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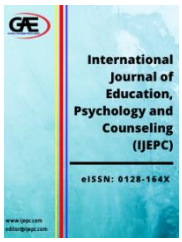

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THE TPACK CONFIDENCE OF PRE-SERVICE TEACHERS IN SELECTED PHILIPPINE TEACHER EDUCATION INSTITUTIONS

Romell A. Ramos[1*], Edward E. Babasa[2], Imelda B. Vergara[3], Bernadeth I. Manalo[4], Lorna L. Gappi[5], Tina G. Morfi[6]

[1] Center for Publications, Research, Linkages, and Liaison, University of Batangas
Email: romell.ramos@ub.edu.ph
[2] College of Education, University of Batangas
Email: edward.babasa@ub.edu.ph
[3] College of Education, St. Bridget College
Email: imeldabvergara687@yahoo.com
[4] St. Birdget College
[5] College of Education, Colegio ng Lungsod ng Batangas
Email: eneganrol@gmail.com
[6] College of Education, Colegio ng Lungsod ng Batangas
[*] Corresponding Author

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Abstract:

The changing educational landscape of Philippine education in the past decade poses challenges to the implementers of the curriculum innovations – the teachers. Consequently, this has put more pressure on the teacher education institutions (TEIs) to produce a quantity of quality teachers. From this context, this paper examines the technological, pedagogical, and content knowledge (TPACK) confidence level of pre-service teachers in selected Philippine teacher education institutions. The TPACK Model has been a very useful framework for academic stakeholders to understand and measure the level of technology integration in teaching and learning. Using a 64-item self-diagnostic questionnaire designed to measure the dimensions of TPACK in terms of learning experience and practice, and assessing the responses of 187 graduating pre-service teachers from selected Philippine TEIs, the data suggest that the pre-service teachers are fairly confident with the learning experience they get from the TEIs and that by using these experiences they frequently demonstrate the acceptable teacher competency and standards. Furthermore, the levels of TPACK confidence of the secondary and elementary pre-service teachers significantly differ from each other such that the former are more

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confident with their learning experience and practice. Data also show that there is a significant relationship between the quality of learning experience and the ability of the pre-service teachers to demonstrate the core competencies of TPACK. Hence, teacher education institutions must consider innovating their curriculum through training, subject-focused pedagogical modeling, and subject-specific technologies.

Keywords:

Technological Pedagogical Content Knowledge, Pre-Service Teachers, Philippines

Introduction

The recent curricular changes in the Philippine basic education, brought about by K to 12 Reform, ASEAN Integration, globalization, and demand of the 21st-century learners, call for competent, efficient, and effective teachers. Moreover, today's young generation of teachers, despite being digital natives themselves, are challenged with the use of technology (Urbani, Roshandel, Michaels, & Truesdell, 2017). As articulated in the Philippine Professional Standards for teachers (Department of Education Order No. 42, s. 2017), it is expected that a beginning teacher should have a strong understanding of the subject in terms of content knowledge and pedagogy while demonstrating skills in positive use of the information communications technology (ICT) to facilitate the teaching and learning process.

In an ICT rich classroom with a diversity of 21st-century learners, the beginning teachers find teaching as an overwhelming task and, more often than not, lead to the feeling of ineffectiveness (Scherer, 2012). It is also pointed out in several studies that a balanced combination of the technological, pedagogical, and content knowledge of the pre-service teachers had not been attained (Tanak, 2018; Ogan-Bekiroglu & Karabuz, 2017; Cacho, 2014; Papanikolaou, Gouli, & Makri, 2013; Hsu, 2012, Messina & Tabone, 2012) contributing to difficulties in dealing with the challenges of the teaching and learning process.

The success of these beginning teachers in the teaching profession is a reflection of the kind of teacher training provided by their respective teacher education institutions (TEIs). Hence, it is imperative for TEIs to establish a scheme of monitoring and evaluating not just their outputs (graduates) but also the processes (learning experience and internship/practice) that have been included in the teacher training (Philips, Koehler, Rosenberg, & Zunica, 2017). One such measure that gauges the effectiveness of the processes is the technological, pedagogical, and content knowledge (TPACK) framework.

Based on the stated premises, the study aims to assess the technological, pedagogical, and content knowledge (TPACK) confidence of the pre-service teachers from selected Philippine teacher education institutions. Specifically, it aims to:

1. determine the profile of the pre-service teachers;
2. determine the pre-service teachers' TPACK confidence level in terms of the learning experience and extent of practice;
3. compare the elementary and secondary pre-service teachers' TPACK confidence levels;

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4. correlate the pre-service teachers' learning experience and extent of the practice in relation to TPACK.

The study used a descriptive (comparative, correlational) design. One hundred eighty-seven graduating pre-service teachers were randomly selected from teacher education institutions in Batangas City, Batangas, Philippines. A 64-item self-diagnostic questionnaire was construed based on the TPACK survey developed by chai, Koh, and Teo (2018), and Schmidt, et a. (2009) to measure the TPACK confidence level of the pre-service teachers in terms of the learning experience and practice, and was administered in the last semester of their teacher training. The data gathered were analyzed using frequency count, percentage, weighted mean, independent samples t-test, and Pearson's coefficient of correlation. Interviews with selected key informants were used to get more data on specific dimensions of TPACK.

Literature Review

The TPACK Framework

The technological pedagogical and content knowledge (TPACK) model has been a very useful framework for academic stakeholders to understand and measure the level of technology integration in teaching and learning (Mishra, 2019; Herring, Koehler & Mishra, 2016). Years following its development, many educators and leaders proposed ways on how to measure the dimensions of TPACK using self-diagnostic questionnaires (Cacho, 2014; Chai, Koh, & Tsai, 2011; Baran, Chuang, & Thompson, 2011; Archambault & Barnett, 2010; Schmidt, et al., 2009), interviews and focused discussions, observations, and/or documentary evidence (Hsu, 2012; Koh & Divaharan, 2011; Jang & Chen, 2010). However, many argued that the delineation among the seven domains is not clear (Archambault & Barnett, 2010); hence, more empirical-based studies are needed to validate the constructs for TPACK.

The following are the seven domains of TPACK model (Koehler, 2012).

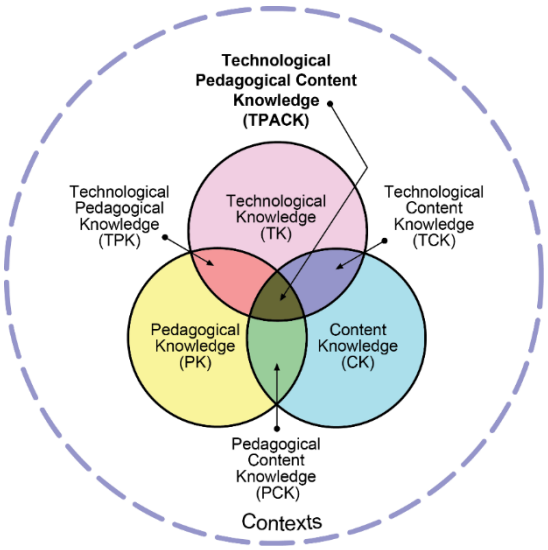

Figure 1: Dimensions of the TPACK Model

Source: tpack.org

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Content knowledge refers to the knowledge about the subject matter to be learned or taught. Pedagogical knowledge refers to deep knowledge about the processes and practices or methods of teaching and learning. Technology knowledge refers to ways of thinking and applying technology, tools, and resources. Pedagogical content knowledge refers to the use of applicable pedagogy in teaching specific content. Technological content knowledge refers to the influence and restrictions of technology and content on each other. Technological pedagogical knowledge refers to the understanding that positive change can occur when a particular technology is used in teaching and learning. Technological pedagogical content knowledge is the seamless interplay of all three concepts (Herring, Koehler & Mishra, 2016).

Teacher Preparation and TPACK

In many studies concerning teacher preparation and technology integration, it was evident that the pre-service teachers' expertise had significantly improved when proper TPACK implementation was carried out and modeled (Lehtinen, Nieminen, & Viiri, 2016; Martin, 2015; Koh & Divaharan, 2011). Accordingly, teacher education institutions should focus not only in technology used but also on the learning outcomes that support technology including pre-service teachers' self-confidence and efficacy (Bekiroglu & Karabuz, 2017), and the formation of structures, habits, and expertise in the teacher education institutions that are conducive for developing TPACK (Voogt & McKenny, 2015)

Discussions and Conclusion

Profile of the Respondents

Table 1 shows the profile of the pre-service teacher respondents. Majority of the pre-service teachers were female (n = 166, 88.8%) with average age of 21.5 years old (SD = 2.33 years old). Moreover, majority of respondents were elementary pre-service teachers (n = 127, 67.9%) from the local government-operated college (n = 90, 48.1%) and attending on a fulltime basis (n = 167, 89.3%) with complete academic units (n = 167, 89.3%).

Table 1. Description of the Pre-service Teacher Respondents

Profile Variables	frequency	%
Type of TEI		
Autonomous Private University	27	14.4
Local College (Government)	90	48.1
Private College	70	37.4
Age		
16-19 years old	27	14.4
20-23 years old	139	74.3
24-27 years old	16	8.6
28 years old and above	5	2.7
Mean (SD)	21.5 years old (2.33 years)	
Sex		
Male	21	11.2
Female	166	88.8
Program		
Elementary	127	67.9

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Secondary	60	32.1
Academic Status		
Regular Student (w/ complete academic units)	167	89.3
Irregular Student (w/ incomplete academic units)	20	10.7
Student Type		
Full-time Student	167	89.3
Working Student	20	10.7
Total	187	100.0

Pre-service Teachers' Learning Experience and Practice of TPACK

Table 2 shows the TPACK experience and practice of the pre-service teachers from the selected teacher education institutions. It can be gleaned from the table that the pre-service teachers were fairly confident (M = 3.97, n = 187) with their learning experience. This suggests that the learning experience and opportunity in their teacher training had been enough for them to understand the proper integration and interplay of the TPACK in their respective disciplines. Accordingly, the pre-service teachers were able to frequently practice and apply TPACK in their internship (M = 3.92, n = 187). Having the right understanding of the TPACK in their teacher training increases the pre-service teachers' TPACK confidence throughout their teacher training; thus, the pre-service teachers will be able to correctly and effectively demonstrate the acceptable teacher competencies not only in their internship but also in the in-service (Lehtinen, Nieminen, & Viiri, 2016; Karatas, Tunc, Yilmaz, & Karaci, 2016).

Table 2. Pre-service Teachers' TPACK Confidence Level

TPACK Dimensions	Learning Experience		Practice	
	Mean	Interpretation	Mean	Interpretation
Technological Knowledge	3.71	Fairly confident	3.70	Frequently
Content Knowledge	3.94	Fairly confident	4.00	Frequently
Pedagogical Knowledge	4.03	Fairly confident	3.92	Frequently
Pedagogical Content Knowledge	4.02	Fairly confident	3.99	Frequently
Technological Content Knowledge	3.95	Fairly confident	4.06	Frequently
Technological Pedagogical Knowledge	4.01	Fairly confident	3.67	Frequently
Technological Pedagogical Content Knowledge	3.97	Fairly confident	3.92	Frequently

Note: 1.00-1.49, not confident at all/not at all; 1.50-2.49, slightly confident/rarely; 2.50-3.49, somewhat confident/occasionally; 3.50-4.49, fairly confident/frequently; 4.50-5.00, very confident/almost always

Results also show that the pre-service teachers were particularly confident with their pedagogical knowledge (M = 4.03, n = 187), pedagogical content knowledge (M = 4.02, n = 187), and technological pedagogical knowledge (M = 4.01, n = 187). However, the learning experience along these dimensions did not translate much into practice. It can be noted that the content knowledge (M = 4.00, n = 187) and technological content knowledge (M = 4.06, n = 187) were more frequently practiced than the other dimensions of TPACK. This gap implies that although teachers possessed the technological, pedagogical, and content knowledge, they

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have not equally and functionally combined the knowledge for teaching (Handal, et al., 2013; Hofer & Harris, 2012).

Comparison of the Pre-service Teachers' TPACK Learning Experience and Practice

It can be gleaned from Table 3 that there is a significant difference in the TPACK learning experience of secondary and elementary pre-service teachers, $t(185) = 4.74$, $p < 0.001$. The secondary pre-service teachers ($M = 4.28$, $SD = 0.63$) were more confident than the elementary pre-service teachers ($M = 3.82$, $SD = 0.60$) as regards their learning experiences related to TPACK. The findings indicated the difference in the kind of learning experiences the two groups are receiving.

Table 3. Comparison of the Pre-service Teachers' TPACK Learning Experience

TPACK Dimensions	Program	Mean	SD	t-value	df	p-value
Technological Knowledge	Secondary	4.11	0.64	4.57	185	<0.001
	Elementary	3.52	0.60			
Content Knowledge	Secondary	4.29	0.54	6.08	185	<0.001
	Elementary	3.77	0.55			
Pedagogical Knowledge	Secondary	4.33	0.50	5.39	185	<0.001
	Elementary	3.88	0.55			
Pedagogical Content Knowledge	Secondary	4.31	0.61	4.42	185	<0.001
	Elementary	3.87	0.63			
Technological Content Knowledge	Secondary	4.33	0.54	6.15	185	<0.001
	Elementary	3.77	0.60			
Technological Pedagogical Knowledge	Secondary	4.32	0.56	5.18	185	<0.001
	Elementary	3.85	0.58			
Technological Pedagogical Content Knowledge	Secondary	4.28	0.63	4.74	185	<0.001
	Elementary	3.82	0.60			

Note: Independent variable – Program of Study (secondary pre-service program, elementary pre-service program.); t-value is significant at 5%

It should be also noted that secondary pre-service teachers significantly differ with the elementary pre-service teachers in the other dimensions of TPACK measured in terms of the related learning experiences. In the interviews with the pre-service teachers, it was revealed that the differences noted in the TPACK dimensions were attributed to the availability of resources and teaching models for TPACK with respect to their program of study. More TPACK related learning experiences and resources were available for secondary pre-service teachers than the elementary pre-service teachers.

Table 4. Comparison of the Pre-service Teachers' TPACK Practice

TPACK Dimensions	Program	Mean	SD	t-value	df	p-value
Technological Knowledge	Secondary	4.02	0.59	4.57	185	<0.001
	Elementary	3.57	0.64			
Content Knowledge	Secondary	4.23	0.53	3.52	185	0.001
	Elementary	3.91	0.61			
Pedagogical Knowledge	Secondary	4.32	0.50	6.39	185	<0.001
	Elementary	3.72	0.63			
Pedagogical Content Knowledge	Secondary	4.34	0.46	5.87	185	<0.001

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	Elementary	3.82	0.60			
Technological Content Knowledge	Secondary	4.39	0.52	5.22	185	<0.001
	Elementary	3.91	0.60			
Technological Pedagogical Knowledge	Secondary	3.83	0.55	2.55	185	0.011
	Elementary	3.60	0.59			
Technological Pedagogical Content Knowledge	Secondary	4.31	0.48	6.38	185	<0.001
	Elementary	3.74	0.60			

Note: Independent variable – Program of Study (secondary pre-service program, elementary pre-service program); t-value is significant at 5%

It can be noted in Table 4 that there is a significant difference in the TPACK practice of the secondary and elementary pre-service teachers, $t(185) = 6.38$, $p < 0.001$. The secondary pre-service teachers ($M = 4.31$, $SD = 0.48$) practiced TPACK more frequently in their daily teaching during internship than the elementary pre-service teachers ($M = 3.74$, $SD = 0.60$). Moreover, there is also a significant difference in the secondary and elementary pre-service teachers' practice of other TPACK dimensions. An interview with the pre-service teachers revealed that the TPACK practice had been influenced by their previous experiences in the courses that they had taken in their teacher education institutions and further strengthened through field experience in the internship. The results emphasized the important roles of both the teacher education institutions and the laboratory or cooperating schools in honing and developing the TPACK practice of pre-service teachers. More specifically, the learning opportunities offered by these two important stakeholders should complement each other to clarify inaccurate preconceptions as well as the practice of the pre-service teachers (Nordin, Davis & Tengku Ariffin, 2013).

Correlation between Pre-service Teachers' TPACK Learning Experience and Practice

Table 5 shows that there is a significant, positive relationship between the pre-service teachers' TPACK learning experience and extent of the practice, $r(185) = 0.69$, $p < 0.001$. The results affirmed the fact that the pre-service teachers in their final year in the teacher education institutions showed significant improvements and preparedness due to experiences that they gained in the different education courses and during their internship or fieldwork (Khalid, Karim, & Husnin, 2018).

Table 5. Correlation Factors between TPACK Learning Experience and Practice

TPACK Dimensions	r	p-value
Technological Knowledge	0.55	<0.001
Content Knowledge	0.58	<0.001
Pedagogical Knowledge	0.66	<0.001
Pedagogical Content Knowledge	0.53	<0.001
Technological Content Knowledge	0.60	<0.001
Technological Pedagogical Knowledge	0.44	<0.001
Technological Pedagogical Content Knowledge	0.69	<0.001

Note: Pearson's r is significant at 5%

Indirectly speaking, the respondents' teacher education institutions have provided them with quality learning experiences that enriched their knowledge and skills for adopting and integrating technology effectively. However, it is best for pre-service teachers to exert

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purposeful efforts to reflect on and evaluate their TPACK confidence as regards to technology integration (Cam & Koc, 2019; Cacho, 2014).

Implications of the Study

Due to the significant differences noted in the pre-service teachers' TPACK learning experience and practice as well as the significant positive relationship between these important aspects of teacher education training, the teacher education institution should further strive to improve their teacher education curricula by including trainings focused on TPACK (Messina & Tabone, 2012), subject-focused pedagogical modeling, and subject-specific technologies (Tanak, 2018). The teacher education institutions should also adopt other assessment methods to fully gauge the progress of pre-service teachers.

Educational leaders and teacher education institutions should consider redesigning of the teacher education curriculum to adopt a more flexible approach to accommodate new emerging technologies for better teaching and learning of contents. While theories can help prospective pre-service teachers to discern important pedagogical, technological, and content knowledge it is also imperative that internship and practicum should be a source of rich teaching experiences. Hence, it will be functional if laboratory schools and cooperating schools have model classrooms showcasing best practices of the technological, pedagogical, and content knowledge. Furthermore, aside from the national government licensure examination, teacher education institution should also provide quality control with their graduates wherein a comprehensive revalidation od's acquired skills must be in place.

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