Factors Influencing Technological Pedagogy Content Knowledge for English Normal Students in China

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Abstract. In the digital age, information technology has been integrated into every field of education. The cultivation of normal students' information teaching ability has become one of the important training goals of higher education universities. In this study, 203 English normal students were studied by means of a quantitative questionnaire. In order to achieve the goal of improving the information teaching ability of English normal students by optimizing teacher education curriculum, descriptive statistics mean and inferential statistics independent sample T test were employed to analyze the collected data by using SPSS 26.0. The results show that Internship experience can influence CK and TCK of TPACK framework significantly; Educational Technology Course can influence CK, TCK, TPK of TPACK framework for English normal students significantly. This study has played a theoretical and practical guiding role on improvement of TPACK for English normal students. Based on the findings, some feasible suggestions were put forward for optimizing teacher education curriculum in combination with the improvement of English normal students' TPACK.

Keywords: English normal students; TPACK; Internship experience; Educational technology course

1 INTRODUCTION

Information technology has also had a profound impact on the field of education, and education informatization has become an inevitable trend with the rapid development of the Internet [1]. With the aim to promote teaching abilities, teachers should conscientiously follow the new trends and fresh ideas in the area of education based on valuable information competence framework [2]. Pre-service teacher education must also keep in line with the development of the Times. As an important base for training teachers, educational colleges would focus on the trend of current basic education reform, and focus on the cultivation of normal students 'informatization teaching ability. Based on the new requirements of teachers' ability in the information age, it is urgent to improve the training and level of English normal students' informatization ability. The

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application ability of information technology of teachers should be effectively improved, education informatization should be comprehensively promoted, curriculum reform should be deepened, and a solid foundation should be laid for the independent professional development of teachers. However, little attention has been paid to unpack how teachers shape their confidence and beliefs to apply TPACK in practice [3].

TPACK theory framework is the short for Technological Pedagogical Content Knowledge and also it is the Knowledge requirement of teachers' teaching ability in informatization age. The Technological Pedagogical Content Knowledge (TPACK) framework provides both empirical and theoretical guidance for technology integration in the classroom [4].

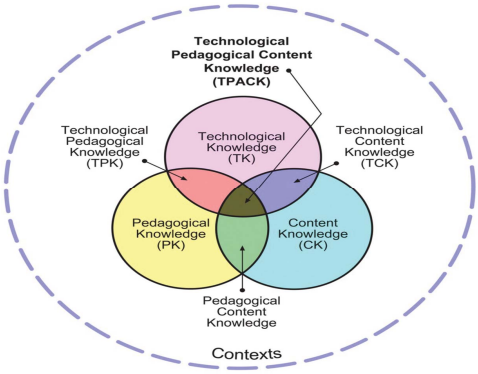

Fig. 1. TPACK Theory Framework

For figure 1, according to Koehler, Mishra and Cain [5], the elements of TPACK theory framework are divided into seven aspects: technology knowledge (TK), pedagogy knowledge (PK), content knowledge (CK), pedagogy content knowledge (PCK), technology pedagogy knowledge (TPK), technology content knowledge (TCK), and technology pedagogy content knowledge (TPACK). Among them, TK, CK, and PK are three core elements, and the three basic core elements are interacted to produce four composite elements, PCK, TPK, TCK, and TPACK. The TPACK framework is a kind of knowledge which integrates technology into specific subject content and specific teaching pedagogical approaches, with the aim to outcome effective subject teaching with educational technologies. The research aims to study influencing factors for English normal students' on TPACK in H University and the two research questions are:

RQ1. Is there any differences of English normal students' TPACK based on Educational Technological Course?

RQ2. Is there any differences of English normal students' TPACK based on Internship experience?

2 RESEARCH DESIGN

Quantitative was employed and 203 English normal students were investigated using a questionnaire adapted from Chai's TPACK scale. SPSS 26.0 was used to conduct descriptive statistics and inferential statistics of the collected data. The research results provide support for improving the TPACK of English normal students through the optimization of teacher education curriculum.

2.1 Research Population and Samples

The research population of this study is English normal students in Inner Mongolia of China. The purposive sampling technique is adopted in this study, and 203 English normal students in H University were selected as research samples. Among them, there are 184 females, accounting for 90.6%; there are 19 males, accounting for 9.4%.

2.2 Research Instruments

This study used questionnaire as research instrument which was designed based on the maturity 5-point Likert scale of Chai. There are 31 items in the questionnaire, measuring the seven components, CK, TK, PK, TCK, PCK, TPK and TPACK of the TPACK framework.

3 RELIABILITY AND VALIDITY

Two hundred and twenty-seven questionnaires were finally collected. After checking the data, 24 invalid data was deleted. Finally, 203 questionnaires were employed in the present study. Skewness and Kurtosis were employed to conduct the Normality test, and the results indicate that the data distribution is normal. And also Cronbach Alpha coefficient was employed to check reliability of the questionnaire which shows that the Cronbach Alpha coefficients of CK, TK, PK, TCK, PCK, TPK and TPACK of the questionnaire are greater than 0.8. Meanwhile, the questionnaire's whole coefficient of Cronbach Alpha is 0.980, which indicates that the reliability of the questionnaire is high, indicating that the questionnaire has reasonable consistency. The KMO and Bartlett's test of Sphericity were employed to test the data validity. The results show that all KMO values present greater than 0.8. And the overall KMO value is 0.932. Thus, the results shows that this instrument can be employed to analyze factors.

4 RESULTS AND FINDINGS

4.1 Results and Findings of Question One

The study used Mean, Standard Deviation and Simple Sample T test to answer research question one.

Table 1. Mean of TPACK under Educational Technology Course

	Mean Score (Standard Deviation) *Yes (N=170)*	*No (N=33)*
CK	4.00（0.57）	3.69（0.69）
PCK	4.02（0.56）	3.88（0.49）
PK	4.09（0.54）	3.98（0.63）
TPACK	4.04（0.55）	3.89（0.62）
TCK	4.07（0.56）	3.84（0.66）
TPK	4.07（0.54）	3.78（0.61）
TK	4.04（0.54）	3.90（0.64）

The researchers test whether the Educational Technology of English normal university students affects TPACK significantly, and the results in Table 1 show that Educational Technology has an impact on seven factors of TPACK. In order to more accurately analyze the accuracy of this result, the researchers continued to conduct independent sample T test.

Table 2. Results of T-test of TPACK factors under Educational Technology Course

		Levene's Test for Equality Variances							*95% Confidence Interval of the Difference*	
		F	Sig.	t	Df	Sig.(2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CK	EVA	4.554	0.034	2.738	201	0.007	0.31185	0.11391	0.08723	0.53648
	EVNA			2.419	41.047	0.02	0.31185	0.12892	0.05151	0.5722
PCK	EVA	0.489	0.485	1.318	201	0.189	0.13986	0.10614	-0.0694	0.34915
	EVNA			1.453	50.128	0.152	0.13986	0.09622	-0.0534	0.33311
PK	EVA	0.843	0.36	0.963	201	0.337	0.10271	0.10667	-0.1076	0.31304
	EVNA			0.868	41.614	0.391	0.10271	0.11839	-0.1362	0.3417
TPCK	EVA	0.731	0.394	1.348	201	0.179	0.14538	0.10783	-0.0672	0.358
	EVNA			1.248	42.463	0.219	0.14538	0.11648	-0.0896	0.38037
TCK	EVA	3.193	0.075	2.148	201	0.033	0.23703	0.11034	0.01945	0.45461
	EVNA			1.929	41.511	0.061	0.23703	0.1229	-0.0110	0.48513
TPK	EVA	1.886	0.171	2.734	201	0.007	0.29176	0.10673	0.0813	0.50221
	EVNA			2.525	42.394	0.015	0.29176	0.11554	0.05866	0.52485
TK	EVA	2.007	0.158	1.274	201	0.204	0.1365	0.10718	-0.0748	0.34784
	EVNA			1.142	41.473	0.26	0.1365	0.11953	-0.1048	0.3778

The researchers tested whether Educational Technological Course had an impact on the TPACK ability of English normal college students. The results in Table 2 show that the P-values of Levene's Test for Equality of Variances for the six factors of TPACK are all greater than 0.05, including PCK, PK, TPACK, TCK, TPK, TK. The analysis continues with the P-value on Equal Variances Assumed line. The results showed that the P-values of the four factors were all greater than 0.05, including PCK, PK, TPCK,

TK. Meanwhile, the P-values of the two factors were smaller than 0.05, including TPK and TCK. Furthermore, CK was analyzed, and the results show that P values on Levene's Test for Equality of Variances is 0.034. The analysis continues with the P-value on Equal Variances Not Assumed line. The results showed that the P-values of CK factor is higher than 0.05. Through the analysis, the result show that the Educational Technological Course, of English normal students has an impact on CK (Content Knowledge), TPK (Technology Pedagogy Knowledge) and TCK (Technology Content Knowledge).

4.2 Results and Findings of Question Two

The researchers used independent sample T-test to analyze the influence on TPACK based on Internship Experience. Results of the mean and standard deviation are shown in the following Table 3.

Table 3. Mean of TPACK under Internship Experience

Items	*Mean Score (Standard Deviation)*	
	Yes (N=137)	*No (N=66)*
CK	4.01（0.58）	3.83（0.64）
PCK	4.02（0.56）	3.96（0.55）
PK	4.09（0.54）	4.03（0.59）
TPACK	4.05（0.56）	3.95（0.56）
TCK	4.09（0.57）	3.91（0.59）
TPK	4.07（0.560）	3.92（0.58）
TK	4.07（0.55）	3.91（0.57）

The researchers test whether the internship experience of English normal university students affects TPACK significantly, and the results in Table 3 show that the internship experience has an impact on seven factors of TPACK. In order to more accurately analyze the accuracy of this result, the researchers continued to conduct independent sample T test.

Table 4. Results of T-test of TPACK factors under Internship Experience

		Levene's Test for Equality Variances							*95% Confidence Interval of the Difference*	
		F	Sig.	t	Df	Sig.(2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
CK	EVA	3.244	0.073	2.044	201	0.042	0.184	0.090	0.006	0.363
	EVNA				1.981	118.627	0.05	0.184	0.093	0.000
PCK	EVA	0.001	0.978	0.731	201	0.466	0.061	0.083	-0.104	0.226
	EVNA				0.735	130.255	0.464	0.061	0.083	-0.103
PK	EVA	0.231	0.632	0.715	201	0.476	0.060	0.084	-0.105	0.225
	EVNA				0.693	118.802	0.49	0.060	0.086	-0.11
TPACK	EVA	0.171	0.68	1.171	201	0.243	0.099	0.085	-0.068	0.267

	EVNA				1.175	129.648	0.242	0.099	0.084	-0.068
TCK	EVA	0.047	0.828	2.091	201	0.038	0.181	0.086	0.010	0.353
	EVNA				2.061	123.705	0.041	0.181	0.088	0.007
TPK	EVA	0.153	0.697	1.684	201	0.094	0.143	0.085	-0.024	0.310
	EVNA				1.662	124.35	0.099	0.143	0.086	-0.027
TK	EVA	0.139	0.71	1.882	201	0.061	0.158	0.084	-0.007	0.323
	EVNA				1.854	123.554	0.066	0.158	0.085	-0.010

The researchers tested whether the internship experience had an impact on the TPACK ability of English normal college students. The results in Table 4 show that the P-values of Levene's Test for Equality of Variances for the seven factors of TPACK are all greater than 0.05. The analysis continues with the P-value on Equal Variances Assumed line. The results showed that the P-values of the five factors were all greater than 0.05, including CK, PK, TK, TPK, PCK and TPACK. Furthermore, CK and TCK are analyzed, and the results show that P values on Equal Variances Not Assumed line are 0.042(CK) and 0.038 (TK). Through the analysis, the results show that the internship experience of English normal university students has an impact on CK (Content Knowledge) and TCK (Technology Content Knowledge).

5 CONCLUSION

The factors influencing TPACK of English normal college students, such as internship experience and educational technology courses, were investigated. The results present that internship experience and educational technology courses make an impact on both CK and TCK. For CK, internship can closely combine the theory and practice of content knowledge and Educational technology courses can enable to optimize the learning of content knowledge by using technology, thus promoting CK. TCK is the integration of technology into content knowledge. Internship and educational technology courses can influence TCK from the perspective of first-line classroom application and educational technology knowledge learning. And the results show that educational technology courses have an impact on TPK. Obviously, TPK is the knowledge of educational technology integrated into teaching methods, and educational technology courses are the courses to improve relevant abilities. According to the research results, the following suggestions are put forward: First, the differences of cultural background and educational environment should also be paid attention to in the course setting and practice setting of educational technology. Normal university students in the future employment environment with higher information skills should be taught more technical knowledge in the curriculum and practice links. Second, curriculum teaching should be closely combined with current middle school English content, so that English normal school students can have a clear understanding of English related English content, including teaching focus, teaching difficulties, knowledge evaluation and so on. Third under the guidance of practical classroom experience, teachers should give effective guidance to English normal college students, so that they can better grasp the subject knowledge and the application of technology teaching method in teaching. Fourth, educational

technology courses are set up to improve the quality of information of normal students. In addition, since educational technology course has a significant influence on CK, TCK, and TPK, which supports the results [6] that TCK and TPK are better predictors of high TPCK over time, the educational technology courses should be combined with the subject knowledge content of students as far as possible, so as to have a positive impact on the TPACK level of pre-service teachers and effectively improve the TPACK level of pre-service teachers.

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