A Study of Pre-Service Preparation of Exceptional Teachers in Elementary Schools from the Perspective of TPACK

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Abstract: In the context of educational informatization, what knowledge and ability teachers should have has always been a hot topic in educational research. The proposal of TPACK, which integrates technology, not only conforms to the trend of the times and promotes the integration of curriculum, but also provides a new perspective for teachers' professional development. The quality of primary school excellent teachers determines the quality of primary education in China. Pre-service training is the most systematic, comprehensive and far-reaching stage in teacher training. Therefore, it is very important to do a good job of pre-service training of primary school excellent teachers. This study mainly analyzes the problems existing in the training concept, curriculum setting and teaching practice of excellent teachers in pre-service primary schools in China, and puts forward the mode construction of cultivating excellent teachers in primary schools from the perspective of TPACK, so as to promote the pre-service training of excellent teachers in primary schools and promote the process of educational informatization in China.

Keywords: TPACK; Outstanding primary school teacher; Pre-Service training.

1. INTRODUCTION

With the wide application of modern information technology, the development of education informatization has entered a new era. Since April 2018, the state has successively issued the Action Plan for Education Informatization 2.0, the Implementation Plan for Accelerating the Modernization of Education (2018-2022), and China Education Modernization 2035, which respectively call for the construction of an education informatization system that is compatible with the country's economic and social and education development levels, accelerating educational change in the information age, and constructing information technology of a new education teaching mode. It can be seen from these policies promulgated by the state that information technology education should be vigorously developed in line with the trend of the times, so as to accelerate the pace of education modernization.

The quality of cultivating outstanding elementary school teachers determines the quality of elementary school education and affects the overall development of elementary school students. In order to cultivate outstanding elementary school teachers of excellence, since August 2014, relevant state departments have respectively issued the Opinions of the Ministry of Education on the Implementation of the Teacher Training Program of Excellence, the Opinions on Comprehensively Deepening the Reform of Teacher Team Building in the New Era, and the Opinions on the Implementation of the Teacher Training Program of Excellence 2.0, which not only require that teachers of excellence in elementary school love the cause of elementary school education, have a wide range of knowledge, have comprehensive abilities. The opinions not only require outstanding elementary school teachers to love the cause of primary school education, have extensive knowledge and comprehensive abilities, and be able to meet the needs of multidisciplinary education and teaching in elementary school, but also require outstanding elementary school classrooms to take the initiative to adapt to the changes in new technologies such as informatization and artificial intelligence, and to be brave to innovate in teaching and learning, be adept at comprehensive parenting, and have the ability to develop lifelong learning.

In addition, with the modernization of education, higher education institutions have also introduced information technology courses for pre-service elementary school teachers of excellence, but pre-service elementary school teachers of excellence are still deficient in the integration of information technology between specific disciplines and pedagogies, and they lack the opportunity to practice applying the integrated knowledge to the ability to solve complex teaching problems. And the Ministry of Education's Ten-Year Development Plan for Education Informatization (2011-2020) and the Ministry of Education's Opinions on the Implementation of the National Primary and Secondary School Teachers' Information Technology Application Ability Enhancement Project 2.0, issued in March 2012 and March 2019, respectively, put forward the goal and task of comprehensively promoting...
the development of the in-depth integration of information technology and education and teaching. It can be seen that the integration of information technology with the curriculum and the integration of information technology into subject teaching are of great significance in serving classroom teaching, as well as in the cultivation of pre-service elementary school teachers of excellence in higher education institutions.

2. UNDERSTANDING OF TPACK AND TEACHER EXCELLENCE IN ELEMENTARY SCHOOLS

2.1 The concept of TPACK

TPACK is a knowledge framework consisting of three core elements, i.e., subject matter content knowledge, pedagogical knowledge, and technological knowledge, and four composite elements, i.e., subject matter pedagogical knowledge, subject matter content knowledge of integrating technology, pedagogical knowledge of integrating technology, and subject matter pedagogical knowledge of integrating technology, as well as contextual veins [1].

2.2 The concept of Teacher Excellence

Regarding the understanding of excellence, in the Modern Chinese Dictionary, excellence means "very good, beyond the average"; in the Hanyu Da Dictionary, excellence means "superior and outstanding"; in the Xinhua Chinese Dictionary, excellence means "In the Xinhua Chinese Dictionary, excellent means "very outstanding, very good". It can be seen that "excellence" means more than general, and higher than the ordinary level of "excellence", belonging to the top of the excellence [2].

American scholars Hageman, Vicki, Brackett and Jim pointed out through research, excellent teachers should have respect for students, harmony with students, support for students, communication and cooperation between teachers, teaching skills, work enthusiasm, professional knowledge and other 12 standards [3]. According to British scholars Daw Nathan and Graham, exceptional teachers should possess four main qualities: good academic standards, strong social skills, clarity of expression, and interest in students and learning [4]. According to Malaysian scholars Hamzah, G. and others, exceptional teachers should have good personality traits, knowledge and skills, excellent work performance, good communication skills and have the potential to move towards excellence [5].

According to Shi Zhongying, a professor at Beijing Normal University, an excellent teacher should have love in his heart and a high level of professionalism. According to Fu Huailiang, an excellent teacher includes four constituent elements: noble teacher ethics, rich knowledge, excellent teaching ability and strong innovation ability. Wang Zhiguang defines the concept of excellent teachers from both static and dynamic levels. The static level mainly refers to the use of quantitative methods to assess and evaluate teachers' teaching theories and practices, and those with outstanding performance can be recognized as "excellent"; the dynamic level mainly refers to the fact that excellent teachers do not stay in a certain state but promote themselves to a deeper and deeper level during the process of educational action. The dynamic level mainly refers to the fact that excellent teachers do not stay in a certain state, but in the process of educational action to promote the development of self in the direction of deeper, higher and more sophisticated [6].

Through combing through the literature related to excellent teachers, the author found that in the age of information technology, teachers' professionalism, professional knowledge, and professional competence will be in dynamic change with the development of the times. Therefore, this study mainly adopts Wang Zhiguang's conceptual definition of excellent teachers.

2.3 The concept of Teacher Excellence in Primary Schools

After combing and analyzing the relevant literature collected, the author found that domestic scholars define the concept of excellent teachers in elementary school mainly based on the Opinions of the Ministry of Education on the Implementation of the Excellence in Teacher Cultivation Program and the Professional Standards for Primary School Teachers in terms of teachers' morality, knowledge and competence. For example, according to Wen Jiqiu, an outstanding elementary school teacher is a professional who "meets the basic requirements of the Professional Standards for Primary School Teachers, performs the job duties of elementary school education and teaching, is superior to ordinary teachers in terms of knowledge, teacher ethics, and competence, and constantly pursues
excellence in his educational career, surpasses himself, and cultivates educated people into high-quality human resources [7]. "According to Liu Dejing, outstanding elementary school teachers are "teachers who love elementary school education, love elementary school students, have strong educational beliefs, high level of educational teaching ability and outstanding scientific research ability [8]." According to Wang Jiajun, an excellent elementary school teacher is "an outstanding elementary school teacher who has a strong passion for education, an unswerving belief in education, a broad foundation in the subject matter, an outstanding teaching ability, a high moral character, a unique understanding of education, a keen and efficient research ability, and a lifelong learning philosophy [9]." 

By analyzing the above concepts or connotations of the relevant elementary school teachers of excellence, combining the TPACK knowledge framework and the problem-solving abilities needed to apply the integrated knowledge to real teaching situations, this study mainly adopts Wen Jiqiu's definition of the concept of elementary school teachers of excellence.

3. CURRENT PROBLEMS IN THE PRE-SERVICE TRAINING OF OUTSTANDING TEACHERS IN ELEMENTARY SCHOOL

3.1 Training philosophy: non-specific combination of theory and practice

At present, the training concept of combining theory and practice is emphasized in the TPACK training of pre-service elementary school teachers of excellence, but the combination of theory and practice emphasized in the training concept is not specific enough, as shown in the following two aspects:

First, the cultivation goal. In terms of the orientation of the cultivation goal, some higher education institutions cultivate pre-service elementary school teachers of excellence as technology designers. However, from the research and study of information technology application practice, although the overall level of information technology of China's pre-service elementary school teachers of excellence has been improved, but most of them are only at the level of "technology consumers" and do not have the ability of "technology designers". In addition, from the practical examples of information technology, if there is no solid technical foundation and subject teaching knowledge, it is impossible to achieve the effect of technology to improve teaching [10]. Thus, it can be seen that the goal of cultivation is too high, not in line with the actual situation, and difficult to realize.

Second, the cultivation mechanism. Currently, some higher education institutions have proposed a fusion and integration TPACK training mechanism for pre-service elementary school teachers of excellence. However, as we all know, the realization of "integrated TPACK training mechanism" requires effective policy support, specific training programs and detailed curriculum plans, otherwise, "integration" will be difficult to realize. In addition, the realization of "integration" requires strong logical thinking skills, rich knowledge of information technology, subject specialization and pedagogy, which is very difficult for pre-service elementary school teachers of excellence [11]. Therefore, "integration" can be regarded as a goal that is constantly pursued in education, but it is not an effective method or strategy to enhance the TPACK of outstanding elementary school teachers.

3.2 Curriculum: Lack of TPACK integration

The current public courses of educational technology in higher teacher colleges and universities have problems such as short class schedule, unreasonable ratio of compulsory and elective courses, unscientific assessment methods, and lack of practical guidance and exercise. Most importantly, the educational technology courses have the problems of emphasizing theory, emphasizing practice and lacking operability, which seriously affects the cultivation of pre-service elementary school teachers of excellence in TPACK.

In addition, the colleges of China's senior teacher colleges cultivating pre-service elementary school teachers of excellence have not formed a set of integrated courses from basic teacher training in teaching skills, to instructional design, information technology learning, and then to instructional organization and exercise in teaching practice. As a result, pre-service elementary school teachers of excellence can only learn according to their own interests, which leads to a large difference in the level of their single subject content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK), as well as the difficulty in forming their composite knowledge, which in turn makes it more difficult for them to form their subject pedagogical knowledge of integrated technology (TPACK). Overall, the current curriculum for excellent teacher education in pre-service
elementary schools is dominated by a lack of integrated courses that use pedagogical knowledge (PK) and technological knowledge (TK) to teach case studies in the context of the professional curriculum.

3.3 Teachers’ traditional mode of teaching

Take the teaching of subject content knowledge as an example. First of all, in terms of teaching, some of the current teachers in higher education institutions are still mainly teaching subject content knowledge by the traditional lecture method, and the obvious disadvantage of this method of teaching is that it provides fewer opportunities for pre-service elementary school teachers of excellence to practice teaching, which leads to poorer transfer of their knowledge. Second, in terms of instructional design, although the technological tendency of instructional design was emphasized, it was not evident in the actual instructional design of the courses, and teachers mainly followed the traditional instructional design. Again, in terms of teaching strategies, although emphasis was placed on the use of diversified teaching strategies and the construction of a learning community of pre-service elementary school teachers of excellence to promote their TPACK learning, the actual effect was not obvious. In addition, in terms of teaching means, since there is no clear document in the higher education institutions to require teachers to use modern teaching means such as multimedia for teaching, therefore, in the specific teaching practice, there is no integration of technology in the teaching of the subject, which is specifically manifested in the following ways: some teachers do not have the concept of integrating information technology in the teaching of the subject, and information technology on the production of classroom materials is not obvious, and the screen is merely treated as a blackboard. The teaching effect is naturally not significantly improved, thus affecting the development of pre-service elementary school teachers of excellence TPACK.

3.4 Inadequate practice mechanisms

The practice mode of TPACK for pre-service elementary school teachers of excellence in China's higher teacher colleges and universities is mainly based on microgrid teaching and educational internship, and these two practice modes in the cultivation of pre-service elementary school teachers of excellence in TPACK are mainly characterized by imperfect mechanism problems.

3.4.1 Microgramme Teaching

At present, some institutions of higher education do not provide sufficient microform teaching training equipment for pre-service elementary school teachers of excellence, and the mechanism does not guarantee sufficient training time for them, nor do they arrange microform teaching training for the educational technology courses and subject teaching method courses. In addition, some institutions of higher education do not guarantee that pre-service elementary school teachers of excellence have instructors on-site to guide them every time they do microgram teaching training, which leads to unsatisfactory results in microgram teaching training, and then leads to a lack of pre-service elementary school teachers of excellence's ability to effectively integrate technological knowledge, subject matter knowledge, and pedagogical knowledge into the same classroom teaching.

3.4.2 Educational internships

First of all, from the arrangement of educational internship bases, many higher education institutions do not provide suitable internship bases for pre-service elementary school teachers of excellence, for example, some internship schools lack hardware such as information technology, which results in pre-service elementary school teachers of excellence not being able to effectively improve their TPACK through educational internship.

In addition, from the point of view of the time arrangement of educational internships, the educational internships provided for pre-service elementary school teachers of excellence in many higher education institutions are shorter and more concentrated, and such internship arrangements are not in line with the general law of knowledge acquisition and transfer in learning psychology. As we all know, it takes ten years to grow trees and a hundred years to cultivate people, and talent cultivation is a relatively long process, so it is not realistic to let pre-service elementary school teachers of excellence make progress in all aspects through short-term and centralized educational internships. The use of information technology in teaching by pre-service elementary school teachers of excellence in educational internship is also affected by the teaching hardware and software of the internship school and other factors [12].
4. CONSTRUCTING A MODEL OF PRE-SERVICE TRAINING FOR OUTSTANDING TEACHERS IN ELEMENTARY SCHOOLS UNDER THE PERSPECTIVE OF TPACK

4.1 Revision of the talent cultivation program

In order to adapt to the requirements of elementary school teachers in the information age and to meet the real needs of elementary school education, higher education institutions should revise their talent training programs to cultivate pre-service elementary school teachers of excellence into teachers with educational sentiments, broad knowledge, comprehensive abilities, subject literacy, teacher professionalism and the high degree of integration with the new era of information technology, and at the same time, all-round development of morality, intellectuality, physical fitness, aesthetics, and labor, with good moral integrity, professional ethics, teamwork, and capable of teaching the subject as well as educational management. They are highly qualified elementary school teachers who are competent in subject teaching and education management. In addition, in the new talent cultivation program, the cultivation of information literacy of teachers in the information age should be strengthened, the high degree of integration of online and offline teaching should be emphasized, the full integration of TPACK theory and practice should be emphasized, and the technology should be integrated in the curriculum, classroom teaching, microgrid teaching, and educational internships, so as to cultivate pre-service elementary school teachers of excellence in TPACK [13].

4.2 Revision of the talent cultivation program

Curriculum is a key element of education. The realization of the cultivation goal of pre-service elementary school teachers of excellence needs to be supported by the corresponding curriculum. Therefore, in setting up curricula for pre-service elementary school teachers of excellence, tertiary institutions should pay attention to optimizing the educational technology curriculum system, reforming the content of educational technology courses, and adopting a curriculum model that combines theory and practice.

4.2.1 Optimizing the educational technology curriculum

At present, in addition to teaching the three main courses of "language, mathematics and foreign languages", elementary school teachers in China are also responsible for teaching the courses of "music, physical education and aesthetics", which require elementary school teachers to have good information literacy. For this reason, tertiary institutions should take the modern education concept of the new era as the lead, optimize the curriculum system for cultivating outstanding elementary school teachers in TPACK, and set up more courses on educational technology.

Considering that the cultivation objectives of outstanding teachers of elementary school in higher teacher institutions should be consistent with the requirements of primary education, in order to meet the needs of teachers in the information age, in addition to the compulsory courses of educational technology such as University Computer Application Fundamentals and Modern Educational Technology and Application and the elective courses of educational technology such as Microcourse Design and Production and Multimedia Courseware Design and Production for pre-service outstanding teachers of elementary school, it is also necessary to set up additional courses of Information Technology and Subject Teaching Integration" and other compulsory educational technology courses, thus ensuring the deep integration of pre-service elementary school teachers of excellence in technology knowledge (TK), subject content knowledge of integrated technology (TCK), pedagogical knowledge of integrated technology (TPK), subject pedagogical knowledge of integrated technology (PCK), and subject pedagogical knowledge of integrated technology (TPACK).

4.2.2 Reforming the content of educational technology courses

At present, China's senior teacher colleges and universities mainly cultivate pre-service elementary school teachers of excellence in educational technology through the public courses of educational technology, but we know that the mastery of technology has not yet allowed pre-service elementary school teachers of excellence to effectively integrate technology into subject teaching, which is also the main reason for the low TPACK of pre-service elementary school teachers of excellence in China at present. To address this problem, we can refer to relevant studies at home and abroad to reform educational technology courses.
Some scholars in China emphasize the integration of the content structure of educational technology courses. Specifically, it is to introduce technological elements in the learning process of educational technology courses and strengthen the integration of technology in the curriculum, so as to improve the TPACK of pre-service elementary school teachers of excellence.

In recent years, foreign scholars and universities have taken the TPACK framework as an indicator of educational technology courses, so as to reform educational technology courses and teaching materials. Specifically, in terms of curriculum, New Zealand scholars Grath and Morrow have redesigned the e-learning course of the School of Education of the University of Canterbury in order to improve students' motivation to participate in the course and combine the course content with students' real life; the University of Indianapolis has revised its educational technology course according to the TPACK framework. Second, in terms of teaching materials. In the spring 2009 teacher education program, the University of Maine at Farmington, Fort Hays State University, and State Georgia Southwestern University, USA, used the TPACK manual as a textbook for their educational technology courses; Integrating Educational Technology in Teaching and Learning by Lynette Roblyer and Aaron Doering, USA, became the A best-selling educational technology textbook in the United States, currently in its fifth edition, in which the authors use TPACK as one of their foundational theories [14].

4.2.3 Adoption of a program model that combines theory and practice

The study found that pre-service elementary school teachers of excellence were not interested in learning the theory of educational technology courses. Therefore, teachers in higher education institutions should link the theory and practice of educational technology courses so that pre-service elementary school teachers of excellence can understand the reasons for using information technology. To this end, higher education institutions can adopt a curriculum model that combines theory and practice to enhance the TPACK of pre-service elementary school teacher excellence. This curriculum model can be carried out in three specific phases: the first phase is technology-based teaching and instruction. That is, pre-service elementary school teachers of excellence study the course of educational technology, mainly learning the theory of educational technology, how to apply technology in educational teaching, and how to apply technology in microgram teaching. The second stage is an educational practicum based on pedagogy. That is, pre-service elementary school teachers of excellence in the teaching process of educational internship using demonstration method, experimental method, deductive method, inductive method and other teaching methods, the whole teaching process of the whole video, teaching reflection based on the video after the end of teaching. The third stage is technology-based educational internship. This stage requires pre-service elementary school teachers of excellence to apply the technology learned in the first stage in the development of instructional design, the implementation of the teaching process, the reflection of teaching examples, and to adjust their instructional design based on the suggestions and comments of their supervising teachers [15].

4.3 Teaching and learning

Classroom teaching is an effective way to implement the program. In order to realize the goal of cultivating excellent teachers in elementary school, higher education institutions should adopt blended learning mode, improve the mechanism of microgrid teaching and carry out microgrid case studies, improve the mechanism of educational internship and build learning communities to improve the effectiveness of teaching in pre-service elementary school teacher excellence cultivation courses.

4.3.1 Adoption of a blended learning model

In order to comply with the requirements of education reform in the era of informationization, pre-service elementary school teachers of excellence must master new teaching modes such as flipped classroom and microcourse, and use the TPACK framework to innovate teaching methods and modes of teaching. For example, senior teacher colleges and universities can open online quality courses on the Mucou platform, so that pre-service elementary school teachers of excellence can learn by adopting autonomous and cooperative, online and offline blended learning modes. The pre-service elementary school teachers of excellence complete the courses by mastering TPACK and pass the course assessment, and the higher education institutions should count the credits of these courses into the system [16].

4.3.2 Improvement of microgram teaching mechanism and development of microgram case studies
Higher education institutions should create opportunities for pre-service elementary school teachers of excellence to engage in classroom teaching practices in which there is learner and mentor participation, the use of relevant pedagogical rules, and the application of technological methods, thereby promoting their ability to integrate technology into subject matter teaching.

First, improve the existing training mechanism for microgrid teaching. Higher education institutions should arrange the training time for microgrid teaching in conjunction with the number of pre-service elementary school teachers of excellence, and arrange the content of microgrid teaching training in conjunction with the public courses on educational technology offered as well as the courses on subject teaching methodology. In addition, institutions of higher education should provide advanced microgrid teaching equipment for pre-service elementary school teachers of excellence, guarantee the time of microgrid teaching training, and ensure that every time a teacher to the microgrid teaching site to guide them, so as to ensure the quality of microgrid teaching training.

Secondly, carry out research on microgrid class cases. The research of microgrid lesson case is pioneered by foreign scholars, specifically, the research of microgrid lesson case is the combination of microgrid teaching and lesson case study. As a result, China's higher education institutions can improve the TPACK of pre-service elementary school teachers of excellence based on microgrid lesson case study. The specific operation of microgrid lesson case study is as follows: firstly, on the basis of existing microgrid teaching, pre-service elementary school teachers of excellence form a group in a cooperative way and design a lesson. Then, the whole group practiced the microgrid case study in three stages: in the first stage, all members of the group had to teach the designed lesson in the form of microforms and videotape the lesson; in the second stage, all members of the group watched the video recording of the lesson and evaluated whether the lesson achieved the pre-determined teaching objectives; and in the third stage, the whole group suggested modifications to the lesson of each member. It is important to note that these three stages are repeated in a cycle until all group members have attended the lesson. In the microgrid lesson study model, pre-service elementary school teachers of excellence develop TPACK in authentic problem-solving situations by viewing, discussing, evaluating, reflecting, revising, and teaching the lesson multiple times [17].

4.3.3 Improving Educational Internship Mechanisms and Building Learning Communities

As we know, the subject matter pedagogical knowledge of integrating technology (TPACK) on the one hand is mainly derived from teaching practice, and on the other hand it can effectively guide teaching practice activities, which means that TPACK is characterized by its practical nature. Since TPACK is a practical knowledge, TPACK is best developed through problem solving. Therefore, there is a need for higher education institutions to provide more opportunities for pre-service elementary school teachers of excellence to practice education. Educational internship is a good opportunity for practice. Higher teacher institutions should improve the guarantee mechanism of educational internship, so that pre-service elementary school teachers of excellence can build a learning community in educational internship, re-interpret and validate the learned TPACK theories, so as to improve their personal TPACK.

First, the higher education institutions should improve the internship guarantee mechanism, i.e., the higher education institutions should provide the pre-service elementary school teachers of excellence with suitable internship bases and sufficient internship time, so as to guarantee that they can apply the learned pedagogical knowledge and information technology knowledge to implement teaching.

Secondly, construct a learning community. Due to the contextual, practical and reticent characteristics of TPACK, this determines that it is generated in practice, developed in reflection and added value in sharing. Therefore, the construction of a learning community with common goals, common participation in learning, and exchange, communication and sharing in learning has an indispensable role in the development of TPACK for pre-service elementary school teachers of excellence in educational practice. In the construction of learning communities, network tools can be used as technical and material carriers, and different learning communities can be formed by combining educational technology and taking into account the specificity of the subject specialties of pre-service elementary school teachers of excellence, so that pre-service elementary school teachers of excellence can experience the theory of TPACK, reflect on the practice of TPACK, deepen the knowledge of TPACK, and thus improve TPACK in the communication and sharing of learning communities. The specific operation is divided into three phases: in the first phase, community members learn and master TPACK theory and the theory of a certain knowledge teaching method. In the second stage, community members observe the teaching demonstration
of experienced instructors based on the learned TPACK theory and the teaching method of a certain knowledge. In the third stage, community members conduct technology-based instructional design and practice teaching based on the instructional design, after which other community members will analyze and provide feedback on their teaching. In the fourth stage, Community members reflect on their teaching and teach using the new teaching method, and then share and discuss with other Community members the teaching video after adopting the new teaching method. And so on. It can be seen that the construction of the learning community provides a practical opportunity for pre-service elementary school teachers of excellence to integrate and apply what they have learned in real teaching situations and in this way enhance their ability to solve real problems.

5. CONCLUSION

The development of information technology not only requires teachers to change their teaching methods, but also requires them to have a corresponding knowledge structure. The quality of cultivating excellent teachers in elementary school determines the quality of primary education, and pre-service cultivation is the most systematic, comprehensive and far-reaching stage of teacher cultivation, therefore, it is crucial to do a good job in the pre-service cultivation of excellent teachers in elementary school in order to promote the development of excellent teachers in elementary school with TPACK. In the TPACK perspective, in the process of developing outstanding teachers in elementary school, on the one hand, it is necessary to emphasize the important role of technology in education and teaching, and on the other hand, it is also necessary to master how to use technology in teaching. Firstly, higher education institutions should make pre-service elementary school teachers of excellence understand the importance of integrating technology in subject teaching and develop their concept of integrating technology in subject teaching. Second, they need to develop the ability of pre-service elementary school teachers of excellence to integrate technology into subject matter teaching knowledge and encourage them to learn about integrating technology into subject matter teaching. Finally, higher education institutions should provide pre-service elementary school teachers of excellence with opportunities to practice integrating technology into subject teaching knowledge and provide them with the ability to apply technology integration in subject teaching, thus promoting their ability to solve complex problems and facilitating their development towards the goal of teacher excellence.

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