

Current Situation of TPACK for Art Vocational Teachers: Problem Analysis and Countermeasures

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Abstract. The knowledge of Technological Pedagogical Content Knowledge (TPACK) is a new definition of the knowledge structure of higher vocational college teachers in the era of information society. This study investigated the prominent problems in TPACK training of teachers in higher vocational college of arts in our city by sampling. Firstly, in the professional training of provincial or municipal teachers, emphasis was placed on "theory or method propaganda" rather than "guidance of technology integration training"; Secondly, focus on "discipline knowledge", "teaching knowledge" and "technical knowledge" of a single module of training, but lack of "integration and deep integration of the three"; In view of the above problems, it is suggested that educational administrative departments or universities should pay attention to the training of "subject teaching with technology integration" in the professional training of teachers, and pay attention to the deep integration of "Content knowledge", "Pedagogical knowledge" and "Technological knowledge" in the training process. In order to effectively improve the TPACK knowledge structure of the teachers in higher vocational college of arts, promote the high-quality development of vocational education in our city.

1 INTRODUCTION

In the current era of rapid development of information and intelligent technology, The traditional structure of teachers' knowledge and skills has been unable to meet the requirements of today's information-based teaching. Under the premise that teachers have various basic knowledge, such as subject content knowledge (i.e., ontology knowledge), Pedagogical Knowledge (i.e., conditional knowledge), situational knowledge (i.e., practical knowledge) and cultural knowledge, they also need to add teaching technology knowledge to their knowledge structure system. Punya Mishra and Matthew Koehler advocate that teachers be able to use technology to teach effectively. In 2006, they formally proposed the classic theoretical model of TPACK. the ability of teachers in higher vocational colleges of arts to integrate the knowledge of Technological Pedagogical Content Knowledge (TPACK) is directly related to the high-quality development of higher vocational education, the construction of vocational education power, more related to the cultivation of "great craftsmen, skilled craftsmen" and the realization of the goal of manufacturing power. As a new definition of the knowledge structure of college teachers in the information age, subject teaching method knowledge with integrated technology (TPACK) refers to the knowledge complex that integrates information technology into classroom teaching, which is not only the basis of effective teaching of teachers in the information age, but also the embodiment of teachers' information-based teaching ability. It is rooted

in three core ingredients: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK),and integrated into other four derived components, that is, PCK, TPK, TCK and TPACK (See Figure 1).TPACK is the most advanced knowledge complex in line with the development needs of The Times^[1].

Based on the "14th Five-Year Plan" project of Education science in Chongqing, this study investigated and studied the knowledge of the Technological Pedagogical Content Knowledge (TPACK) of integrated technology among teachers in higher vocational colleges of arts in Chongqing through sampling method, so as to grasp the development situation of TPACK of teachers in higher vocational colleges of arts in Chongqing, and investigate the prominent problems in the improvement process of teachers' TPACK. In order to improve the subject teaching knowledge of integrated technology (TPACK) of vocational teachers, to promote the high-quality development of vocational education to provide reference. The questionnaire adopted by the research takes the questionnaire designed by Schmidt et al for pre-service teachers as reference, and revises and redevelops the questionnaire based on the characteristics of the knowledge structure of teachers in China's higher vocational colleges ^[2]. The reliability and validity of the questionnaire are tested, and the test results are good. Under the condition of ensuring the good reliability and validity of the questionnaire, 268 teachers were sampled in the city's higher vocational colleges, including 37

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professors, 60 associate professors, 125 lecturers and 46 teaching assistants.

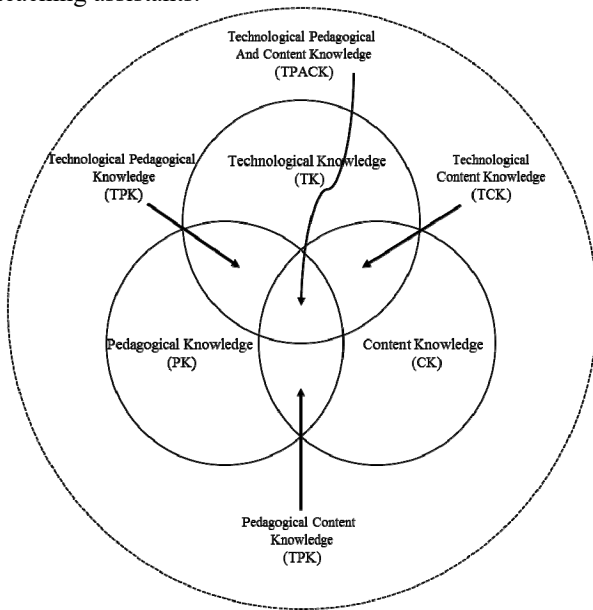


Figure 1: TPACK structure diagram

2 The present situation of TPACK knowledge structure of teachers in higher vocational colleges of arts

2.1 The overall level of technology-related knowledge in the TPACK knowledge structure of teachers in higher vocational colleges of arts is low, and the knowledge of subject teaching method integrating technology has serious shortcomings

The basic information of the sample is that the ratio of male and female teachers is 37.2% and 62.8%

Table 1. Table1 Correlation analysis of each element of TPACK.

Factor	Significance	TK	PK	CK	PCK	TPK	TCK	TPACK
TK	Pearson	1						
	Sig.							
PK	Pearson	.256**	1					
	Sig.	.000						
CK	Pearson	.192**	.375**	1				
	Sig.	.003	.000					
PCK	Pearson	.363**	.452**	.573**	1			
	Sig.	.000	.000	.000				
TPK	Pearson	.463**	.287**	.421**	.537**	1		
	Sig.	.000	.000	.000	.000			
TCK	Pearson	.521**	.012**	.215**	.396***	.472**	1	
	Sig.	.000	.000	.001	.000	.000		
TPACK	Pearson	.556**	.381**	.273**	.511**	.642**	.626**	1
	Sig.	.000	.000	.000	.000	.000	.000	

** The correlation coefficients in the above table are significant at the level of 0.01

respectively; The proportion of students with undergraduate education background of normal university and non-normal university was 32.6% and 67.4%, respectively. 13.80% associate professor and 22.38% professor, 46.64% lecturer and 17.18% teaching assistant respectively. The average values of TK, PK, CK, PCK, TPK, TCK and TPACK of teachers' knowledge dimensions are 3.42, 3.67, 3.92, 3.90, 3.23, 3.36 and 3.16, respectively, in order from height to bottom: CK > PCK > PK > TK > TPK > TPACK.

From the average values, it can be found that the average values of CK, PCK and PK related to subject knowledge and teaching method are relatively high, indicating that teachers in higher vocational colleges of arts have a relatively high level in subject knowledge and teaching method knowledge. However, the TK, TPK and TCK of technology-related knowledge structures are significantly lower, and the average value of PK is the highest and that of TK is the lowest in single dimension. The average value of PCK is the highest and the average value of TPACK is the lowest in multidimensional aspects, which indicates that there are serious shortcomings in technical knowledge and subject teaching knowledge integrating technology of teachers in higher vocational colleges.

2.2 There is no significant correlation between TPACK level of teachers in higher vocational colleges of arts and education training and other variables, that is, teachers receive more single module training and less comprehensive training

There is a significant correlation between the various elements of teachers' knowledge of integrated technology in (TPACK), as shown in Table 1.

Table 2. Table1 Correlation analysis of each element of TPACK.

Factor	significance	Training frequency	Normal major or not	Teaching years
TK	Pearson	-.032	-.221**	-.152**
	Sig.	.423	.000	.006
PK	Pearson	-.067	-.231**	.276**
	Sig.	.186	.000	.000
CK	Pearson	.035	.126*	.251**
	Sig.	.543	.024	.000
PCK	Pearson	-.165**	-.172**	.262**
	Sig.	.003	.002	.000
TPK	Pearson	-.003	-.196**	.173**
	Sig.	.946	.001	.002
TCK	Pearson	-.0625	-.318**	-.034
	Sig.	.287	.000	.042
TPACK	Pearson	.076	-.356**	.158**
	Sig.	.108	.000	.005

** The correlation coefficients in the above table are significant at the level of 0.01

In terms of education and training, the frequency of teachers' education and training only has a significant correlation with "Pedagogical-Content" knowledge (PCK), but no significant correlation with the other six factors, which indicates that the training teachers receive is almost related to subject knowledge, and has nothing to do with pedagogical knowledge and technical knowledge. It shows that the content of teachers' training is mainly concentrated on the single "Content knowledge" module or " Pedagogical Knowledge (PK)" module, and the lack of the in-depth integration of "Technological knowledge" and "Content knowledge" by the use of "information technology knowledge", that is, there is a phenomenon that teachers receive more single module training and less comprehensive training.

In terms of whether the undergraduate is a normal major, from the average value, the factors except Content knowledge (CK) of teachers majoring in normal education are higher than those of teachers majoring in non-normal education. It can be seen that, in terms of teaching knowledge, teachers with a bachelor's degree in normal majors are significantly higher than those with a bachelor's degree in non-normal majors. It can be concluded that teachers with bachelor's degree in non-normal majors in higher vocational schools need to supplement pedagogical knowledge.

3 Prominent problems in TPACK training of teachers in higher vocational colleges of arts

3.1. In the education and training of teachers in higher vocational colleges of arts, they pay too much attention to theoretical preaching and neglect the guidance of technical integration training

"China Education Informationization2.0 Action Plan" points out that teachers' innovation ability of Information based teaching is still insufficient, and the deep

integration of information technology and subject teaching is not enough, among which" the deep integration of information technology and subject teaching is not enough "is the problem that needs to be solved in the 2.0 stage of information based education .In the TPACK structure of higher vocational teachers, the CK and PCK related to subject knowledge are higher, but the TCK, TK and TPK related to technology are lower .At present, China has invested a huge amount of manpower, material resources and financial resources in the in-service training of teachers. Every year, various kinds of training aimed at improving the professional development of teachers, teachers' information-based teaching ability, and teachers' teaching methods are abundant. To some extent, good training results have been achieved, which effectively promotes the professional growth of teachers. However, it is undeniable that most of the training still adopts the traditional lecturing style, in which the training teachers speak on the stage while the trained teachers listen below. The training has not achieved the best effect due to it, and it is difficult to improve the training interest and effect of teachers from the substantive level [3]. Therefore, it is urgent to change the traditional mode of education and training, transforming the traditional teaching-based training focusing on theory or method into technical practice training focusing on information technology integration of subject knowledge and teaching knowledge.

3.2 In education and training, too much emphasis is placed on the single module of "Content knowledge", "Technological knowledge" and "Pedagogical knowledge", and the training that integrates and deeply fuses the three is lacking

Studies have shown that offering pedagogy and psychology courses is one of the effective ways to strengthen pre-service teachers' integration of technology, teaching method and subject knowledge and improve

their information-based teaching ability [4]. The level of "Technological Content knowledge" (TCK) and "Technological Pedagogical knowledge" (TPK) related to subject knowledge in the TPACK structure of teachers in higher vocational colleges of arts is low. As can be seen from the above table 2, the frequency of teachers receiving professional training is significantly correlated with Pedagogical Content knowledge (PCK), and has nothing to do with the other six factors. Disciplinary training courses, educational teaching courses and information technology training courses are isolated from each other, lack of internal systematization and integration, so the effect of the integration of the three is not obvious. Therefore, teacher education and training can not only rely on training to improve the level of teachers' subject or professional knowledge. Subject professional knowledge level cannot serve teaching well through the presentation and representation of teaching method knowledge and technical knowledge. Therefore, the integration of Pedagogical Knowledge (PK) and Technological Knowledge (TK) is the key factor to improve teachers' knowledge of Technological Pedagogical Content Knowledge (TPACK).

3.3 The teachers with bachelor's degree in non-normal majors are seriously lacking pedagogical knowledge (PK)

Each element of higher vocational teachers' TPACK knowledge structure has a significant correlation with whether they have received normal education, as shown in Table 2 above. Whether a teacher is in normal major during the undergraduate period reflects, to some extent, whether a teacher has received systematic learning of pedagogy, psychology and other knowledge before employment. Studies have shown that offering pedagogy and psychology courses is one of the effective ways to strengthen pre-service teachers' integration of technology, teaching method and subject knowledge and improve their information-based teaching ability [5].

From the average value, in the TPACK knowledge structure of higher vocational school teachers, the teaching method knowledge (PK) factor of teachers who have received normal professional education is significantly higher than those who have not. This will lead to the lack of teaching method knowledge, pedagogy and psychology knowledge of non-normal majors, which will affect their organic integration and deep integration of teaching method knowledge, information technology knowledge and subject content knowledge.

4 Conclusions and Recommendations

4.1 Conclusions

Through the research and analysis of the above relevant data, we can draw the following conclusions:

(1) The overall TPACK level of teachers in higher vocational colleges is in the middle level, the level of Content knowledge and Pedagogical Knowledge is

relatively high, and the Technological Knowledge level is seriously low.

(2) There is a significant positive correlation between TPACK elements, among which TPACK has the highest correlation with TCK and TPK

(3) There is a certain lack of Pedagogical knowledge for non-normal teachers. Whether teachers have received normal education or not is significantly related to each element of teachers' TPACK knowledge structure.

4.2 Recommendations

4.2.1 Focus on technology integrated training on "TPACK"

Relevant foreign studies, such as Chai et al., show that the TK, CK, PK and TPACK levels of pre-service teachers are significantly improved through the learning and training of information technology courses [6]. It is suggested that the relevant municipal departments should carry out diversified education and training, and the training content should be changed from the traditional "focusing on the theory or method of training propaganda" to the "emphasizing information technology integration of subject knowledge and teaching knowledge of technical practice" training. For example, establish practical training of information technology application and general courses or professional courses, special training of teaching methods or teaching modes applied to a certain course, "information technology + innovative education and teaching concept + subject content", that is, subject teaching method training integrating technology, and hold practical, effective and operable education training at all levels and of all kinds. To provide teachers with information technology services and how to improve the teaching methods in the course of the subject of a package of operable training programs.

4.2.2 Strengthen the deep integration of "Content knowledge" with "Technological knowledge and Pedagogical knowledge" in education and training

"China's 13th Five-Year Plan for Educational Informatization" points out that IT is necessary to establish and improve the standards of teachers' application ability of information technology, incorporate the cultivation of information-based teaching ability into the training curriculum system of normal university students, include it in the index system for the assessment of school level in colleges and primary and secondary schools, and include teachers' application ability of information technology into the compulsory teacher training hours (credits). Ability improvement should be closely combined with discipline teaching and training, and targeted courses and teaching methods characterized by deep integration of information technology should be carried out [7]. The purpose of holding education and teaching training is to improve teachers' education and teaching ability, and the purpose of developing teachers' TPACK level is to realize the

deep integration of information technology and subject teaching. It is suggested to strengthen the deep integration of subject content knowledge with technical and pedagogical knowledge in the education and training at municipal and school levels. It is not only to hold some lectures or training to improve teachers' professional or disciplinary knowledge, but also to carry out practical lectures or training that integrate information technology, educational teaching and other knowledge. On the one hand, this can improve teachers' training interest and enthusiasm; on the other hand, it is conducive to improving teachers' ability to deeply integrate modern information technology, innovative educational ideas and subject content knowledge from the overall and operational level, Mishra & Koehler believed that only by gradually developing and improving teachers' TPACK level could the optimal teaching effect be achieved^[8], and thus fundamentally improve teachers' professional ability and information-based teaching ability, and promote the high-quality development of vocational education in our city.

4.2.3 Establish a training mechanism of "attending lectures and learning" for new teachers, especially for non-normal majors with undergraduate degrees, for at least half a year or one year

The new teachers in higher vocational colleges are basically from school to school, that is, from graduation to work, or from enterprises to school. For the new teachers, especially those who have not been trained in systematic normal education, their cognition and knowledge of education and teaching are far from meeting the requirements of excellent teachers in higher vocational education, not to mention integrating technical disciplinary knowledge. Throughout other countries, all attach importance to the training of subject education knowledge of integrating technology for new teachers.

For example, the New Zealand government provides one-year learning opportunities for new teachers in order to enable them to better apply information technology and pedagogical knowledge to their teaching, they provide a one-year learning opportunity for new teachers. During this year, teachers have no teaching tasks, but go to high-quality classes to attend lectures, participate in academic organizations and engage in relevant plans to study in other schools, and learn typical practices and teaching experiences. For another example, South Korea, Finland, the United Kingdom and other countries deliver high-quality training courses and typical teaching case videos to new teachers online, and provide teachers with various teaching methods and information technology services to improve the informatization teaching ability of new teachers.

"Attending lectures" is to learn excellent teachers, experienced teachers of education and teaching methods, learning pedagogical knowledge; Teacher "learning" is to learn "technical knowledge, subject content knowledge". It is suggested to establish a long-term training mechanism for teachers to "attending lectures

and learning", to carry out regular workshops to improve teachers' teaching ability, and to organize regular activities such as technical exchange and teaching experience sharing, so as to provide a community of practice for teachers to improve their TPACK level at school-level. It is suggested that education administration departments or relevant functional departments of colleges and universities should establish at least half a year or one year of "attending lectures" system for new teachers, which is a dual demand of feasibility and necessity, so as to provide broad space for future development for new teachers, strengthen the ability of vocational education, and provide strong support for training high-quality skilled talents, craftsmen of great powers and skilled craftsmen.

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