the dilemmas for most of us including teachers, authors, and policy makers. One of the hottest topics these years in China is the depth fusion IT and education.
2 RELATED CONCEPTS AND IT EDUCATIONAL APPLICATION IN CHINA

Information technology (IT) is the application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data (Daintith, 2009), often in the context of a business or other enterprise. Moreover, it is mainly applied in design, development, installation, and developing information systems and application software. IT as the microcomputer, Internet, distance education, network curriculum, virtual schools, and so on have entered the area of instruction to do teachers and students a favor. Integration of ICT into the education basically refers to use of technology in communication, data processing and data storage to impact the knowledge on learners.

At the first stage of application IT into education, we called it as integration, or IT integrating into other subjects. During this stage, the integration meant developing multimedia educational resources and digitizing textbook, etc.; and emphasizing some infrastructure and situation, such as hardware, device, and equipment; and strengthening the application IT skills or equipment in teachers’ daily instruction. The reformer hoped to improve the students’ performance by the IT, namely, the function of the IT is assistant, or making education better, even not indispensable.

Later, some scholars offered a new concept – depth fusion which means fusion IT into education. It is through the effective integration information technology in various disciplines to build a new type of teaching environment, to display better the teachers’ leading role and the students’ main body status, to truly implement the students’ creative spirit and practical ability. Integration of the three basic attributes: create a new teaching environment, realize the new way of teaching and learning, and change the traditional teaching structure (He Kekang, 2007). Depth fusion emphasizes revolutionizing the basic structure of education, which is not constantly a little repair but thoroughly revolution. Similarly, the 2016 National Education Technology Plan demanded that educators should be collaborators in learning, seeking new knowledge and constantly acquiring new skills alongside their students. Education leaders should set a vision for creating learning experiences that provide the right tools and supports for all learners to thrive. Furthermore, education stakeholders should commit to working together to use technology to improve American education (U.S. DoE, 2015).

In China, every stakeholder pay more attention to the educational informatization, who include leaders; teachers, faculty, and other educators; researchers; policymakers; funders; technology developers; community members and organizations; and learners and their families. Many important policies have been made in recent years, for example, Ten Years Planning of Educational Informatization (2011-2020) was introduced in Mar. 2012; the 13th Five Years Planning of Educational Informatization (2016-2020) was come out in Jun. 2016; Liu Yandong (vice-premier of China) gave a speech titled of Full Implement Modernization of Education by Educational Informatization at meeting of the 2nd National Educational Informatization Tele-video-conference on Nov. 19th, 2015.

At present, our strategy of education is that we wish to make modernization of education come true by drive of educational informatization. As you know, implementing educational informatization is a systematic project, huge project, and extremely complex project. So, I just want to discuss the necessary competency of the teachers during the process of educational informatization.

To remain globally competitive and develop engaged citizens, our schools should weave 21st century competencies and expertise throughout the learning experience. These include the development of critical thinking, complex problem solving, collaboration, and adding multimedia communication into the teaching of traditional academic subjects (Joseph Bishop, 2013). In addition, students should have the opportunity to develop a sense of agency in their learning and the belief that they are capable of succeeding in school. As the mentioned above, what is the role or the competency of the teachers in the process of educational informatization?

Through technology, such as videoconferencing, QQ, WeChat, and social media sites, teacher should connect with other educators and experts across their communities or around the world to expand their perspectives and create opportunities for student learning. Teachers need to skill at teaching in a technology-enabled learning environment. In addition, teacher need design highly engaging and relevant learning experiences through related technology. In the process of students’ learning, teachers play the role of guider, facilitators, and motivators. Teachers need to leave their teacher preparation programs with a solid understanding of how to use technology to support students’ learning. Effective use of technology is not an optional add-on or a skill that we simply can expect teachers to pick up once they get into the classroom. Teachers need to know how to use technology to realize state’s learning standards from day one (U.S. DoE, 2015).
3 SURVEY

In order to know about teachers’ skill of IT and the implementation IT in basic education, the author did an investigation in some schools during February and March 2017. More than one hundred teachers in over ten schools were selected in Sichuan province, China. The author took school as the sample unit. Referring to the objective requisite, the author employed the principle as follows, primary schools and lower secondary schools within obligatory education period, balance with urban and suburban schools. So, the schools locate in Leshan city, Chengdu city, and Renshou County, which consist of primary school, lower-secondary school, and nine-years school. Some of the teachers come from prestigious school located in big city, such as Chengdu No.7 lower secondary school; some teachers come from small city or district of city, such as Leshan No.5 lower secondary school, Shanwan primary school, etc.; some come from rural area, such as Renshou Liren school, Shawan Tashui lower secondary school, and so on.

When doing the questionnaires for pursuing the data of teachers IT skills, individual’s characteristics cannot be neglected, for instance, age, teaching experiences, gender, subjects, education attainment, etc. Moreover, in the process of data collection which pertains to the means of questionnaires, and another approach seeking information is through face to face interviews from the teachers, and discussing IT in education via QQ and WeChat.

The survey use questionnaires to investigate some aspects relation to teachers in the process of education informatization, for example, the teachers’ IT capacities, including the usage, development, and re-edit of DLOs in teaching (DLO is acronym of Digital Learning Object, i.e. an electronic textual document, presentation in PowerPoint, Excel file, animation, simulation, didactic game etc., more about DLO eg Bártek, 2016); applying public available educational resources; the model of fusion IT into education; and so on. The questionnaires were collected via post and spot collection. On the other hand, the author discussed the necessary IT skills for the teachers with the director of IT subject of Shawan district, Leshan city via QQ and WeChat. In this paper, the author will analyse the IT skills of the teachers and explore a way to improve it.

3.1 Data Analysis

The author collected 119 questionnaires via post and spot collection during February and March 2017. Some of the basic information of the teachers is display in the Fig. 1 as follow.

![Figure 1. Some of the Basic Information of the Teachers’](image)

We can understand the difficult task of the education informatization in the schools from the results of the questionnaires as above. Nearly 2 % of them have the master degree, and more than 40 % have the college degree (namely, they study in university no more than 2 years), even without any degree. Generally speaking, the higher one acquire the degree or the longer one attain education, the easier one learn new knowledge or skills. At present, the worse status is that the proportion of the old teacher is too high and the proportion of the young teacher is very small. The old teachers feel it is more difficulty to learn new IT skills, even some of them reluctant to learn skills of IT or application IT in their education. Of course, we can know law which the older the teacher is, the more years the teacher serve in school. More than half of them have served in education over twenty years. That is to say, most of them began to work in school before the year 1996, and 37 % entered schools to instruct in
the 1980s. It is easy to obtain the information that approximately fifty percent teachers received tertiary education in 1980s.

Obviously, the economy of that years in China is very backward, not to mention computers in education field. So, we can tell that approximately 50 % teachers never used any computer during their tertiary learning.

About the basic skills of IT, there are some questions in the questionnaire, i.e. MS word, PowerPoint, and Excel. In this section, the author investigated the similar content in Jan. 2016. So, we can draw some comparison between the data coming from the year of 2016 and 2017 as follows in Fig. 2 and Fig. 3.

Note: The questionnaires in 2016 were designed by the author’s colleagues in Leshan Normal University in China, and the questionnaires in 2017 were designed by the author's colleagues in Palacký University in Czech Republic. It is inevitable that they emphasized different key point and the similar theme was understood differently by the participants. Furthermore, there were 143 participants in 2016 consisted of all subjects in basic education, and there were 119 questionnaires all came from mathematic teachers in primary or lower secondary schools. There were 90 questionnaires came from the same sample schools in last year and in this year.

It is revealed that the capability of Microsoft Office (MS Office) and special software is under expectation from the Fig.2. Even though the basic skills of MS Office is the cornerstone of the teaching informatization and further education of informatization, nearly half of them evaluated themselves under the level of average, and there are approximately 15 % mathematic teachers without the capability of application MS Office. Let alone use special tools in education. In addition, there are very small part of teachers having the competency of advanced MS PowerPoint and Excel. From the Fig.4, we know that more than 60 % of the teachers use DLOs in their education with the frequency of over 0.5. It is implied that most teachers make use of DLOs for pursuing high-quality instruction. About the frequency of using DLOs in 2016 and 2017, we may use the Likert Scale to sum the scores. We can exclude the item of frequency=0, then there are five different degrees of frequency left. According to the Likert Scale regulation, we regard frequency from 1 % to 25 % as 1, from 26 % to 50 % as 2, and the rest can be done in the same manner. So, we can calculate the total scores of 2016 (S2016=Σf*i*n, i represents different degree of frequency, the value of n varies from 1 to 5) and 2017. Through simple calculation, we can obtain the totals, S2016=3.35, S2017=2.86. Thus, it is easy to know that the frequency of mathematic teachers use DLOs is approximately 10 % lower than other subject teachers’. This result is related to the concept which the mathematic teachers consider mathematics needs logic reasoning not the vivid display.

No more than 5 % teachers consider the effect of DLOs or IT is little or without any effect, that is to say, nearly all of the teachers think high of the utilization of DLOs or IT in their education. When ask the main reason that they do not create DLOs for teaching, or create or edit them only rarely, their answers are very concentrated on two answers. 59 % teachers chose “I do not have the necessary skills”, and two thirds teachers thought they did not have the necessary software tools. For most the teachers, the skills of IT are the most scarce.
4 CONCLUSIONS - THE AUTHOR’S SUGGESTION

From the result of questionnaires and data analysis, we may conclude that the teachers’ capacity of IT is not optimistic as well, even a bit bad. It is worth noting that every elementary teacher has attained two times at least training of IT in the last ten years by means of face to face or online, and the total course trained are more than 80. The author considers the dilemma comes into being from three reasons, one is that they feel inconvenient to obtain help or guidance in their school; another is that they are short of necessary basic knowledge of IT; the last but not the least, the knowledge of the IT field updates faster than the teachers’ learning. In author’s opinion, the most important issue facing elementary education today is the lack of trained teachers, however, we cannot possibly achieve IT for all if there are not teachers to teach it. There needs to be a way to train existing teachers to teach subject of IT, especially at the elementary level. In elementary schools, the classroom teacher may guide all subjects and there needs to be a way for these teachers to become proficient at teaching discipline of IT. In a word, special industry experts train the IT subject teachers of elementary school, next, who can guide the other subject teachers in their schools.

According to The Criterion of Capacity of K12 Teachers in Application IT (Trial) (MoE of the P.R.C.), The Training Criterion of K12 Teachers in Application IT (Trial) (MoE of the P.R.C.), and the real situation of the teachers, the author designs a main necessary knowledge of IT frame for the teachers of IT curriculum. The author divides the main content into 5 modules for them to learning in 2017 as follows:

Module 1 involves ordinary media, manipulation of computers, and using ordinary office automatic software. The specific content is manipulation of Microsoft Windows 10 version, and the three basic MS Office software (Word, PowerPoint, Excel). For the teachers of IT curriculum, the trainer will deepen to explore some advanced function or manipulation, such as calling the WIN64 API (Application Programming Interface) functions, the usage of Excel complicated functions, editing long document by Word, development complicated motion, usage of triggers in PowerPoint, etc.

Module 2 relates main to develop multimedia educational resources, especially developing animated cartoon, which includes design and development cartoon by new version Adobe Flash, and compile programme with ActionScript 3.0 in the situation of Adobe Flash CS6.

Module 3 is about the content of the program design which emphasizes the thoughts of programme and doesn’t care for the specific rules of different programming language. We will choice the Visual Basic as the example to instruct, and apply VBA (Visual Basic for Applications) to manage or control Microsoft Office for improvement the function of the MS Office.

Module 4 refer to basic manipulation of database and doing some simple query by SQL (Structured Query Language). It will contribute to comprehend the structured data in computer, because we all in the big data era. The SQL is a standard query language which can be applied together with most of programme languages.

Module 5 relates network which includes design and development website, getting resources through the function of searching and filter, and downloading correctly resources for teaching. About development website, it will pay more attention to dynamic web pages, link database, and HTML5 (the fifth version of HyperText Markup Language).

Teachers should be guides, facilitators, and motivators of students. The information available to educators through high-speed Internet. By understanding how to help students access online information, engage in simulations of real-world events, and use technology to document their world, educators can help their students examine problems and think deeply about their learning. Teachers also can take advantage of these spaces for themselves as they navigate new understandings of teaching that move beyond a focus on what they teach to how students can learn and show what they know (U.S. DoE, 2015).

At last, the author summarizes the viewpoint that the destination of any tool or method is application in our daily work to improve performance, however, the cornerstone of the application is the skills of them.

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REFERENCES


