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Perceived technology integration of Filipino teachers teaching in the U.S.A.

Mary Adelle Calingasan Veridiano * and Joseph Mitas Brondo

School of Teacher Education, National Teachers College, Manila, Philippines.

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Abstract

Integrating technology, pedagogy, and content knowledge in teaching is a challenging but fulfilling undertaking. Teachers in the 21st century are expected to integrate technology in the classrooms effectively, while at the same time being knowledgeable in the pedagogy and content of the subjects being taught. The purpose of this study is to describe the perceptions of Filipino teachers teaching in the U.S. on the Technological Pedagogical Content Knowledge (TPCK) framework. Data was gathered through a survey using the Questionnaire to Measure Perceived Technology Integration Knowledge of Teachers by Hosseini & Kamal (2012). The study found that among the TPCK's subscales, the mean for pedagogical knowledge (PK) was the highest (4.34), while the mean for technological knowledge (TK) was the lowest (4.03).

Keywords: Technology Integration; Content knowledge; Pedagogical knowledge TPCK; Teachers; Descriptive

1. Introduction

Use of technology in the classroom has been widely encouraged in the K-12 schools. This is evident in the different Teacher Performance Evaluation Rubrics such as the TAP System for Teacher and Student Advancement [12], Danielson Framework for Teaching [8], and Elevate NM [11], which is based on Charlotte Danielson's work but adapted for New Mexico educators. Incorporating technology and multimedia is part of all these rubrics, indicating its importance in student performance. This is especially true in this post-COVID19 pandemic time, where data shows a huge gap between student performance pre- and post-pandemic. Albuquerque Journal published New Mexico's test scores from 2019 as compared to 2022. Results indicate that there is a significant decline in the 4th and 8th graders' Math scores. 4th graders also had a significant decline in their Reading scores [6]. In response to this, a progress report entitled Addressing Pandemic Impacts on Learning as published by the New Mexico Legislature, cited how school districts are provided their Elementary and Secondary School Emergency Relief (ESSER) Fund and how they are choosing to address unfinished learning and/or learning loss in their students [10]. These school districts are enacting different strategies, but one of them is by purchasing learning loss softwares to help students individualize their learning and have them work in their own time.

Because of this learning loss and the need for technology in the classroom, teachers now more than ever need to be proficient in the use of technology. Not only do they need to be proficient but they also need to be more adaptable in learning to use different softwares that school districts are and will be rolling out. This is where the Technological Pedagogical Content Knowledge (TPCK) framework comes in. Technological Pedagogical Content Knowledge (TPCK) was presented to the educational research field as a theoretical framework in order to understand teacher knowledge needed for effective technology integration (Mishra & Koehler, 2006) [4]. To make it simpler to remember and provide a more cohesive whole for the three types of knowledge addressed: technology, pedagogy, and content, the TPCK framework acronym was changed to TPACK (pronounced "tee-pack") (Thompson & Mishra, 2007 2008) [14]. The TPACK paradigm expands on Shulman's concept of Pedagogical Content Knowledge (PCK) by incorporating technology

* Corresponding author: Mary Adelle Veridiano

knowledge that is embedded within content and pedagogical knowledge (Schmidt et al., 2009) [1]. For the purpose of consistency, the researchers will use the acronym TPCK the same as what was used in the instrument developed by Hosseini & Kamal (2012) [3].

Hosseini & Kamal in 2012 cited Doering et al. (2009) and Angeli & Valanides (2008) in explaining that TPCK equips teachers with the specialized expertise they need to effectively use technology in the classroom [3]. Hosseini & Kamal 2012 further said that the TPCK framework provides educators and researchers with a mechanism to assess and deliver useful recommendations for improving the knowledge and abilities of instructors, which are essential for incorporating technology into the classroom [3]. Because of this, the researchers would like to assess the teachers' technological pedagogical content knowledge using the TPCK model. Knowing where teachers are with their technological pedagogical content knowledge would then provide school administrators and stakeholders the data to help them develop professional development initiatives. This will in turn help students with their technology use in completing their learning loss softwares and bridging that learning gap caused by the distance learning format during the pandemic.

Looking at the previous discussion, the researchers will undertake the following questions: (1) To what degree do Filipino teachers in the US possess the following TPCK subscales based on their perceptions, specifically in: Technological Knowledge (TK); Pedagogical Knowledge (PK); Content Knowledge (CK); Technological Content Knowledge (TCK); Pedagogical Content Knowledge (PCK); Technological Pedagogical Knowledge (TPK); and Technological Pedagogical Content Knowledge (TPCK)? (2) Which TPCK subscore is perceived to be an area of strength by Filipino teachers? (3) Which TPCK subscore is perceived to be an area of need by Filipino teachers? (4) What is the overall perceived technology integration knowledge of Filipino teachers teaching in the US?

2. Material and methods

2.1. Research Design

This study utilizes the descriptive research design, whereby the researchers analyze the TPCK overall and subscale scores. This provides the researchers insight as to the levels of Filipino teachers teaching in the USA's perceived technology integration knowledge and needs.

The quantitative research method was applied in this study. Data was collected from 79 respondents. The mean was computed using Microsoft Excel in order to identify which subscale Filipino teachers believe to be proficient in. Standard deviation was also computed to determine the dispersion of responses from the mean and its reliability.

2.2. Study Site and Respondents

The study targeted Filipino teachers teaching in the U.S.A., specifically in the state of New Mexico. Cluster Sampling was applied. The researchers divided the participants by school clusters. New Mexico has a total of 225 public high schools, as listed in the US News website. The questionnaire link was sent to Filipino teachers from 23 clusters. The researchers decided on 23 clusters as this is 10% of the total number of high schools in New Mexico. 3-5 respondents from each cluster completed the questionnaire. This brings a total of 79 respondents.

2.3. Research Instrument

The researchers utilized the Questionnaire to Measure Perceived Technology Integration Knowledge of Teachers (TPCK) by Hosseini & Kamal (2012) based on the Technological Pedagogical Content Knowledge (TPACK) questionnaire developed and validated by Schmidt et al., (2009). This instrument was used with the permission of the authors Hosseini & Kamal (2012). It is divided into seven subscales which are: Technological Knowledge (TK); Pedagogical Knowledge (PK); Content Knowledge (CK); Technological Content Knowledge (TCK); Pedagogical Content Knowledge (PCK); Technological Pedagogical Knowledge (TPK); and Technological Pedagogical Content Knowledge (TPCK).

The questionnaire was presented to the respondents using Microsoft Forms in Likert scale format, where SD = Strongly Disagree; D = Disagree; U = Undecided; A = Agree; and SA = Strongly Agree. It consists of 53 close-ended Likert-scale questions for assessing TPCK knowledge and its components were included in the TPCK instrument. The respondents were provided with 20 days to complete the questionnaire. The link was initially emailed at day 1, then a follow up email on day 10. The link was also provided through social media, such as Facebook Messenger and Viber with permission from the respondents.

2.4. Data Analysis

The study presented the technology knowledge level of Filipino teachers teaching in the U.S. using conventional tables and charts for all TPCK subscales. Also, mean ratings and standard deviations were calculated using excel to provide essential data interpretation regarding the varied and comprehensive relationship of TPCK with the respondents.

The researchers utilized The Five-Stage Model of Adult Skill Acquisition by Dreyfus (2004) [4] in interpreting the data, the five stages being: (1) novice; (2) advanced beginner; (3) competent; (4) proficient; and (5) expert. Each stage was assigned an equivalent to the adjectival rating of strongly disagree, disagree, undecided, agree, and strongly agree.

3. Results

3.1. Degree of Filipino Teachers' TPCK Subscales

3.1.1. Technology knowledge (TK).

The adjectival ratings for the remarks were two "Strongly Agree," eight "Agree," and one "Undecided." The teachers' overall adjectival rating is "Agree," demonstrating their proficiency in TK (Table 1). In terms of weighted mean (± sd), statement 3 had the highest value at 4.36 ± 0.485, while statement 10 had the lowest value at 3.29 ± 1.052.

3.1.2. Pedagogy Knowledge (PK)

All remarks obtained "Strongly Agree" adjectival ratings, demonstrating that the teachers are Experts in their PK (Table 2). The highest weighted mean (± sd) was 4.38 ± 0.488 for statements 5 and 7, while the lowest was 4.23 ± 0.598 for statement 4.

3.1.3. Content Knowledge (CK)

The adjectival ratings for the remarks were five for "Strongly Agree" and two for "Agree." The teachers' overall adjectival rating is "Strongly Agree," indicating that they are experts in CK (Table 3). Statement 2 had the highest weighted mean value at 4.39 ± 0.491, while statement 4 had the lowest at 4.18 ± 0.474.

3.1.4. Technological Content Knowledge (TCK)

As demonstrated in Table 4, teachers were proficient in TCK with an overall mean of 4.18 ± 0.082 and an adjectival rating of Agree. The mean (±sd) for statement 3 was the highest at 4.29 ± 0.535, while statement 2 had the lowest mean (±sd) of 4.08 ± 0.572.

3.1.5. Pedagogical content Knowledge (PCK)

The remarks received adjectival ratings of five for "Strongly Agree" and two for "Agree." The teachers are experts in PCK, as evidenced by their overall adjectival rating of "Strongly Agree" (Table 5). This demonstrates that teachers are able to choose methods that encourage students to think critically and learn about the content. With a weighted mean of 4.29 0.457 for statement 2 and 4.11 0.660 for statement 4, statement 2 had the greatest and lowest values, respectively.

3.1.6. Technological Pedagogical Knowledge (TPK)

The remarks received adjectival ratings of seven for "Strongly Agree" and three for "Agree." The teacher's overall adjectival rating is "Strongly Agree," indicating that they are TPK experts (Table 6). As reflected by statement 1 having the highest mean (±sd) of 4.33 ± 0.473, while statement 2 garnered the lowest mean (4.14 ± 0.445); this indicates that teachers are capable of choosing which technologies are appropriate for their teaching strategy.

3.1.7. Technological Pedagogical Content Knowledge (TPCK)

Teachers are proficient in their TPCK, as evidenced by the overall mean (±sd) of 4.15 ± 0.130 and an adjectival rating of "Agree" (Table 7). Statement 5 had the highest weighted mean (± sd) of 4.25 ± 0.438, while Statement 7 had the lowest weighted mean (± sd), 3.91 ± 0.835.

Table 1 Technology knowledge (TK) of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
I know how to solve my own technical problems	4.03	0.751	Agree	Proficient
I can learn technology easily	4.05	0.946	Agree	Proficient
I keep up with important new technologies	4.36	0.485	Strongly Agree	Expert
I frequently play around the technology.	4.09	0.788	Agree	Proficient
I know about a lot of different technologies	3.89	0.716	Agree	Proficient
I have the technical skills I need to use technology.	3.99	0.610	Agree	Proficient
I have had sufficient opportunities to work with different technologies.	4.16	0.669	Agree	Proficient
I can use technology tools to process data and report results.	4.19	0.681	Agree	Proficient
I can use technology in the development of strategies for solving problems in the real world.	4.06	0.463	Agree	Proficient
I have ability to design webpages and to use authoring software	3.29	1.052	Undecided	Competent
I understand the legal, ethical, cultural, and societal issues related to technology.	4.22	0.523	Strongly Agree	Expert
Overall	4.03	0.276	Agree	Proficient

Table 2 Pedagogy Knowledge (PK) of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
I know how to assess student performance in a classroom	4.38	0.562	Strongly Agree	Expert
I can adapt my teaching based-upon what students currently understand or do not understand.	4.33	0.473	Strongly Agree	Expert
I can use a wide range of teaching approaches in a classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project-based learning etc.).	4.34	0.477	Strongly Agree	Expert
I am familiar with common student understandings and misconceptions	4.23	0.598	Strongly Agree	Expert
I know how to organize and maintain classroom management	4.38	0.488	Strongly Agree	Expert
I can assess student learning in multiple ways.	4.34	0.451	Strongly Agree	Expert
I can adapt my teaching style to different learners.	4.38	0.488	Strongly Agree	Expert
Overall	**4.34**	**0.053**	**Strongly Agree**	Expert

Table 3 Content Knowledge of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
I have sufficient knowledge about (the particular content)	4.24	0.536	Strongly Agree	Expert
I can use (the particular subject) as the way of thinking.	4.39	0.491	Strongly Agree	Expert
I have various ways and strategies of developing my understanding of (the particular content	4.25	0.438	Strongly Agree	Expert
I have sufficient knowledge about structure of knowledge (the particular content).	4.18	0.474	Agree	Proficient
I know concept, facts, theories and procedure within the (the particular content)	4.25	0.438	Strongly Agree	Expert
I believe in the validity and reliability of the (the particular content)	4.20	0.490	Agree	Proficient
Overall	**4.25**	**0.074**	**Strongly Agree**	Expert

Table 4 Technological Content Knowledge of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
I know about technologies that I can use for understanding (the particular content)	4.14	0.473	Agree	Proficient
I know how to use specific software and Web sites about (the particular content).	4.08	0.572	Agree	Proficient
I can find and evaluate the resources that I need for (the particular content)	4.29	0.535	Strongly Agree	Expert
I can use technology for presenting (the particular content).	4.18	0.500	Agree	Proficient
I can use technology tools and resources for managing and communicating information of (the particular content).	4.24	0.536	Strongly Agree	Expert
Overall	**4.19**	**0.082**	**Agree**	Proficient

Table 5 Pedagogical Content Knowledge of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
I know how to select effective teaching approaches to guide student thinking and learning in (the particular content).	4.16	0.373	Agree	Proficient
I know the purposes and objectives for (the particular content).	4.29	0.457	Strongly Agree	Expert
I am able to manage my students' learning about (the particular content).	4.24	0.582	Strongly Agree	Expert
I have the curricular knowledge (horizontal and vertical) of (the particular content)	4.11	0.660	Agree	Proficient
I know instructional strategies that are suitable for the topic (content).	4.25	0.438	Strongly Agree	Expert
I know prior knowledge of students about (the particular content).	4.18	0.549	Agree	Proficient
I know how and what to assess of (the particular content).	4.28	0.530	Strongly Agree	Expert
Overall	**4.22**	**0.067**	**Strongly Agree**	Expert

Table 6 Technological Pedagogical Knowledge of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
I can choose technologies that enhance the teaching approaches for a lesson.	4.33	0.473	Strongly Agree	Expert
I can choose technologies that enhance students' learning for a lesson.	4.14	0.445	Agree	Proficient
I am thinking critically about how to use technology in my classroom.	4.25	0.518	Strongly Agree	Expert
I can adapt the use of the technologies that I am learning about to different teaching activities.	4.25	0.518	Strongly Agree	Expert
My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom.	4.16	0.541	Agree	Proficient
I can use technology resources to facilitate higher order thinking skills, including problem solving, critical thinking, decision-making, knowledge and creative thinking.	4.20	0.490	Agree	Proficient
I can use technology tools and information resources to increase productivity.	4.38	0.562	Strongly Agree	Expert
I can infuse technology to strategies of teaching.	4.29	0.457	Strongly Agree	Expert
I can use technology for more collaboration and communication among students and with teacher too.	4.25	0.438	Strongly Agree	Expert
I know how to use technology to facilitate academic learning.	4.30	0.463	Strongly Agree	Expert
Overall	**4.26**	**0.074**	**Strongly Agree**	**Expert**

Table 7 Technological Pedagogical Content Knowledge of Filipino teachers in the U.S. Public school

Statement	Mean	Standard deviation (±sd)	Adjectival Rating	Interpretation
1. I can teach lessons that appropriately combine (the particular content), technologies and teaching approaches.	4.24	0.512	Strongly Agree	Expert
2. I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	4.24	0.430	Strongly Agree	Expert
3. I can use strategies that combine (the particular content), technologies and teaching approaches that I learned about in my coursework in my classroom.	4.24	0.430	Strongly Agree	Expert
4. I can provide leadership in helping others to coordinate the use of (the particular content), technologies and teaching approaches at my school and/or district.	4.11	0.800	Agree	Proficient
5. I can choose technologies that enhance the learning of (the particular content) for a lesson	4.25	0.438	Strongly Agree	Expert
6. I can evaluate and select new information resources and technological innovations based on their appropriateness to specific tasks in (the particular content). *	4.06	0.539	Agree	Proficient
7. I can use (the particular content)-specific tools (e.g., software, simulation, environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. *	3.91	0.835	Agree	Proficient
Overall	**4.15**	**0.130**	**Agree**	Proficient

4. Discussion

4.1. Degree of Filipino Teachers' TPCK Subscales

Based on the results of this paper, Filipino teachers teaching in the U.S. believe that they are most competent in the subscale Pedagogy Knowledge (PK) with an overall mean of 4.34. Which in Dreyfus' (2004) [2] stage of skill acquisition would be in the expert level. The teacher respondents believe that they are experts in assessing student performance in the classroom, organizing and maintaining classroom management, and adapting teaching styles to different learners.

Technological Pedagogical Knowledge (TPK) is a close second subscale where the teacher respondents feel they are most competent in, with a mean of 4.26. Teacher respondents consider themselves the most competent in the use of technology tools and information resources to increase productivity in the classroom under this subscale.

Another subscale where Filipino teachers in the U.S. feel most competent is the Content Knowledge (CK) with a mean of 4.25. Teacher respondents believe that they are experts in using (the particular subject) as the way of thinking.

Teacher respondents also feel that they are experts in Pedagogical Content Knowledge, with the mean of 4.22. The statement "I know the purposes and objectives for (the particular content)" has the highest mean among the other statements.

Filipino teachers in the U.S. believe that they are proficient in their Technological Content Knowledge (TCK), with this TPCK subscale garnering a mean of 4.19. Under this subscale, the teacher respondents believe that they are experts in finding and evaluating the resources needed for (the particular content).

Technological Pedagogical Content Knowledge is one of the least subscale Filipino teachers in the U.S. believe they are competent in, with a mean of 4.15, although this is still in the proficient range. Under this subscale, teacher respondents believe that they are experts in choosing technologies that enhance the learning of (the particular content) for a lesson.

However, respondents believe themselves to be least competent in using (the particular content)-specific tools (e.g., software, simulation, environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research.

Finally, the TPCK Filipino teachers in the U.S. believe themselves to be the least competent in Technology Knowledge (TK), with a mean score of 4.03. Respondents believe themselves to be simply competent in having the ability to design webpages and to use authoring software. This is understandable, however, as designing web pages and use of authoring softwares are in the more advanced spectrum of technology knowledge.

4.2. Filipino Teachers' Strongest TPCK Subscale

Filipino teachers teaching in the U.S. believe themselves to be experts in the use of Pedagogy Knowledge (PK). PK includes statements on the most basic skills teachers need in order to be competent in the classroom. This confirms Sapad & Caballes' (2022) findings where teachers had the highest perceived confidence in PK in general [5]. Mulholland (2014) defines PK as a term used for knowledge of how to teach that is applicable across a range of teaching areas [9]. In order to be accepted for a teaching job in a foreign country, teachers undergo a rigorous set of interviews and credential reviews. It follows that teachers teaching in the U.S. will have an expertise on how to teach.

4.3. Filipino Teachers' Weakest TPCK Subscale

The lowest TPCK subscale in this research is Technology Knowledge (TK) followed by Technological Pedagogical and Content Knowledge (TPCK). This result also concurs the findings of Sapad & Caballes (2022), where Science teachers' TK and TPCK were perceived to be lower than their PK [5]. With the ever-changing technologies in the classroom, it is understandable that teachers are not as competent in all the different technologies they are presented with.

4.4. Overall Perceived TPCK of Filipino Teachers Teaching in the US

The overall all perceived TPCK mean of Filipino teachers teaching in the US is 4.20, which is interpreted as Proficient. In Dreyfus' (2004) [2] Adult Skill Acquisition, being proficient in a skill is having the perspective of an experienced person, being analytic in making decisions, and being involved in understanding but is detached in deciding about the skill. In relation to the teachers surveyed in this study, this finding indicates that the teacher respondents perceive themselves to be experienced in the use of technology, pedagogical, and content knowledge in the classrooms. The teacher respondents are able to make decisions based on a logical analysis as well.

5. Conclusion

In conclusion, Filipino teachers teaching in the US perceive themselves to be experts in knowing how to teach and what to teach. The respondents feel confident in having effective classroom management styles as well as knowing about the content of the lessons being taught. However, when technology knowledge is factored in, the respondents still perceive themselves to be proficient but not experts. Because of this, the researchers would like to recommend that administrators and school leaders provide professional developments on technology use as well as advance information to help teachers effectively choose, use, manipulate, and create using technology. This is especially important if there are new gadgets being introduced or softwares being rolled out in the schools. This is because despite the research-based technology, its impact on students can only be measured by how teachers understand it and will be utilizing it in the classrooms. Integrating technology, pedagogy, and content knowledge is indeed a complicated but effective practice for teaching and learning. However, teachers need a lot of support from school leaders and administrators in order to do this. Hopefully, in the future, teachers will perceive themselves as experts in the use of technology as well as in integrating technology, pedagogy, and content knowledge in the classrooms.

Compliance with ethical standards

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Disclosure of conflict of interest

All authors of the manuscript have no conflict of interest to declare.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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