# Assessment of Pre-Service Teachers' TPACK Competence, Attitude and Abilities in Laguna State Polytechnic University, Philippines

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## ABSTRACT

The Technological Pedagogical Content Knowledge (TPACK) framework links technology to curriculum content and specific pedagogical approaches and explains how teachers' knowledge of these three knowledge bases can interact to produce effective discipline-based teaching with educational technologies. The purpose of this study was to measure pre-service teachers' self-assessment of whether their knowledge, skills, and attitudes had an impact on their level of competence in TPACK at Laguna State Polytechnic University. This research employed the descriptive method and utilized quantitative research. The level of technological pedagogical content knowledge reveals that pre-service teachers have a "Very High" level of teaching attitude and abilities. The p-value of 1.20386E-32 states that there is a significant relationship between TPACK competence and teaching attitude of the respondents. It implies that if teaching attitude increases, the TPACK competence of pre-service teachers also increases. The computed p-value of 1.13448E-35 showed that it rejects the null hypothesis that there is a significant relationship between pre-service teachers' TPACK competence and teaching abilities. It was found out that TPACK competence and teaching abilities have a positive correlation. When TPACK competence of pre-service teachers increases, teaching abilities also increase and vice versa.

**Keywords –** TPACK, competence, Pre-Service Teachers.

## INTRODUCTION

The Technological Pedagogical Content Knowledge (TPCK) Framework for successful technology integration has garnered a lot of attention in recent years Koehler and Mishra (2009); Mishra and Koehler (2006); Niess (2007); American Association of Colleges for Teacher Education (AACTE), 2008. The TPACK framework links technology to specific pedagogical approaches and curricular content, and it shows how instructors' comprehension of these three knowledge bases might interact with one another to provide effective discipline-based teaching with educational technologies. The TPACK framework serves as a "conceptual lens" through which one can see educational technology by emphasizing some features of the phenomenon, minimizing unimportant concerns, and focusing on key ones. According to this perspective, the framework serves as a classification scheme that sheds light on the characteristics of the objects (as well as the interactions among the concepts and actions) that are the subject of the analysis (Koehler, et al., 2012). The TPACK framework had a significant impact on educational technology research and practice. In order to comprehend the teachers' knowledge required for the efficient integration of technology, a theoretical framework called technological pedagogical content knowledge (TPACK) was created in the field of educational research (Mishra & Koehler, 2006). The TPACK framework expands on Shulman's idea of Pedagogical Content Knowledge" (PCK) to include technical knowledge as it is placed in "pedagogical and content knowledge." TPACK is a crucial component of today's educational system because it takes into account the rising need for the use of technology in the classroom while maintaining the emphasis on the subject matter and how it is taught. As a result, it prepares students for their futures as well as the future of education. To effectively integrate TPCK into their courses, teachers must be fully updated and educated about the curriculum and its components. Technology helps today's students work more efficiently, and they frequently perceive the content and methods of direct instruction to be extremely outdated. Students, therefore, become more involved in their learning when the technological component is added to the previously existing PCK paradigm.

Beyond the classroom, technology has taken on a bigger role in kids' lives, and it can even improve students' understanding of difficult subjects or foster peer collaboration. Teachers' views on technology should be considered in addition to the need to expand their knowledge and abilities. To properly define the abilities teachers need to incorporate technology into their lectures, integration also needs to be understood (Agyei & Voogt, 2015). For example, According to Agyei and Voogt (2015), TPACK is frequently utilized in research on mathematics education. The only purpose of using classroom-based technologies for learning in the modern classroom shouldn't be drill and practice. Instead, TPACK is utilized to assist teachers in forming a technology mindset geared toward utilizing cutting-edge communication and computation tools to aid students in understanding the fundamental ideas and how they relate to the outside world.

Moreover, Muir et al. (2016) showed how the TPACK framework can be beneficial for characterizing teaching practices that involve technology as well as for thinking about the mathematics knowledge needed for instruction. A key responsibility of teacher education programs has been to prepare pre-service teachers for efficient technology integration (Tendeur et al., 2012). Instead of offering pre-service teachers a continuous program-wide preparation for this effort, most teacher education programs opt to offer a standalone educational technology course for a variety of pragmatic reasons (Wang et al., 2018). Researchers have been debating the effectiveness of this strategy, concentrating primarily on measuring technological, pedagogical content knowledge (TPACK). However, TPACK development alone could not support the effectiveness of the stand-alone educational technology course or forecast whether pre-service teachers will be able and willing to integrate technology into their future curricula (Tondeur et. al., 2017).

Cost, access, and time are frequently significant barriers to implementing technology in the classroom, but another challenge is a lack of knowledge about how technology may be used most effectively to help students across a variety of subject areas. Pre-service teachers enter educational technology courses with varying levels of prior knowledge and experiences, as well as varying attitudes and self-efficacy beliefs toward technology use and integration in K–12 schools (Holland & Piper, 2016; Kavanoz et al., 2015). In addition, pre-service teachers enter these courses with varying levels of prior knowledge and experiences, as well as varying attitudes and self-efficacy beliefs, ( Koh &Chai, 2014). All these differences pose more challenges to the instructors of such pre-service teachers. Educators need to identify specific pedagogical strategies that target these challenges and thus maximize pre-service teachers' TPACK development and their intentions to integrate technology in their future classrooms.

The TPACK framework states that particular technological instruments (hardware, software, apps, related information literacy practices, etc.) are best employed to train and direct students toward a deeper, more thorough comprehension of the subject matter. The three types of knowledge – TK, PK, and CK – are thus combined and recombined in various ways within the TPACK framework. Technological pedagogical knowledge (TPK) describes relationships and interactions between technological tools and specific pedagogical practices, while pedagogical content knowledge (PCK) describes the same between pedagogical practices and interactions between technological tools and specific pedagogical practices, while pedagogical content knowledge (PCK) describes similarities between pedagogical practices and specific learning objectives, while (PCK) describes similarities between pedagogical practices and interactions between technological tools and specific pedagogical practices. Finally, (TCK) describes relationships and intersections between technologies and learning objectives. TPACK, which takes into account the connections between all three regions and recognizes that educators are functioning within this complex space, is then composed of these triangulated areas. Thus, thinking about how teachers might incorporate instructional technology into the classroom using the TPACK framework proves to be fruitful. The TPACK framework thus becomes a productive way to consider how teachers could integrate educational technology into the classroom. Additionally, TPACK can be used to assess instructor knowledge, which may have an impact on the professional development and training programs available to teachers of all levels of experience. Lastly, the TPACK framework is also helpful since it explains the kinds of knowledge that are most essential for successful technology integration in the classroom. Teachers only need to be aware that content-driven, pedagogically sound, and technologically cutting-edge information best shapes instructional practices in order to benefit from the TPACK framework. They do not even need to be conversant with the complete TPACK framework as such.

Pre-service teachers eager to make a difference in their students' lives. The decision to focus on these pre-service

teachers was driven by a desire to understand how well they can combine technology, teaching methods, and subject matter before they step into the classroom. This stage of their development is crucial because it's where they form the foundation of their skills and attitudes toward using technology in education. Research has shown that introducing them to TPACK principles early on can significantly enhance their teaching practices and prepare them to effectively use educational technologies in the future.

However, evaluating pre-service teachers during their training can be a bit tricky. There's a risk that their self-assessments might not fully align with their actual abilities in a real classroom setting. While these self-assessments give us a glimpse into their confidence and readiness, they might not capture the full picture of how well they can apply TPACK in practice. To get a more complete understanding, it would be beneficial to combine these self-assessments with practical exercises, such as planning lessons or participating in simulated teaching scenarios.

The study probably looked at pre-service teachers at various points in their training program, focusing on how they perceive their own abilities in integrating technology, pedagogy, and content. This could involve early-stage trainees who are just starting to learn about TPACK or more advanced trainees who have received specialized training to improve their skills in combining these areas. By examining both groups, researchers can gain a deeper understanding of how TPACK training impacts their development as future educators.

With these, the purpose of the study was to measure pre-service teachers' self-assessment of whether their knowledge, skills, and attitudes had an impact on their level of competence in Technological Pedagogical Content Knowledge (TPACK) at Laguna State Polytechnic University.

### Objectives of the Study

The general objective of the study was to determine the competence of pre-service teachers in Technological Pedagogical Content Knowledge (TPACK) according to their knowledge, skills, and attitude. Specifically, it sought to answer the following: (1) What is pre-service teachers' competence level on technological pedagogical content knowledge (TPACK)? (2) What is the level of teaching attitude of pre-service teachers? and (3) What is the level of teaching ability of pre-service teachers? (4) Is there a significant relationship between TPACK competence and pre-service teachers' teaching attitudes? (5) Is there a significant relationship between TPACK competence and pre-service teachers teaching ability?

## MATERIALS AND METHODS

### Research Design

This research employed the descriptive method. The researchers found it the most suited method for the present study. Punch (2008) as cited by Borreo (2014), in Rudiments of quantitative research design and analyses, the descriptive method describes or tells the "hows" and "whats" of a series of events in the present. It was set out to collect, organize and summarize information about the matter being studied and to provide a description.

According to Peamante (2018) as cited by Sampa, the researcher has the ability to simultaneously address confirmatory and exploratory questions, to generate richer and more thorough inferences, and to provide a higher potential for bringing about agreement between opposing viewpoints.

According to Palispis and Vicencio, who were referenced by Borreo (2014), this type of research is known as a "descriptive normative survey" or simply a "descriptive method" and, as the name implies, it goes on to explain specific phenomena. Since many studies explain specific actual phenomena like programs, projects, or any fact, this method is a widely utilized research methodology. This study approach aims to "tell what exists or what is about a particular social or educational phenomenon."

### Participants/Respondents

To examine and evaluate the Technological Pedagogical Content Knowledge (TPACK) Competence of Pre-service Teachers, 171 pre-service teachers from Laguna State Polytechnic University Siniloan Campus were

employed as respondents in this study.

The respondents were chosen using a basic random sampling procedure. It's a subset of a statistical population where each subset member has an equal chance of getting chosen. A basic random sample is intended to represent a group in an unbiased manner.

**Instrumentation**

The researchers adapted the instrument used in this study. The adapted instrument was developed and designed by Schmidt, et.al., (2012) from their study titled Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers. This was a research survey questionnaire that determined the Technological Pedagogical Content Knowledge (TPACK) Competence of Pre-service Teachers. The research survey instrument was divided into three (3) parts such as the profile of the respondents, the Technological Pedagogical Content Knowledge (TPACK) Competence of Pre-service Teachers, and the attitudes and ability of the pre-service teachers. The first part of the questionnaire was the profile of the respondents. The second part was the Technological Pedagogical Content Knowledge (TPACK) Competence of Pre-service Teachers, which consisted of forty-six (46) statements scored using a Likert scoring procedure ranging from (5) Strongly Agree, (4) Agree, (3) Neither Agree nor Disagree, (2) Disagree, and (1) Strongly Disagree. The third part was the attitudes of pre-service teachers and of pre-service teachers' abilities. The statements were scored on a Likert scoring procedure ranging from ((5) Strongly Agree, (4) Agree, (3) Neither Agree nor Disagree, (2) Disagree, and (1) Strongly Disagree. Before the study was conducted, the researchers piloted the instrument to determine its reliability and validity. The researchers used the coefficient alpha to determine the level of internal consistency for this instrument. The result of the reliability test is 0.981 which implies that the reliability is excellent.

**Data Collection Procedure**

The following steps were undertaken by the researchers to collect data:

The researcher sought permission to conduct this study from the college dean. After the permission from the college dean, the researchers consulted university authorities in the gathering of information pertinent to the researcher. Populations of pre-service teachers from Laguna State Polytechnic University Siniloan Campus were the respondents for the study. After that, the researcher was given permission to conduct the study, the researchers held a meeting with the pre-service teachers to explain what the study is all about. After that, the researcher personally distributes the questionnaires to all respondents. The respondents were given enough time to answer the questionnaire. Second, the researcher is advised by the college dean/program head if the questionnaires are all complete for retrieval. Lastly, all the data gathered from the respondents will be tallied, tabulated, and analyzed.

**Ethical Consideration**

Ethical approval was sought first from the Ethical Review Board to ensure that the research design was ethically acceptable. After receiving such approval, the researchers seek prior permission from the university authorities, from the college dean until to the program head of the target student-respondents, regarding the participation of their students in the study. To ensure compliance with the time- on task measures by the institution, the researchers oathed to undertake procedures to assure not to disrupt any classes.

Participants were briefed on what the study was all about. And since voluntary participation is a must, the participants were informed that they were free to opt in or out of the study at any point. After this explanation of the research process, informed consent was obtained. Potential student-participants were then provided with an Information Sheet to further explain the study. They were given enough time to read its content and decide whether to proceed or not as subjects of the study, even after they already had signed the informed consent.

In answering the questionnaire, the respondents had the option as well whether to reveal or not their names and identity. Confidentiality on their personal information was managed to preserve their privacy.

Lastly, the researchers provided the necessary acknowledgment of works for all research contributions using the

APA system.

**Data Analysis**

This research utilized quantitative research. The descriptive correlational method was used in order to determine the relationship between the TPACK competence of pre-service teachers and their attitudes and ability. A personal related variable which is the moderating variable of the study was considered such as age, gender, course or program.

According to Kermer (2021), descriptive correlational research is a design where the researcher is mainly interested to describe the relationship among the variables without pursuing to create a fundamental connection.

Frequency, percentage, and rank were used in analyzing the data for the respondents' profiles. Mean was used in analyzing the TPACK of pre-service teachers and their attitudes and ability, and providing the verbal interpretations per indicator. To determine the relationship between TPACK competence of pre-service teachers and their attitudes and ability, Spearman rho was used to analyze the data testing the significant relationship in terms of their TPACK competencies and teaching attitudes and ability.

## RESULTS AND DISCUSSION

The first question sought to identify the competence level of pre-service teachers on TPACK. In order to find out the answer, an adapted survey questionnaire which was adapted by the researchers to Schmidt, et.al., (2012) from their study titled "Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teacher" was applied to the respondents. The questionnaire was developed to determine the Technological Pedagogical Content Knowledge (TPACK) competence of pre-service teachers. Table 1 provides a detailed analysis of the competence level of pre-service teachers.

Table 1.1 reveals the competence level of the respondents when it comes to TK. Pre-service teachers marked "High" with a weighted mean of 4.03 in TK (Technology Knowledge). It means that the respondents had high level technology knowledge. Statements 1, 4, and 3, "I know how to solve my own technical problems," "I keep up with important new technologies," and "I can learn technologies easily" had the interpretation of "High" with weighted mean of 4.14, 4.11, and 4.10 respectively got the highest number.

In Lambert's research, and Gong, (2010), pre-service teachers had decreased computer anxiety and improved their technical proficiency when using technology. Giving pre-service teachers digital skills and knowledge is increasingly acknowledged as a crucial component of any teacher training program in order to enable future educators to meet the educational objectives of the 21st century (Batanae, T., & Ngwako, 2017).

**Table 1.1: Level of Technological Knowledge of Pre-service Teachers**

| **TK (Technological Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 1. I know how to solve my own technical problems. | 4.14 | High | 1 |
| 2. I know about a lot of different technologies. | 3.95 | High | 5 |
| 3. I can learn technologies easily. | 4.10 | High | 3 |
| 4. I keep up with important new technologies. | 4.11 | High | 2 |
| 5. I frequently play around the technology. | 3.93 | High | 6 |
| 6. I have the technical skills I need to use technology. | 3.96 | High | 4 |
| **GWA** | **4.03** | **High** | |

| **CK (Content Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| **Mathematics** | | | |
| 7. I have sufficient knowledge of mathematics. | 3.64 | High | 3 |
| 8. I have various ways and strategies of developing my understanding of mathematics. | 3.74 | High | 1 |
| 9. I can use a mathematical way of thinking. | 3.67 | High | 2 |
| **GWA** | **3.68** | **High** | |
| **Social Studies** | **MEAN** | **VI** | **RANK** |
| 10. I have sufficient knowledge about social studies. | 3.98 | High | 3 |
| 11. I have various ways and strategies of developing my understanding of social studies. | 4.05 | High | 1 |
| 12. I can use a historical way of thinking. | 4.03 | High | 2 |
| **GWA** | **4.02** | **High** | |
| **Science** | **MEAN** | **VI** | **RANK** |
| 13. I have sufficient knowledge about science. | 3.83 | High | 3 |
| 14. I have various ways and strategies of developing my understanding of science. | 3.89 | High | 1 |
| 15. I can use a scientific way of thinking. | 3.87 | High | 2 |
| **GWA** | **3.86** | **High** | |
| **Literacy** | **MEAN** | **VI** | **RANK** |
| 16. I have sufficient knowledge about literacy. | 4.01 | High | 3 |
| 17. I have various ways and strategies of developing my understanding of literacy. | 4.04 | High | 1 |
| 18. I can use a literary way of thinking. | 4.03 | High | 2 |
| **GWA** | **4.03** | **High** | |

Table 1.3 describes pre-service teachers' PK scores. Pre-service teachers' PK marked "Very High" with a weighted mean of 4.23. In addition, while pre-service teachers had a very high level of knowledge on how to assess student performance in a classroom, adapt teaching based on what students currently understand or do not understand, organize and maintain classroom management, adapt teaching style to different learners, and assess student learning in multiple ways, pre-service teachers only have high level of knowledge when it comes to the use of a wide range of teaching approaches in a classroom setting, and familiarize with common understanding and misconceptions.

Aksu, M., Guler-Nalbantoglu, F. (2021), pre-service science teachers thought they were competent in terms of PK. Participants had positive impressions of lesson planning, assessment, learners and learning, and classroom management.

**Table 1.3: Level of Pedagogical Knowledge of Pre-service Teachers**

| **PK (Pedagogical Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 19. I know how to assess student performance in a classroom. | 4.29 | Very High | 1 |

| | | | |
|---|---|---|---|
| 20. I know how to organize and maintain classroom management. | 4.23 | Very High | 3.5 |
| 21. I can adapt my teaching based on what students currently understand or do not understand. | 4.26 | Very High | 2 |
| 22. I can adapt my teaching style to different learners. | 4.23 | Very High | 3.5 |
| 23. I can assess student learning in multiple ways. | 4.21 | Very High | 5 |
| 24. I can use a wide range of teaching approaches in a classroom setting. | 4.18 | High | 7 |
| 25. I am familiar with common student understandings and misconceptions. | 4.19 | High | 6 |
| **GWA** | **4.23** | **Very High** | |

Table 1.4 shows the pre-service teachers' PCK of Pre-service teachers had a weighted mean of 4.03 with a verbal interpretation of "High." Among the learning areas, literacy ranked as first in selecting effective teaching approaches to guide student thinking and learning.

In addition, F. Guler-Nalbantoglu, M. Aksu, & J. (2021), prospective science teachers believed they had a good degree of understanding of scientific teaching practices, science learners, science misconceptions, science curriculum, and science assessment.

**Table 1.4: Level of Pedagogical Content Knowledge of Pre-service Teachers**

| **PCK (Pedagogical Content Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 26. I can select effective teaching approaches to guide student thinking and learning in mathematics. | 3.96 | High | 4 |
| 27. I can select effective teaching approaches to guide student thinking and learning in literacy. | 4.08 | High | 1 |
| 28. I can select effective teaching approaches to guide student thinking and learning in science. | 4.02 | High | 3 |
| 29. I can select effective teaching approaches to guide student thinking and learning in social studies. | 4.04 | High | 2 |
| **GWA** | **4.03** | **High** | |

Table 1.5 reveals the pre-service teachers' scores in TC. In TCK, pre-service teachers had 4.05 weighted mean with verbal interpretation of "High." Based on the findings, respondents had a high level of knowledge on how to use technology within specific areas such as literacy, social studies, science, and mathematics.

**Table 1.5: Level of Technological Content Knowledge of Pre-service Teachers**

| **TCK (Technological Content Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 30. I know about technologies that I can use for understanding and doing mathematics. | 3.94 | High | 4 |
| 31. I know about technologies that I can use for understanding and doing literacy. | 4.10 | High | 1.5 |

| | | | |
|---|---|---|---|
| 32. I know about technologies that I can use for understanding and doing science. | 4.06 | High | 3 |
| 33. I know about technologies that I can use for understanding and doing social studies. | 4.10 | High | 1.5 |
| **GWA** | **4.05** | **High** | |

Table 1.6 shows the pre-service teachers' TPK scores. For TPK, pre-service teachers marked "Very High" with a weighted mean of 4.21. Almost all the statements got "Very High" level which means that pre-service teachers have immense knowledge of how various techniques or technology can be used in teaching. Nevertheless, statements 38, 39, and 40, "I can use strategies that combine content, technologies, and teaching approaches that I learned about in my coursework in my classroom", " can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district", and I can choose technologies that enhance the content of a lesson." are in "High" level.

In the Lee, K.S., Smith, & Boss, S.,(2014) self-reported perceptions from pre-service teachers in , they have strong technology integration skills. According to the findings, TPK were evident in the lesson planning using the teaching models that they felt most comfortable using because they were students themselves.

However, despite feeling pressure to be able to teach with technology, pre-service teachers often feel secure in their ability to use it (Mulder, D. J., 2017). In addition, Batane, T., & Ngwako, A. claimed to have high levels of proficiency using technical resources. The majority of participants, according to 2017 statistics, did not give their classes using technology.

Teachers must be trained in order to successfully integrate technology into their classrooms as society becomes increasingly digital. Teachers are believed to need the technological pedagogical knowledge (TPK) specified in the TPACK framework in order to integrate technology effectively. (F. Baier, M. Kunter, & Co., 2020).

**Table 1.6: Level of Pedagogical Content Knowledge of Pre-service Teachers**

| **PCK (Pedagogical Content Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 34. I can choose technologies that enhance the teaching approaches for a lesson. | 4.25 | Very High | 2.5 |
| 35. I can choose technologies that enhance students' learning for a lesson. | 4.22 | Very High | 5 |
| 36. I can adapt the use of the technologies that I am learning about to different teaching activities. | 4.20 | Very High | 6.5 |
| 37. I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn. | 4.25 | Very High | 2.5 |
| 38. I can use strategies that combine content, technologies, and teaching approaches that I learned about in my coursework in my classroom. | 4.17 | High | 8 |
| 39. I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district. | 4.11 | High | 9 |
| 40. I can choose technologies that enhance the content of a lesson. | 4.19 | High | 7 |
| 41. My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom. | 4.26 | Very High | 1 |
| 42. I am thinking critically about how to use technology in my classroom. | 4.20 | Very High | 6.5 |
| **GWA** | **4.03** | **High** | |

Table 1.7 reveals pre-service teachers' TPACK scores. The mean TPACK scores of pre-service teachers in all course modes are in the "High" level. Social studies made it to the top followed by literacy, science and

mathematics.

**Table 1.7 Level of Technological, Pedagogical and Content Knowledge of Pre-service Teachers**

| **TPACK (Technology Pedagogy and Content Knowledge)** | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 43. I can teach lessons that appropriately combine mathematics, technologies, and teaching approaches. | 3.90 | High | 4 |
| 44. I can teach lessons that appropriately combine literacy, technologies, and teaching approaches. | 4.04 | High | 2 |
| 45. I can teach lessons that appropriately combine science, technologies and teaching approaches. | 3.93 | High | 3 |
| 46. I can teach lessons that appropriately combine social studies, technologies, and teaching approaches. | 4.06 | High | 1 |
| **GWA** | **3.98** | **High** | |

The second research question sought to evaluate the attitudes and abilities of the respondents perceived as pre-service teachers.

In order to find out the answer to the questions, the researchers used the questionnaire "Elements of a quality pre-service teacher mentor: A literature review" from Ellis, Neville John, Dennis Alonzo, and Hoa Thi Mai Nguyen. The questionnaire has an item of fifteen (15) attitude items and fifteen (15) ability items. The survey questionnaire was scored ranging from ((5) Strongly Agree, (4) Agree, (3) Neither Agree nor Disagree, (2) Disagree, and (1) Strongly Disagree.

Table 2 below presents the attitudes of pre-service teachers in teaching. Study reveals that pre-service teachers have a "Very High" level of teaching attitude.

**Table 2 Level of Teaching Attitudes of Pre-service Teachers**

| **Teaching Attitudes of Pre-service Teachers**<br>As a pre-service teacher, I….. | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 1. I have a unified vision. | 4.44 | Very High | 15 |
| 2. I have care and respect for students. | 4.70 | Very High | 2 |
| 3. I have a sense of ownership and responsibility. | 4.60 | Very High | 10.5 |
| 4. I am unbiased in all tasks related to the school | 4.60 | Very High | 10.5 |
| 5. I am committed to school values. | 4.65 | Very High | 3.5 |
| 6. I pay attention to any professional development activities. | 4.63 | Very High | 7.5 |
| 7. I treat others with respect. | 4.73 | Very High | 1 |
| 8. I am intrinsically motivated to take on the role of a pre-service teacher who will form a more positive relationship with others. | 4.61 | Very High | 9 |
| 9. I incorporate respectful, responsive, reciprocal, and reflective elements in teaching. | 4.64 | Very High | 5.5 |
| 10. I need to be empathetic to my students by understanding and appreciating | 4.58 | Very High | 12.5 |

| | | | |
|---|---|---|---|
| that learning to teach is a complex phenomenon. | | | |
| 11. I am a provider that I should share a clear vision of what good teaching entails. | 4.58 | Very High | 12.5 |
| 12. I willingly engage in developing relationships and demonstrate a positive attitude toward students. | 4.64 | Very High | 5.5 |
| 13. I always engage in honest and ethically informed action toward teaching. | 4.63 | Very High | 7.5 |
| 14. I am highly motivated, enthusiastic, and passionate. | 4.57 | Very High | 14 |
| 15. I recognize the importance of the affective domain in learning & development and be empathetic to my students' struggles by being caring, supportive and nurturing. | 4.65 | Very High | 3.5 |
| **GWA** | **4.62** | **Very High** | |

Table 3 below reveals the abilities of pre-service teachers in teaching. Study shows that pre-service teachers have a "Very High" level of teaching abilities.

**Table 3 Level of Teaching Ability of Pre-service Teachers**

| **Teaching Abilities of Pre-service Teachers**<br>As a pre-service teacher, I….. | **MEAN** | **VI** | **RANK** |
|---|---|---|---|
| 1. I have a logical structure and content for my area of specialization. | 4.33 | Very High | 14 |
| 2. I have good knowledge of their areas of teaching. | 4.36 | Very High | 12 |
| 3. I collectively brainstorm on resolutions to provide effective learning. | 4.42 | Very High | 11 |
| 4. I am always looking for specialized training and seminars for better teaching styles. | 4.32 | Very High | 15 |
| 5. I am confident in teaching multi-culture students. | 4.34 | Very High | 13 |
| 6. I try innovative methods for better learning. | 4.43 | Very High | 10 |
| 7. I see to it that students' progress is of utmost importance. | 4.49 | Very High | 6 |
| 8. I am willingly engaged in the mentoring relationship and demonstrate a positive attitude toward mentoring. | 4.52 | Very High | 3 |
| 9. I need to focus on developing a pedagogy of practicum learning and development. | 4.46 | Very High | 8.5 |
| 10. I should employ different mentoring styles to elicit different types of learning. | 4.46 | Very High | 8.5 |
| 11. I should undergo formalized learning as a teacher. | 4.47 | Very High | 7 |
| 12. I need to possess strong teaching skills & subject knowledge then be willing to share such knowledge and competency. | 4.51 | Very High | 4.5 |
| 13.I must have a clear understanding of my responsibilities. | 4.55 | Very High | 1 |
| 14. I need good questioning and listening skills to facilitate open and genuine dialogue. | 4.54 | Very High | 2 |
| 15. I can relate learning to my students suited and aligned with Professional Standards. | 4.51 | Very High | 4.5 |
| **GWA** | **4.45** | **Very High** | |

The fourth research question sought to investigate if there is any significant relationship between TPACK competence of pre-service teachers and their teaching attitude. To answer this question, a Pearson's r test was used. It reveals the relationship between TPACK competence and teaching attitudes of the respondents. As depicted on the table, the p-value is 1.20386E-32 which is lower than the 5% alpha level of significance, therefore, it states that there is significant relationship between TPACK competence and teaching attitude of the respondents. It implies that if teaching attitude increases, the TPACK competence of pre-service teachers also increases.

The study's findings are corroborated by research by Holland & Piper (2016) and Kavanoz et al. (2015), which found that pre-service teachers' views on technology and opinions about their own abilities to use it effectively were closely related to the growth of their TPACK.

**Table 4: Significant relationship between TPACK competence and their teaching attitude**

| **Variables** | | **r-value** | **p-value** | **VI** |
|---|---|---|---|---|
| TPACK Competence | Attitudes | 0.5102<br>Moderate Relationship | 1.20386E-32 | Significant |

The fifth research question sought to investigate if there is any significant relationship between the pre-service teachers' competence level to its teaching ability. To answer this question, Pearson's r was computed. Table 4 presents the significant relationship between TPACK competence and teaching abilities of the respondents.

The computed p-value of 1.13448E-35 showed that the researchers reject the null hypothesis that there is a significant relationship between pre-service teachers' TPACK competence and teaching abilities. The researchers found out that TPACK competence and teaching abilities have a positive correlation. When TPACK competence of pre-service teachers increases, teaching abilities also increase and vice versa.

It was anchored with the study of Koh &Chai, (2014) that the pre service teachers need to identify specific pedagogical strategies that target challenges and thus maximize pre-service teachers' TPACK development and their intentions to integrate technology in their future classrooms.

**Table 5: Significant relationship between TPACK competence and their teaching ability**

| **Variables** | | **r-value** | **p-value** | **VI** |
|---|---|---|---|---|
| TPACK Competence | Abilities | 0.5981<br>Moderate Relationship | 1.13448E-35 | Significant |

## CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

### Conclusion

Based on the results and the null hypothesis of the study, it was therefore concluded that the level of technological knowledge and content knowledge of the respondents is High while the pedagogical knowledge is Very High.

In terms of technological content knowledge and pedagogical content knowledge of the respondents, it was revealed that they had a High level of technological content knowledge and pedagogical content knowledge as pre-service teachers.

It was concluded also that the technological, pedagogical and content knowledge of pre-service teachers is very high.

In terms of attitudes and abilities, it was concluded that the pre-service teachers had a Very High level of teaching attitudes and abilities.

With regards to their technological, pedagogical and content knowledge and attitudes and abilities, there is a moderate relationship between the two variables. It means that, as the levels of technological, pedagogical and technological knowledge increases, their teaching attitudes and abilities also increase.

The findings suggested the need for curriculum enhancement in teacher education programs, particularly in strengthening technological and content knowledge. While pre-service teachers exhibited very high pedagogical knowledge, their technological and content knowledge remained at a high level. This indicated that additional training and coursework should be incorporated to ensure a more balanced development across all domains of teaching expertise. Emphasizing practical applications of technology in instruction will further equip pre-service teachers with the necessary skills to integrate digital tools effectively into their teaching practices.

**Limitations**

The main objective of this study was to determine the respondents' levels of technological, pedagogical and technological and their attitudes and abilities. The respondents of the study were the pre-service teachers from Laguna State Polytechnic University Siniloan Campus.

The study was limited to assessing the technological, pedagogical and technological and their attitudes and abilities of pre-service teachers in Laguna State Polytechnic University and the willingness of the respondents to participate in the research study.

**Recommendations**

Based on the conclusions presented, it is recommended that the pre-service teachers maintain a high level of technological, pedagogical and content knowledge . The teaching attitudes of the pre-service teachers should develop a positive teaching attitude, as well as their teaching abilities in order to apply what knowledge they have. It is also recommended to study other variables that measure teaching competence of pre-service teachers.

Moreover, continuous professional development is essential to sustain the strengths observed in pedagogical knowledge while addressing areas for improvement in technological and content knowledge. Teacher education institutions should offer workshops, seminars, and training programs that reinforce best teaching practices and introduce innovative strategies for integrating technology into the classroom. Alongside this, structured teaching experiences and mentorship programs will help pre-service teachers develop confidence and refine their instructional approaches.

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