

Innovations

An Investigation on TPACK Level of Public Course Teachers in China - A Case Study of College Teachers in China

Yuanyuan Yang^{1*}, Wan Nurul Elia Haslee Sharil²,
Karthiyainy Supramaniam³ & Muhamad Nur Fariduddin Abdul Aziz⁴

^{1,2 & 3} Universiti Teknologi Mara, Selangor, Malaysia

Abstract: *This paper investigates the development of Technological Pedagogical Content Knowledge (TPACK) among college public course teachers in Hebei Province, China. Through a questionnaire, the researcher investigated whether there are significant differences in TPACK levels based on teachers' educational backgrounds and the subjects they teach. The findings suggest that there is no significant difference in TPACK levels among public course teachers in college. However, the average TPACK values follow this order: Pedagogical Knowledge (PK) (5.19) > Pedagogical Content Knowledge (PCK) (5.08) > Content Knowledge (CK) (5.04) > Technological Knowledge (TK) (4.81) > Technological Pedagogical Knowledge (TPK) (4.80) > TPACK (4.67) > Technological Content Knowledge (TCK) (4.54). In conclusion, public course teachers demonstrate a strong understanding of subject matter and teaching methodology but show a deficiency in technical knowledge. Therefore, in teacher training program, we should still focus on enhancing teachers' ability to apply technical knowledge.*

Key words: *college public course teachers; TPACK level; Teacher competency*

1. Introduction

Teacher competence serves as the foundation for teachers, and enhancing it stands as an essential approach to guaranteeing educational quality. In 2021, the Ministry of Education, along with six other departments in China, collaborated to formulate the Guiding Opinions on Strengthening the Reform of College Teacher Construction in the New Era, emphasizing the imperative for colleges to significantly enhance teachers' teaching ability and development. Under the background of promoting the development of education modernization, proficiency in utilizing information technology emerges as a critical professional skill for teachers. Accordingly, teacher training in the contemporary era should focus on the en-

hancement of technical skills.

In the faculty of China's universities, there is a special group known as public course teachers. These teachers are responsible for teaching public foreign language courses, ideological and political courses, public physical education courses, and other general courses. However, there was little research on the teaching abilities of these teachers.

Among the students enrolled in these public courses, many lack interest, and some attend solely to fulfill credit requirements. Public course teachers constitute a vital segment of universities, and their teaching abilities are very important for their development. Their teaching ability can invigorate student engagement, elevate teaching quality, bolster students' development and cultivate innovation. The proficiency of public course teachers in applying information technology has become a pivotal factor in teaching quality and effectiveness. Only by enhancing the information technology skills of public course teachers in universities can we more effectively promote educational modernization, enhance the teaching quality of public courses.

2. TPACK Theory

Teachers' ability to apply information technology mostly rely on the integration of technology into teaching to achieve a perfect combination of technology and curriculum. TPACK, as a theoretical framework for technological integration, has been extensively studied by many domestic scholars (Xu, 2015; Zhang, 2015; Zhou, 2019).

In 2005, American scholars Koehler and Mishra first proposed the TPACK framework. Since then, TPACK has garnered global attention from researchers and teachers as a theoretical model for the integration of technology in teaching (Mishra, P, Koehler, M, 2016). TPACK stands for Technological Pedagogical Content Knowledge, which assesses teachers' ability to integrate and apply knowledge. As shown in Figure 1, TPACK is a new form of knowledge that integrates subject matter, pedagogy, and technological knowledge (Mishra, P, Koehler, M, 2016). It consists of three core elements: Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). These core elements are combined to four composite elements: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK). Mastering and applying TPACK flexibly has become essential knowledge and skills for teachers. In addition to a solid understanding of subject matter and pedagogical knowledge, teachers also need to be familiar with operating modern educational technology platforms and effectively integrate them into teaching practices (Malik, S., Rohendi,

D., &Widiaty, I, 2019). TPACK can enhance student learning, provide support for students' development, provide equal opportunities for every student, and contribute to teachers' professional development (Niess M L, 2005).

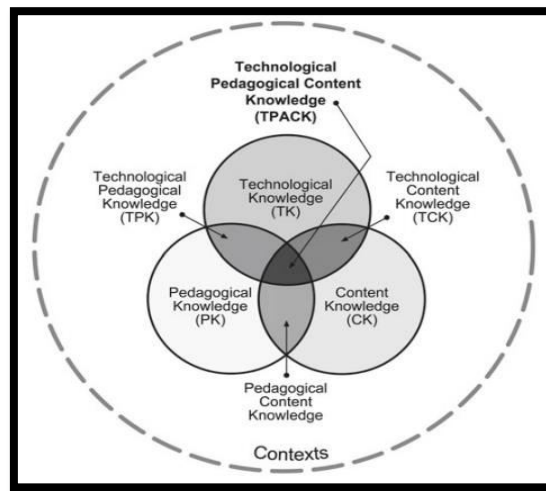


Figure 1 TPACK framework proposed by Koehler & Mishra (2006)

3. Current Research on TPACK of College Teachers

Research on TPACK in foreign countries mainly focuses on pre-service and in-service teachers' TPACK (Angeli C, Valanides N., 2009), subject specific TPACK, and the integration of technology (Schmidt D A, Baran E, 2009). In China, research on TPACK mainly includes studies on the theoretical framework of TPACK (Ruan, Yang, 2014)(Liu, Xu, Wang, 2015), the development of teachers' TPACK competencies (Sun, Hu, Liu, 2017) (Lou. 2015), and the development of TPACK in the course subject (Feng. 2014) (Yan, Hui, Ning, 2018). In the research on TPACK of college teachers, Ren and Ren (2015) conducted a related analysis of the relationship among teachers' teaching experience, training frequency, teacher education background, and TPACK. The results showed a significant correlation between teachers' teaching experience, teacher education background, and various elements of TPACK. Si (2022) conducted a questionnaire survey on the development level of TPACK competencies among college teachers in Inner Mongolia and combined it with in-depth interviews to analyze the reasons that affect the development of teachers' TPACK competencies.

Li (2022) explored the TPACK level among college English teachers from the perspectives of self-assessment by teachers and perception evaluation by students. Zhang and Ouyang (2023) conducted a survey on the TPACK competencies of physical education teachers in universities in Shanxi Province and found that the physical teachers' TPACK level was not high, and the scores in the corresponding dimension of technological knowledge were relatively low. Moreover, the TPACK level did not improve with increasing academic qualifications and teaching expe-

rience.

With the development of educational modernization, research on TPACK of college teachers has increased. However, there is little research focused on the unique group of public course teachers in universities. What is the TPACK level of public course teachers in university? Is the TPACK level the same among teachers of different disciplines in this large teaching group? Does the TPACK level of public course teachers vary with their educational background? In light of these research questions, this paper takes Technological Pedagogical Content Knowledge (TPACK) as the theoretical basis, analyzes the TPACK level among public course teachers in universities, compares the data of TPACK knowledge levels across seven dimensions, identifies existing problems in practice, analyzes specific reasons, and proposes corresponding strategies based on this theory to improve teachers' TPACK competencies and promote the professional development of public course teachers.

4. Research Methodology

4.1 Research Participants

This study selected 160 public course teachers from a university in Hebei Province as participants, including teachers teaching public foreign language courses, ideological and political courses, physical education courses, and other related courses. Excluding invalid questionnaires, a total of 152 valid questionnaires were obtained, with a valid response rate of 95%. Among the participants, there were 35 foreign language teachers, 54 ideological and political teachers, 42 physical education teachers, and 20 teachers from other disciplines. Among them, 28 held a bachelor's degree, and 124 held a master's degree (please refer to Table 1 for the frequency analysis of population variables).

Frequency Analysis of Demographic Variables

variable	items	frequency	percentage	average value	standard deviation
majors	Foreign language	35	23%	2.32	0.973
	Ideological and Political	54	36%		
	Physical Education	43	28%		
	Other disciplines	20	13%		
educational background	Bachelor	28	18%	2.82	0.389
	master	124	82%		

Table 1

4.2 Research Instrument

The research instrument in this study is the "International Technology, Pedagogy, and Content Knowledge Survey Questionnaire (2012 version)." It assesses the TPACK level among public course teachers across seven dimensions: CK, PK, TK, PCK, TCK, TPK, and TPACK.

The questionnaire, originally developed by Schmidt (2009) for investigating teacher pedagogical and technological knowledge, was translated into Chinese and validated for its reliability by Chai Ching Sing and colleagues in 2012 (Chai, 2012) (Guo, 2014). It is suitable for evaluating the TPACK level of public course teachers. The questionnaire consists of 36 items, and respondents provide their responses on a 7-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (7).

According to the results of one-way ANOVA (table 2), we can see the differences of each TPACK dimension in teaching disciplines.

Analysis of Differences in Dimensions across Teaching Disciplines

variables	items	n	M	standard deviation	f	sig	Multiple Comparisons
CK	Foreign language	35	20.49	4.00	3.253	0.024	3 > 2
	Ideological and Political	54	18.93	4.17			
	Physical Education	43	21.26	3.24			
	Other disciplines	20	20.60	3.52			
PK	Foreign language	35	26.29	3.05	0.232	0.874	/
	Ideological and Political	54	25.72	3.16			
	Physical Education	43	25.95	3.03			
	Other disciplines	20	25.85	3.53			
PCK	Foreign language	35	36.83	4.99	2.007	0.115	/
	Ideological and Political	54	34.44	5.05			
	Physical Education	43	35.40	4.84			
	Other disciplines	20	36.45	3.78			
TK	Foreign language	35	34.89	4.44	1.346	0.262	/
	Ideological and Political	54	33.06	4.94			

	Physical Education	43	33.58	4.05			
	Other disciplines	20	33.25	2.61			
TPK	Foreign language	35	25.23	3.99	1.733	0.163	/
	Ideological and Political	54	23.72	4.10			
	Physical Education	43	23.67	3.04			
	Other disciplines	20	23.30	3.33			
TCK	Foreign language	35	19.06	2.54	1.913	0.13	/
	Ideological and Political	54	18.02	2.75			
	Physical Education	43	17.84	2.18			
	Other disciplines	20	17.70	2.89			
TPACK	Foreign language	35	19.23	3.01	0.931	0.428	/
	Ideological and Political	54	18.94	3.48			
	Physical Education	43	18.12	3.24			
	Other disciplines	20	18.35	3.281			

Note: 1 represents foreign language teachers, 2 represents political ideology teachers, 3 represents physical education, 4 represents the other disciplines teachers.

Table 2

The result of the significance test of CK in teaching disciplines is 0.024, which is less than 0.05, indicating that the CK level of teachers in different majors is different. According to multiple comparisons, the CK level of PE teachers is slightly higher than that of ideological and political teachers. The results of the significance test of the differences of PK, PCK, TK, TPK, TCK and TPACK in teaching subjects in other dimensions are 0.087, 0.115, 0.262, 0.163, 0.13, 0.428 respectively, which is significantly greater than 0.05, indicating that public course teachers of various majors are more effective in PK, PCK, TK, TPK, TPK. There was no statistically significant difference between TCK and TPACK.

According to the results of independent sample T-test analysis (table 3), we can see the differences in educational qualifications of each TPACK dimension. The analysis of differences based on educational level in each dimension

variables	items	n	M	standard deviation	f	sig
CK	bachelor degree	28	19.82	3.591	0.265	0.607
	master degree	124	20.24	3.966		
PK	bachelor degree	28	26.43	2.781	0.857	0.356
	master degree	124	25.82	3.201		
PCK	bachelor degree	28	35.15	5.006	4.02	0.047
	master degree	124	37.18	3.916		
TK	bachelor degree	28	32.93	4.036	0.947	0.332
	master degree	124	33.81	4.418		
TPK	bachelor degree	28	23.82	3.642	0.078	0.78
	master degree	124	24.04	3.764		
TCK	bachelor degree	28	18.32	3.116	0.125	0.724
	master degree	124	18.13	2.476		
TPACK	bachelor degree	28	18.54	3.776	0.083	0.774
	master degree	124	18.73	3.175		

Table 3

The significance test result of PCK difference in educational background is 0.047, which is less than 0.05, indicating that there are differences in the PCK level of public course teachers. According to the independent sample T-test analysis, the PCK level of teachers with master’s degree is slightly higher than that of teachers with bachelor’s degree. The results of the significance test of the differences in educational backgrounds of CK, PK, TK, TPK, TCK and TPACK are 0.607,

0.356, 0.332, 0.78, 0.724 and 0.774 respectively, which is significantly greater than 0.05, indicating that public course teachers with different educational backgrounds are more effective in CK, PK, TK, TPK and TPCK. There was no statistically significant difference between TCK and TPACK.

The analysis of the average value of each dimension (Table 4) shows that there is no significant difference in the seven dimensions of TPACK among teachers with different education backgrounds and subjects, but the author has analyzed the average value of each dimension (the median value is 4.81). It can be concluded that the average value of TPACK of public course teachers is PK(5.19) > PCK (5.08) > CK (5.04) > TK (4.81) > TPK (4.80) > TPACK (4.67) > TCK (4.54).

The average value between the dimensions

items	N	M	standard deviation	sig
TCK	152	4.54	0.65	0.42
TPACK	152	4.67	0.82	0.67
TPK	152	4.80	0.75	0.56
TK	152	4.81	0.62	0.39
CK	152	5.04	0.97	0.95
PCK	152	5.08	0.70	0.49
PK	152	5.19	0.63	0.39

Table 4

The results show that the TPACK of the teachers in this university is in the middle level. To be specific, public course teachers have a solid grasp of subject knowledge and teaching knowledge, but lack of technical knowledge. It is concluded that the application and improvement of technical knowledge are the problems that need to be paid attention to in the improvement of teachers' competency. Teachers have rich knowledge of subject teaching methodology and subject content, but their technology integration ability is generally weak. How to improve teachers' knowledge and ability to integrate technology into curriculum teaching effectively is the main factor to promote the development of teaching informatization.

5. Conclusion

The analysis indicates that the overall level of technology and technology integration knowledge of public course teachers is not high. Public courses in colleges are compulsory courses, and the teaching quality can affect the students' participation and the development of their social ability. However, the high level of teachers' subject knowledge and teaching knowledge and the relatively low level of technology-related knowledge indicate that teachers have little enthusiasm for

modern information technology in teaching and are still inclined to adopt traditional methods and teaching concepts. Therefore, the lack of technical knowledge of public course teachers in colleges affects TK, an important ability of TPACK, and further affects TCK, TPK, and TPACK.

There is no significant difference in TPACK development among teachers with different educational background and different majors, which indicates the requirements and standards of the education system for teacher development and training is not good enough. Therefore, in teacher training program, it is necessary to pay attention to the continuous professional development and training to provide diverse training and support to meet the individual needs and professional development of teachers.

Teachers should also continue to pursue professional development opportunities and continuously improve their TPACK level to adapt to the development of educational environment and student needs. As an indispensable ability of teachers under the background of education informatization, information technology is a key technology in current education. Therefore, training efforts and communication opportunities should be strengthened in the professional training and in-service training of public course teachers in colleges, then the TPACK ability of public course teachers can be promoted.

References :

1. Angeli C.: Valanides N. *Epistemological and methodological issues for the conceptualization, development and assessment of ICT-TPCK: Advances in technological pedagogical content knowledge (TPCK)* [J]. *Computers & Education*, 2009, (52):154-168.
2. Chai, Hohnj, Kohjhl, et al.: *Examining preservice teachers' perceived knowledge of TPACK and cyberwellness through structural equation modeling* [J]. *Australasian journal of educational technology*, 2012, 28(6): 1000-1019.
3. Feng.: *A case study on TPACK comparison of primary school mathematics novices, proficient and expert teachers [D]*. Ningbo: Ningbo University, 2014.
4. Guoyuan Sanga, Jo Tondeurb, Ching Sing Chaic & Yan Dongd.: *Validation and profile of Chinese pre-service teachers' technological pedagogical content knowledge scale*. *Asia-Pacific Journal of Teacher Education*, 2014.
5. Li.: *TPACK Level Status and Development Strategies of college English teachers: from the perspective of teachers and students*. *English Abroad*, 2022, (22), 181-182+190.
6. Liu, Xu, Wang.: *Research on the construction of context factor model of Teacher Integrated Technology Subject Teaching Knowledge (TPACK)* [J]. *Modern Distance Education*, 2015(2):60-66.

7. Lou.: *Research on experiential teaching of Chemistry in Middle school under the framework of TPACK knowledge [J]. Chemical Education, 2015,36 (15):1-5.*
8. Malik, S., Rohendi, D., &Widiaty, I. (2019, February).: *Technological Pedagogical Content Knowledge (TPACK) with Information and Communication Technology (ICT) integration: A literature review. In 5th UPI International Conference on Technical and Vocational Education and Training. Indonesia (ICTVET 2018), Atlantis Press.*
9. Mishra,P,Koehler,M.: *Technological Pedagogical Content Knowledge-A Framework for Teacher Knowledge [J] .The Teachers College Record,2006,108(6);1017–1054.*
10. Niess M L.: *Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge[J]. Teaching and Teacher Education,2005,(21):509-523.*
11. Ren.: *Investigation and Problem Analysis of TPACK among college teachers [J]. Modern Educational Technology,2015,(4):38-44.*
12. Ruan, Yang.: *The development of disciplinary and pedagogical knowledge frameworks for integrating technology: from TPACK, TSACK to TMACK [J]. China Distance Education, 2014(11):20-26, 96.*
13. Schmidt D A, Baran E.:*Technological pedagogical content knowledge (TPACK): The development and validation of an assessment instrument for preservice teachers[J]. Journal of Research on Technology in Education, 2009,(2): 123-149.*
14. Si.: *Analysis of TPACK ability Level of Inner Mongolia University Teachers and its influencing factors, Journal of Chifeng University (Philosophy and Social Sciences Edition), Vol.43 No.4 April.2022.*
15. Sun, Hu, Liu, et al.: *Professional Competence of Mathematics normal University students from the perspective of TPACK: Level, connotation and training path [J]. Educational Exploration, 2017(1):101-104.*
16. *The Ministry of Education and other six departments.: Guiding Opinions on strengthening the reform of the construction of college teachers in the new era.[EB/OL].*
17. Xu.: *Research on TPACK Development Strategy Based on Key Characteristics [J]. Modern Educational Technology, 2015,04:45-51.*
18. Yan, Hui, Ning.: *Comparative study on TPACK level of junior middle school mathematics teachers in urban and rural areas [J]. Shanghai Education and Research, 2018(6):51-56.*
19. Zhang, Zhang, Wang.: *A review of international TPACK theory: 2005-2014 [J]. Modern Distance Education,2015(6):10-15.*
20. Zhang, Ouyang.: *Research on Teaching ability development strategies of college PE teachers in Shanxi Province from the perspective of TPACK. Wushu*

Research. 2023,8(01).

21. Zhou, Mo.: *Review, Reflection and Prospect of TPACK Research in China [J]. Heilongjiang Higher Education Research, 2019, 37(8):59-64.*