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COMPETENCES FOR THE APPLICATION AND PROMOTION OF TECHNOLOGY IN VOCATIONAL PROFESSIONAL TEACHER EDUCATION: A CASE STUDY OF CHINA

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Abstract

The application of technology in vocational education teacher education is becoming more and more important, and it has become a trend that cannot be ignored, especially under the influence of the digital age and the epidemic, the process of technology application has been accelerated. Studies have shown that the use of technology-based teaching resources such as multimedia courseware, digital textbooks, and distance online courses can provide students with a rich and varied learning experience, thereby improving the quality of teaching. Technology can also increase the effectiveness of teacher training programs by providing teachers with flexible and convenient ways to acquire new knowledge and skills. This paper takes China as a case study on higher vocational education in different regions of the country, using methods such as investigation, interview and analysis, to explore the status quo, problems and reasons for the application of technology in the current vocational professional teacher education process. Finally, try to make some suggestions on how to use technology to improve the competence of vocational teachers in higher vocational colleges.

Keywords*:* Vocational education, professional teacher education, competencies and technology.

Introduction

In the world, many countries attach great importance to the cultivation of professional teachers' competencies: Yang Y. (2014) mentioned that Germany adopted the "dual system" VET model. Dual-system universities have strong practicality, and the integration of theory and practice is close. Full-time teachers in German dual-system universities must obtain a doctorate and should have more than five years of internship experience. Most teachers are part-time and come from all fields of society. These teachers have strong practical skills and a rich theoretical knowledge level. Zhao Y. (2004) mentions that teachers in vocational education in Denmark must receive theoretical and in-service training before entering the profession and that these teachers must have professional teaching experience and teaching ability, after which they are required to take the in-service teacher qualification examination. Only after they are all qualified can they take up their post.

Through the analysis of the practice of each country, it can be found that most developed countries have established the vocational teacher qualification access system and VET plan, and all attach great importance to the quality of vocational education teacher training and teacher continuing education. Although the improvement of professional teacher education in China's vocational colleges can learn from foreign training systems and methods, we need to further explore and practice the innovation of teacher education technology in a specific practice. Through the discussion of different techniques, the education competencies of professional teachers in vocational colleges is improved, and the improvement of teachers' personal competencies promotes the improvement of vocational education quality.

Methodology

This study analyzed sources and applied qualitative and quantitative research methods (questionnaires, interviews). Literature analysis is based on research by multiple authors. The empirical part of the paper presents the case of China. Four kinds of abilities of vocational teachers in higher vocational colleges are analyzed. Conduct a survey of teachers in higher vocational colleges across the country to explore the main characteristics and existing problems of technology and application in the process of vocational professional teacher education.

Interviews were conducted with vocational teachers from vocational schools in different regions and specialties in China. The research aimed to find out the role technology plays in the professional teacher education process. It also analyzes the actual situation of vocational teacher education in higher vocational colleges.

Definition of Higher Vocational Teachers' competence

Here are scholars' definitions of teacher competency from different perspectives. Wu Q. (2014) believes that vocational education teachers should not only have excellent professional theoretical foundation and professional technical competence related to career, but also master knowledge related to work process, technology and career development; In addition to being committed to imparting professional knowledge, we should also have the competence to integrate this knowledge into education and teaching from the perspective of pedagogy; In addition to the competence to find problems, it must also have the competence to formulate solutions and strategies to solve problems; In addition to being familiar with the working process knowledge in relevant professional fields, we must also have the competence to integrate it into Curriculum Development on the premise of following the teaching law of vocational education, and realize the goal of vocational competence training through action-oriented teaching. Lu J., Li P. Zhang H. (2016) summarized the abilities of vocational teachers as teaching cognitive competence, teaching design competence, teaching control competence, teaching scientific research competence, teaching practice competence, teaching technology competence, etc. Jiang J. (2016) believes that the competence of vocational teachers should be "rational and practical". "Integration of theory and practice" refers to the equal emphasis on theory and practice, and the integration between the two. Specifically, vocational education teachers should not only have rich professional theoretical knowledge and theoretical teaching competence but also have solid professional skills and practical guidance competence, which should be connected with each other. when establishing the competency model of higher vocational teachers, Zhou F. (2017) subdivided the summary of teachers' competency teaching competence into six aspects, including teaching competence literacy, scientific and technological competence literacy, practical competence literacy, work attitude, professional literacy and self-management literacy.

After analysis of Song W. (2017), he believes that the competency of higher vocational teachers includes ten contents: practical operation competence, competence to integrate theory with practice, teaching competence, learning and innovation competence, professional knowledge, compound knowledge, professional ethics, educational concept, enterprise work and training experience, character and characteristics. Jiang Y. (2021) roughly divided the teaching competence of higher vocational teachers into three types: first, classroom teaching competence, including the competence to understand the learning situation, design teaching contents and activities, organize teaching, teaching implementation and teaching reflection; Second, professional curriculum construction competence, including curriculum development, curriculum resource integration, curriculum teaching evaluation and so on; The third is the competence to support the expansion of teaching, including the competence of technical guidance and training, reform and innovation, scientific research and development and so on. Jiao X. (2021), after summarizing the relevant research at home and abroad, defined the professional competence of higher vocational teachers as the high-level competence of cognition, affection and skills that higher vocational teachers should have when engaged in teaching, mainly including their own education and teaching, application of educational technology, scientific construction, discipline construction, organization and management, professional practice and so on. Sun D. al. (2022) based on the "double high school plan", summarized the contents of Higher Vocational Teachers' abilities as follows: political competence, integration and innovation competence, scientific research and social service competence, digital application and transformation competence, national production and education resource integration and promotion competence, etc.

Based on the definition of teacher competence provided by relevant foreign institutions and the Chinese definition of teacher competence, the author believes that teacher competence can be summarised in four points: 1. Teachers' competence to lead by example, high moral character, knowledge of national policies and the ability to convey progressive vocational education ideas to students. 2. Competence in teaching and learning: competence in mastering the content of teaching (basic and complex material), competence in teaching students learning methods, competence in teaching students according to their abilities and in the flexible application of teaching methods, competence in instructional design, competence in scientifically organising and managing students' homework, competence in the organisation of teaching. 3. Assessment and management competencies: competence to guide pupils' practice, competence in the practical workplace, competence to understand and investigate pupils' psychological characteristics and level of knowledge, competence to stimulate

pupils' interest in learning and to mobilise pupils' initiative and enthusiasm, competence to assess pupils' competences in a scientific and fair way. 4. Developing innovation competence: the use and encouragement of new technologies for learners (ICT, virtual learning, use of modern access to IT systems, etc.) competence in scientific and technological innovation and competence in research.

Technology and Application in Vocational Professional Teacher Education

According to relevant research, the application of modern technology has significantly promoted the training of vocational education teachers. According to Feng T. (2021) research, the professional development model of vocational education teachers is closely related to technical support. With the support of modern technology, teachers can conduct online teaching and interaction in different locations by using remote teaching techniques such as video conferencing and online classrooms. At the same time, interactive courseware production software can produce vivid and interesting teaching content, and improve learners' learning interest and participation. The application of virtual simulation laboratory can improve learning effect and practical ability. Artificial intelligence technology can analyze and evaluate the learning process of students, and provide personalized learning suggestions and feedback. Mobile learning applications can increase the convenience and flexibility of learning. Social media teaching can make teaching more interactive and interesting. Data analysis technology can conduct in-depth analysis of students' learning process and provide more accurate learning suggestions and assistance. Course management system can improve teaching efficiency and management effect.

In addition, Li T. and Li L. (2018) pointed out in their research that under the background of the mobile Internet, the vocational education teacher training model needs to be innovated. Through the use of modern technology, the constraints of time and space can be broken and educational resources can be better utilized. At the same time, under the background of networkization, Yan J. and Shen M. (2019) believe that the technical application of vocational education teacher training needs to focus on network construction, strengthen the construction of learning platforms, and improve training effects. Zheng Y. (2016) pointed out that the technological innovation and application of vocational education teacher training is a key issue, which can provide help for the improvement of education and training.

In summary,, the development of technology application in professional teacher education is of great significance to the improvement of teachers' competence.

Data analysis

This online questionnaire survey among teachers in higher vocational colleges in different regions of the country from February to May 2021.The questionnaire was conducted by distributing links to the teacher WeChat group. A total of 525 valid questionnaires were collected.

Table 1: *Descriptive statistical analysis*

	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
Exemplary competence	1.00	5.00	4.40	0.56	-1.29	3.22
Educational and teaching competence	2.00	5.00	4.28	0.50	-0.83	1.19
Evaluation and guidance competence	2.20	5.00	4.12	0.51	-0.60	0.27
Developing and innovative competence	2.00	5.00	4.12	0.54	-0.64	0.46

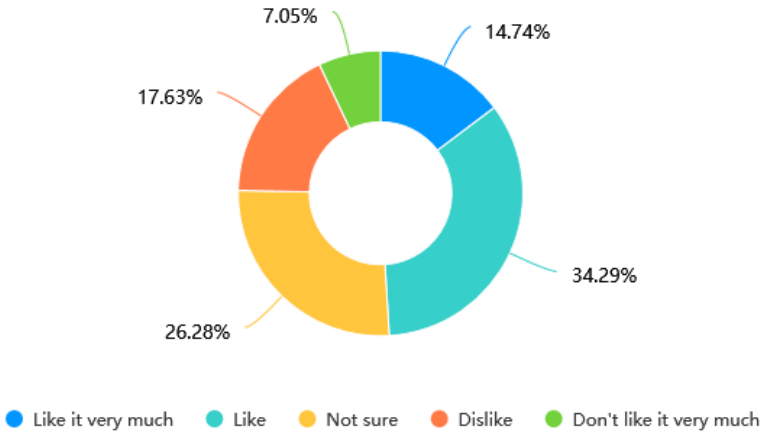
Descriptive statistical results show that the average values of Exemplary competence, Educational and teaching competence, Evaluation and guidance competence, developing and innovative competence are all above 4 points, indicating that teachers' evaluation of their own abilities is above average. The standard deviation of each competence development is about 0.5, indicating that different teachers have different scores of each competence. The results of skewness and kurtosis show that there is some skewness in each competence, but it is not serious.

Generally speaking, the competence of Chinese vocational professional teachers still need to be further improved.

This is a multiple-choice question to find out whether teachers like technology and applications. There are five levels of liking. Among the 525 samples, 77 people said they liked it very much, accounting for 14.74%. 180 students expressed their liking, accounting for 34.29% of the total number. 138 students, accounting for 26.28%,

said they like it a little bit. 93 people (17.63%) said they didn't like it. 37 people, 7.05% said they dislike it very much. (See Figure 1)

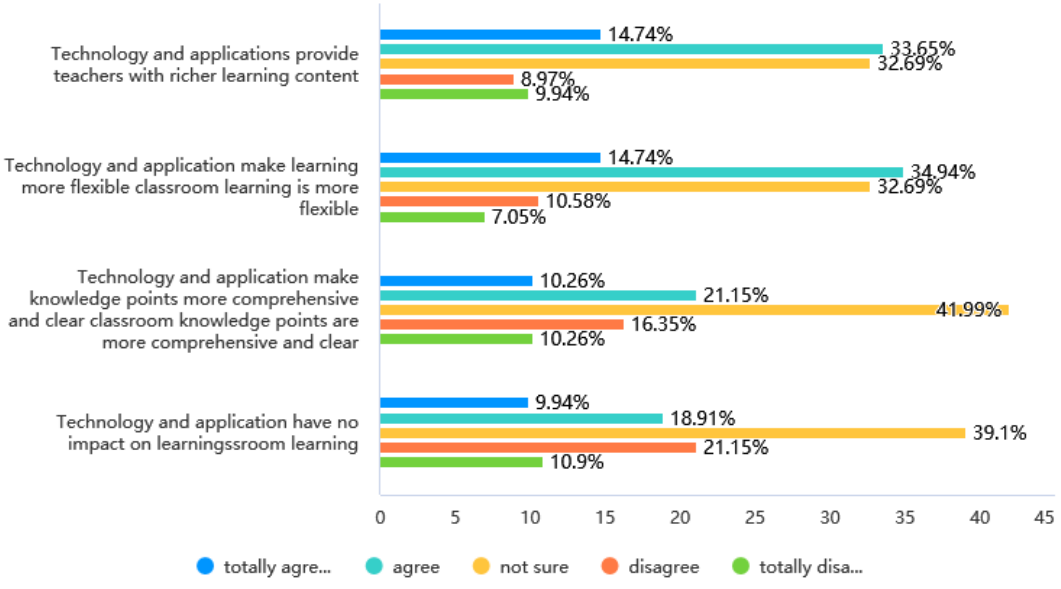
Figure 1: *Favorability of technology and applications in teacher education*



According to the survey results, 235 respondents chose "like" or above, accounting for 75.32% of the total. This partly reflects teachers' general acceptance and acceptance of technology and applications in education. Despite this, 24.67% of teachers still dislike the technology and applications for some reason, which reflects the lack of technology and application. The following issues will be studied in more detail.

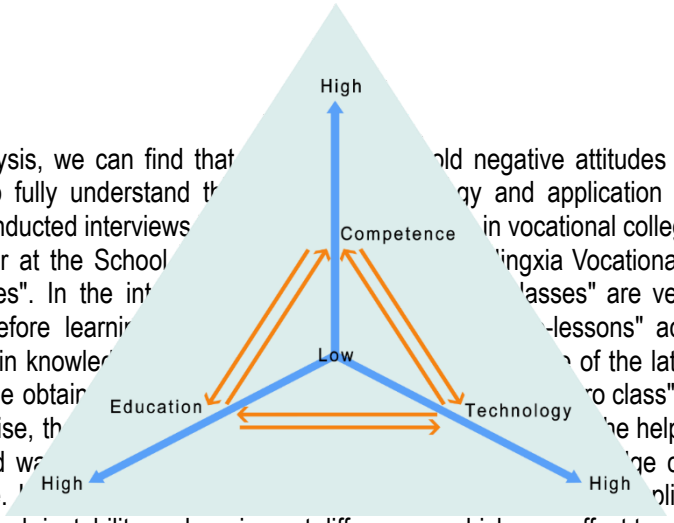
This is a survey on the comparison between technology and application and traditional education. It is a matrix of multiple choice questions, with a total of 4 questions. (See Figure 2)

Figure 2: *Technology & Application vs. Traditional Learning Styles*



It can be seen from the survey data that technology and application have an advantage in terms of the provision of teaching content and the diversity of learning methods. In terms of knowledge point explanation and learning effect, the advantages of technology and application are slightly lower. In the process of teacher education in vocational education, technology and application are different from traditional teaching.

Advantages and disadvantages of application and technology in the improvement of professional teachers' competence



Through data analysis, we can find that ...ld negative attitudes towards technology and applications. In order to fully understand th... ...gy and application on professional teacher education, the author conducted interviews ... in vocational colleges,

Zhang B, a teacher at the School ... ...ingxia Vocational and Technical College, often uses "micro-classes". In the int... ...lasses" are very helpful for vocational education. Generally, before learni... ...-lessons" according to the learning content, and list the main knowle... ... of the latest technical content, or knowledge that cannot be obtain... ...ro class" platform. The content of the micro-lecture is precise, th... ...he help of network resources, it can be downloaded and wa... ...ge cognition becomes more convenient and effective. ... ...plications still have certain limitations, such as network instability and equipment differences, which may affect teachers and students in the teaching process.

Lu X, a teacher at Lanzhou Resources and Environment Technology Vocational College in Gansu Province, mentioned in the interview that the school attaches great importance to the use of Internet + for blended teaching. On May 23, 2020, the school's School of Metallurgical Engineering and the Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences cooperated to hold a themed online public science day. Teachers conduct online live broadcasts and open class learning during the event. There are also more ways for students to complete homework, from paper-based homework and on-site defines to email, learning forums, online APP homework submission, batch correction of homework, and online defence. Various resource platforms can also monitor the learning situation in real-time, quickly analyse and obtain intuitive data, answer questions online, etc., saving a lot of unnecessary time wastage. However, this learning method puts forward new requirements for teachers' competence. Because vocational education teachers are different in age, educational background, technical level and other factors, there are differences in their technology application. Some teachers may lack the competence and confidence in technology application.

Liu G, a teacher at Shaoxing Vocational and Technical College, said in an interview that Zhejiang Province has great advantages in virtual reality technology. Shaoxing Vocational and Technical College is currently the first designated teaching base for the national medical information technology training and examination project in Zhejiang Province, and the first "digital upgrade training base for small, medium and micro businesses" in the country. They have built a virtualized training base. In addition, the school also attaches great importance to students' practical operation, regularly holds skill competitions, and simulates the actual working environment on the Internet, so that teachers can actually apply the skills they have learned to future teaching. However, he said that although the application of modern technology can break through geographical restrictions, with the construction of more and more virtual training bases, some vocational education schools may face the problem of insufficient educational resources, such as insufficient network resources and equipment resources.

Through literature research and interviews with professional teachers we uncover the relationship between education, technology and competence, (See Figure 3)

Figure 3: *The relationship between competence, education and technology*

Education and technology are the basis of competence, and knowledge that is educated through technology and widely applied and transferred can be transformed into competence. competence not only includes the level of achievement that a person has reached now but also includes the potential that a person has. For example, a person who reads a lot may have rich knowledge, but his competence to solve practical problems is low, which means that his knowledge only stays in books and cannot be widely transferred, nor can it be used to solve practical problems.

Education, technology and competence are closely related. First, the formation and development of competence depend on the support of education and technology. With the accumulation of people's education and technology, people's competence will continue to improve. Secondly, the level of competence will affect the level of knowledge and technology mastered in the education process.

Conclusions

With the increase in social needs and the continuous advancement of industrialization, the demand for high-quality technical personnel is also increasing year by year. Higher vocational colleges shoulder the important task of cultivating and delivering high-quality technical talents. In this process, higher vocational colleges need to provide students with advanced teaching concepts, high-quality teaching services, and provide rich practical training opportunities. The development of technology and applications has provided very favourable conditions for vocational education, but at the same time several problems have emerged:

Limitation of technology application: The current technology application still has certain limitations, such as network instability, equipment differences, etc. These problems may cause teachers and students to be affected in the teaching process.

Teachers' technology application level is uneven: Vocational education teachers' age, educational background, technical level and other factors are different, resulting in differences in their technology application. Some teachers may lack the ability and confidence in technology application.

Insufficient educational resources: Although the application of modern technology can break geographical restrictions, some vocational education schools may face the problem of insufficient educational resources, such as insufficient network resources and equipment resources.

Teachers are unwilling to accept training: Some vocational education teachers have a negative attitude towards technical training. They believe that technology is not the focus of teaching, which also leads to poor application effect of technology application in vocational education teacher training.

Single training mode: In vocational education teacher training, a single training mode is often adopted, which has great limitations and cannot meet the needs of different teachers.

Faced with the above problems, schools should strengthen the maintenance and management of networks and equipment to ensure the stability and reliability of technology applications. At the same time, schools can regularly organize teachers to participate in technical training to improve teachers' technical application ability and confidence. In terms of the construction of educational resources, schools should strengthen the construction of educational resources, improve the adequacy and quality of educational resources, and ensure that teachers and students can make full use of modern technology for teaching and learning. For the problem that teachers are unwilling to accept training, it can be solved by guiding teachers to change their attitudes. Luo M (2020) proposed that by setting up practical operation links, teachers' interest and learning motivation can be stimulated, and teachers can be made aware of the importance of technical skills for teaching so that they are willing to receive training. In order to meet the needs of different teachers, vocational education teacher training should promote diversified training models. Yang B (2021) suggested that online education, virtual simulation training, etc. can be used, and personalized training plans can be formulated according to the different needs of different teachers so that teachers can independently choose training methods and content to improve training effects.

In conclusion, the application of technology in vocational education teacher training needs to be continuously refined and improved to meet the ever-evolving educational needs.

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