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Research Article

Primary Mathematics School Teachers' Technological, Pedagogical and Content Knowledge and Learners' Achievement

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ABSTRACT

The goal of this study is to determine the level of primary mathematics school teacher's Technological Pedagogical and Content Knowledge (TPACK) and the achievement of learners of the selected districts of the Division of Butuan City, Agusan del Norte. The participating teachers were able to complete the survey on the following components namely, technology knowledge, content knowledge, pedagogical knowledge, pedagogical content knowledge, technological pedagogical knowledge, technology and pedagogy and content knowledge, and the mathematics achievement level of learners. This study employed descriptive – correlational design to describe the variables and the relationship among them. The results revealed that teachers have high knowledge on the seven components of TPACK and obtained highest average on the technological pedagogical knowledge directly proportional with the mathematics achievement level of the learners. Though teachers showcasing their mastery level of teaching, still they need the support of technology to address the immediate concerns in dealing with the new normal. Thus, teachers may be encouraged to attend conferences, seminar – workshops, and training related to technology specifically training on technology applications that promotes easy techniques in solving word problems in primary grade mathematics.

Keywords*: achievement level of learners, primary mathematics, TPACK*

Introduction

With the advancement of technology, the relevance of mathematics in everyday and professional life has grown. The quality of our individual and societal lives is directly influenced by our mathematics knowledge and skills. However, despite the significance of mathematics in every part of our lives, many people do not learn it well enough for a variety of reasons. The abstract and hierarchical structure of mathematics, techniques and strategies for learning mathematics, and learning challenges

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in mathematics are the main causes for this problem (Mutlu, 2019). Developmental Dyscalculia (DD)/Mathematics Learning Difficulty (MLD) is a brain-based disorder that impairs mathematics learning (Piazza et al., as cited by Mutlu, 2019). Although there are no factors such as intellectual impairment, emotional disorders, cultural deprivation, or lack of education, a pupil with MLD's mathematics performance is substantially worse than predicted for age, IQ, and education (Büttner & Hasselhorn, as cited by Mutlu, 2019). Mathematical difficulties are caused by a variety of cognitive and emotional variables. Arithmetic anxiety is one of the emotional elements that can cause a considerable proportion of children and adults to struggle with math learning and accomplishment (Dowker, Sarkar & Looi, 2016).

Teachers must be aware of the obstacles students face during the learning process in order to develop and administer mathematics sessions (Ciltas & Tatar, as cited by Wijaya, Retnawati, Setyaningrum, & Aoyama, 2019). In this regard, understanding students' learning challenges is frequently seen as a critical step in gaining access to students' reasoning (Brodie, as cited by Wijaya, Retnawati, Setyaningrum, & Aoyama, 2019). Analyzing students' challenges may be a helpful first step in enhancing student performance since it reveals important components of their learning processes that need to be improved. Tall and Razali (as cited by Wijaya, Retnawati, Setyaningrum, and Aoyama 2019) argue that less competent students cannot be easily treated by giving them with particular solutions to overcome their individual faults after assessing their challenges in learning mathematics. These pupils also require comprehensive mathematical techniques. Tall and Razali also point out that, based on their findings, building the confidence of less competent kids is a vital step in helping them achieve higher arithmetic results. The research of Wijaya, et al. (as cited by Wijaya, Retnawati, Setyaningrum, and Aoyama 2019) provides another example of instructional advice based on studying students' challenges. According to the findings of an error analysis done by Wijaya et al. (as cited by Wijaya, Retnawati, Setyaningrum, and Aoyama 2019), enhancing students' task understanding necessitates a focus not just on their language skills, but also on their ability to pick relevant information. Furthermore, another crucial competency that must be enhanced is the capacity to recognize the needed technique or notion.

Perhaps this is why the Federal Government of Nigeria (FGN, as cited by Ogunleye 2019) considers mathematics to be relevant to everyday life and to play a vital part in the nation's scientific and technical growth. Modern society's fundamental technology is mathematics. There would be no computers, airplanes, space program, weather forecasting, or scientific forecasts without mathematics (National Mathematics Advisory Panel, as cited by Ogunleye 2019). Without mathematics, there would be no surgery, and the use of some prescription pharmaceuticals may become unregulated or unsafe, as well as the financial system collapsing. Even if you don't realize it, mathematics is utilized all the time and for everything (Mahadevan, as cited by Ogunleye, 2019). It is a valuable instrument in almost every field of human endeavor, including science, engineering, industry, technology, and even the arts (Oyedeji, as cited by Ogunleye 2019). Any nation that wishes to progress must emphasize the teaching and learning of Mathematics for computing and calculating as a fundamental ingredient in industrial and technical advancement (Oluwaniyi, Ibiyemi & Usman, as cited by Ogunleye, 2019). According to Mahadevan (as cited by Ogunleye 2019), mathematics is an organized language and the language of science. He pointed out that, similar to how a poet utilizes organized language to describe an idea, mathematics is utilized to communicate abstract notions.

Identification and resolution of pupils' issues throughout the learning process are not only requirements of contemporary education, but also duties of teachers (Ciltas & Tatar, as cited by Wijaya, Retnawati, Setyaningrum, & Aoyama 2019). This is in line with one of the National Council of Teachers of Mathematics's (as cited by Wijaya, Retnawati, Setyaningrum, and Aoyama 2019) principles for classroom mathematics, which states that successful mathematics instruction necessitates teachers' understanding of what pupils know and need to learn. Teachers may use this knowledge to help their pupils learn mathematics effectively. As a result, teachers must be aware of their students' problems in learning mathematics in order to plan and implement successful learning activities (Yetkin, as cited by Wijaya, Retnawati, Setyaningrum, & Aoyama, 2019). This requirement suggests that teachers must be able to recognize pupils' learning disabilities. Edelenbos and Kubanek-German (as cited by Wijaya, Retnawati, Setyaningrum, and Aoyama 2019) defined 'teacher's diagnostic competence' in the context of foreign language teaching as "the ability to interpret students' foreign language growth, to skillfully deal with assessment material, and to provide students with appropriate help in response to this diagnosis" (p. 260). Teachers' diagnostic competency might be characterized as their capacity to interpret students' thinking and reasoning processes, to monitor students' progress and challenges, and to deliver appropriate answers to the outcomes of the diagnosis in the context of mathematics instruction. Pupils have varied necessary conditions when it comes to diagnostic competence, thus teachers must be able to recognize each student (Tolsdorf & Markic, 2017) and explain and understand the specific child's talents and limitations.

Schools in the Philippines employ large-scale evaluations as benchmarks for pupils' mathematical proficiency. The education department established a nationwide standard test, presently known as the National Achievement Test (NAT), in 1992. It began as a national test for exclusively public (government) elementary schools in 1992. All sixth graders in public and private elementary schools were given the National Elementary Achievement Test (NEAT) in 1993. The goal was to raise the standard of primary education in the country (DECS Order no. 30, 1993). The National Achievement Test (NAT) was introduced in 2003 and was given to public school pupils in third and fourth grades (elementary) and first year high school. The NAT is now given to third graders in public primary schools, as well as fourth through sixth graders and second-year high school students in both public and private institutions, in 2010. Later, fourth-year high school students from both public and private institutions were enrolled in NAT (Lacia, 2019).

The Department of Education (DepEd) interacts with other departments and sectors to achieve this aim. 7 teachers participated in programs aimed at improving their pre-service education and in-service professional development (SEAMEO- INNOTECH, as cited by Lacia, 2019). Other government agencies, higher education institutions (HEIs), and non-governmental organizations (NGOs) have partnered with the Department of Education (DepEd) to execute education development projects. The Department of Science and Technology provided extensive in-service teacher training to science and mathematics teachers (DOST). While the Centre for Educational Measurement, Inc. (CEM) held National Workshops on International Trends in Mathematics Education and Assessment, the goal of which was to raise awareness of current trends in mathematics teaching as well as techniques to designing test questions (DepEd, as cited by Lacia, 2019). Dr. Yeap Ban Har, an Assistant Professor at the National Institute of Education in Singapore, led the session. Furthermore, The University of the Philippines - National Institute for Science and Mathematics Education Development (UP-NISMED) hosted an International Conference on Science and Mathematics to provide teachers, researchers, educators, and administrators with an opportunity to share innovative and effective assessment practices that could develop and deepen students' understanding of science and mathematics while also sharpening their scientific and mathematical thinking skills (DepEd, as cited by Lacia, 2019).

The National Council of Teachers of Mathematics (NCTM) of the United States and the Philippine Council of Mathematics Teacher Educators (MATHTEDs) Declaration on Mathematics Teaching and Learning for the K-12 Curriculum claimed that technology is an essential tool for learning mathematics in the twenty-first century, and that all schools must ensure that all of their students have access to technology (Roble, Ubalde & Castillano, 2020).

The conventional mathematics classroom is progressively adjusting to the requirements of global learners who are highly excited about working with technology. Prensky called these pupils "digital natives." Because digital natives have spent their whole lives surrounded by and utilizing digital technologies, they "think and absorb information fundamentally differently than their forefathers" (Prensky, as cited by Roble, Ubalde & Castillano, (2020). Teachers who were not born into the digital age, or "digital immigrants," as Prensky calls them, must rethink their methods and material. "Teachers must modify how and what they teach in ways that reflect their students' current and future realities," he continued. Changing the 'how' entails developing a pedagogy that is appropriate for today's pupils. Teachers may not have the power to change the curriculum, but they do have the power to teach the curriculum material in creative and meaningful ways that are valuable for elementary youth, according to research (Roble, Ubalde & Castillano, 2020). According to studies, using technology improved pupils' achievement, attitude, and lowered anxiety about mathematics (Roble, 2014). Even though technology has the potential to improve mathematics teaching and learning, some mathematics teachers are still hesitant, if not outright hostile, to use it in their classrooms (Roble, Ubalde & Castillano, 2020).

Measuring the learning challenges in mathematics has caught the researcher's interest because of the previously discussed theories for one important reason. The researcher thought it was his obligation as a mathematics teacher to assist in determining how to best help pupils thrive academically in mathematics. Thus, the purpose of this research is to see if technological pedagogical and subject expertise can help primary mathematics teachers and students achieve their goals.

Methods

Research Design

This study used descriptive-correlational research design in which the researcher used survey questionnaires and the participating teachers will complete the TPACK survey and the TPACK components namely, Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Technology Pedagogy and Content Knowledge (TPACK) and mathematics achievement of learners. The definition of survey research is "the collecting of information from a sample of persons via their replies to questions.". This type of research allows for a variety of methods to recruit participants, collect data, and utilize various methods of instrumentation (Check & Schutt, 2012, p. 160). In this case, the independent variable is the primary elementary school teachers, while the dependent variables are TPACK components namely, Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Technology Pedagogy and Content Knowledge (TPACK) and achievement of learners in mathematics.

Participants of the Study

The participants involved in this study were the eighty – seven primary teachers and eighty-six learners purposively selected from the different districts of the Division of Butuan City who were included for consultation through survey questionnaire on the teachers' knowledge of the technological pedagogical content knowledge (TPACK) and 86 learners' achievement in mathematics. The study employed purposive sampling wherein the researcher considers the situation of the current pandemic crisis, and it uses the judgment with the help of an expert in selecting cases or it selects cases with a specific purpose in mind and slovens formula to get the sample size of the pupils of their math test results.

Research Instrument

The researcher utilized one (1) set of instruments which is composed of two (2) different parts. The first part of the instrument includes the survey questionnaire to determine the teacher's level on Technological Pedagogical and Content Knowledge (TPACK), which is adapted from the instrument designed by Schmidt, Baran, Thompson, Mishra, Koehler & Shin (2009). And the second part is the achievement of learners. However, the researcher modified some of the contents of the instrument in order to get the necessary data. This will be validated first by the experts.

The instrument purposefully based on elementary school teachers' self-assessment of the TPACK framework's seven knowledge domains. These knowledge domains are as follows: Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).

Data Gathering Procedure

The researcher asked permission through an intent letter from the Schools Division Superintendent (SDS), the approval of the Public School District Supervisor (PSDS) and all school principals of the Southeast I, East I, East II and Southwest District. The researcher will give a link through a google forms to be answered by the teachers. A consent request will be submitted to participants for the following surveys for the first construct: Pre-service Teachers' Knowledge of Teaching and Technology and the TPACK for Meaningful Learning Survey (Casey, 2011). In addition, questions from achievement level of the learners in math will be added.

Data Analysis

To facilitate the presentation of data, and for analysis and appropriate interpretation, the following statistical tools were used.

Frequency count and percentage. These were used to determine the achievement in mathematics of the learners. This was used to answer problem no. two (2)

Mean. This was used to determine the extent and level of knowledge of the participants on Technological Pedagogical Content Knowledge (TPACK). The qualitative data that were gathered from the remarks and insights by the teacher participants, which was used to corroborate the results of the quantitative analysis. This was used to answer problem no. one (1).

Pearson Product Moment Correlation**.** This was used to determine the significant relationship between the level of Technological Pedagogical Content Knowledge and achievement in math. This was used to answer problem no. three (3).

Multiple Regression Analysis**.** This was used to determine the extent of the Technological Pedagogical Content Knowledge and its influence to the relationship of participants' achievement in of math. This was used to answer problem no. five (4).

Results and Discussion

Level of technological pedagogical content knowledge of participants

Table 1 presents the level of Technological Pedagogical Content Knowledge of participants in terms of Technological Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK). It reveals that Pedagogical Knowledge has the highest mean of 4.02 which means that participants had a high-level Pedagogical Knowledge but the technological knowledge with a mean of 3.35 is the lowest among the three (3) components mentioned in this table and still meant that the participants had obtained a high level of Technological Knowledge. Hence, the participants obtained a high level of knowledge of the three (3) components of TPACK.

It implies that teachers had mastery in terms of teaching and how to relate the topics to the learners in a meaningful way but are not efficient in using technology since it is hard to implement it in this new normal with no face-to-face encounter with pupils in a modular distance learning. In addition, their level of Pedagogical Knowledge (PK) increases if they are fully equipped with teaching techniques that could be applicable in a modular distance learning and various trainings on Early Language Literacy and Numeracy or (ELLN) to up skills teachers on the primary level on necessary competencies on their respective levels.

Rapanta, Botturi, Goodyear, Guàrdia, and Koole (2021) add that it enables teachers, researchers, and teacher educators to move beyond simplistic approaches that treat technology as a "add-on" and instead focus on the connections between technology, content, and pedagogy as they play out in more ecological classroom contexts.

As Schatzki (2021) points out, teachers have frequently undervalued the function of space and other tangible (and digital) components of social life in arranging instructional activities. Teachers of all grades and situations were advised to take charge of the learning situation by rethinking, reassessing, and rebuilding their pedagogical techniques in light of the educational world's lack of preparation to react to this crisis (UNESCO 2020).

Table 1. Level of TPACK of the participants in terms of Technology Knowledge (TK), Content Knowledge (CK), and Pedagogical Knowledge (PK)

Indicator	Mean	Interpretation
Technological Knowledge (TK)		
1. I know how to solve technical problems related to technology.	3.19	Moderate
2. I can learn technology easily.	3.48	Moderate
3. I can keep up with new technologies.	3.58	High
4. I frequently manipulate the technology.	3.49	Moderate
5. I know about a lot of different technologies.	3.03	Moderate
Overall Mean	**3.35**	**Moderate**
Content Knowledge (CK)		
6. I have sufficient knowledge about mathematics.	3.58	High
7. I can use a mathematical way of thinking.	3.60	High
8. I have various ways and strategies of developing my understanding of mathematics.	3.58	High
9. Understand mathematics knowledge structures and approaches.	3.67	High
10. Know the Grades 4-6 Curriculum competence indicators.	4.00	High
Overall Mean	**3.69**	**High**
Pedagogical Knowledge (PK)		
11. I can adapt my teaching based-upon what students currently understand or do not understand.	4.10	High
12. I can adapt my teaching style to different learners.	4.08	High
13. I can use a wide range of teaching approaches in a classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project-based learning etc.).	3.95	High
14. I am familiar with common student understandings and misconceptions.	3.84	High
15. I know how to organize and maintain classroom management.	4.13	High
Overall Mean	**4.02**	**High**

Legend: Parameter: 4.50-5.00 (Very high), 3.50-4.49 (High), 2.50-3.49 (Moderate), 1.50-2.49 (Low), 1.00-1.49 (Very low)

Even while ERT cannot be compared to online education in terms of methods and procedures, it did pave the way for first digital teaching experiences due to a lack of administrative support and technological infrastructure. These early signs of digitalization can readily give way to creative and successful blended or'simply' technology-enhanced forms of teaching and learning, given the vast diversity of options within what can be generically referred to as 'teaching and learning with technologies.' However, as our expert interviews revealed, various factors must be considered, including flexibility, empowerment, professionalization, and strategic decision-making (Rapanta, Botturi, Goodyear, Guàrdia, & Koole, 2021).

Table 2 shows the four (4) components of TPACK, Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technology Pedagogy and Content Knowledge (TPACK). It revealed that Technological Pedagogical Knowledge has the highest mean of 4.03, which means that participants had a high level Technological Pedagogical Knowledge but the Pedagogical Content Knowledge and Technological Content Knowledge with a mean of 3.84 are the lowest among the four (4) components mentioned in this table and still meant that the participants had obtained a high level of Pedagogical Content and Technological Content Knowledge. Hence, the participants obtained a high level of knowledge of the four (4) components of TPACK.

It implies that teachers had more skills on teaching approaches combine with technology. Technology itself is not efficient if use without the guidance of a teacher. In addition, their TPK increases with application that could be used in the classroom.

The findings of Jamon, Boholano, Cabanes-Jamon, and Pardillo (2021) corroborated this finding, stating that the first strength of teachers in the new normal in Philippine public education is that they are digitally savvy 21st-century teachers, as evidenced by their responses, and that teachers had developed different strategies and approaches, and that as their experiences grow, they are able to adapt to different types of learners (Patalinghug & Arnado, 2021). Raulston and Alexiou-Ray (2018) define technical literacy as the ability to judge the accuracy of information obtained from the internet and the proper use of all sorts of technology.

Table 2. Level of TPACK of the participants in terms of Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technology Pedagogy and Content Knowledge (TPACK)

Indicator	Mean	Interpretation
Pedagogical Content Knowledge (PCK)		
11. Use appropriate figures and tables to explain mathematical concepts.	3.86	High
12. Use special mathematics knowledge to identify students' mistakes in solving math problems.	3.71	High
13. 13. Identify the rationale when students try new ways to solve mathematics problems.	3.84	High
14. Explain the rationale behind the mathematics problem- solving process for students.	3.80	High
15. Use appropriate examples to explain mathematical concepts.	4.01	High
Overall Mean	**3.84**	**High**
Technological Content Knowledge (TCK)		
16. Know the problems that students might encounter when they use technology in learning.	3.94	High
17. Use appropriate technological tools to teach mathematics, and allow students to apply mathematics knowledge in their daily life.	3.87	High
18. Guide students to use ICT to engage in collaborative learning	3.74	High
19. Guide students to use ICT to evaluate their understanding and obstacles.	3.72	High
20. Reflect on how ICT might impact my teaching.	3.94	High
Overall Mean	**3.84**	**High**

Technological Pedagogical Knowledge (TPK)			
21.	I can choose technologies that enhance the teaching approaches for a lesson.	3.97	High
22.	I can choose technologies that enhance students' learning for a lesson.	3.99	High
23.	My teacher education program has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom.	4.12	High
24.	I am thinking critically about how to use technology in my classroom.	4.10	High
25.	I can adapt the use of the technologies that I am learning about to different teaching activities.	3.99	High
	Overall Mean	**4.03**	**High**
Technology Pedagogy and Content Knowledge (TPACK)			
26.	I can teach lessons that appropriately combine mathematics, technologies and teaching approaches.	3.80	High
27.	I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	3.98	High
28.	I can provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at my school and/or district.	3.69	High
29.	I can choose technologies that enhance the content for a lesson.	3.98	High
30.	Evaluate student learning outcomes based on mathematics content, instructional methods, and technology.	4.01	High
	Overall Mean	**3.89**	**High**

Legend: Parameter: 4.50-5.00 (Very high), 3.50-4.49 (High), 2.50-3.49 (Moderate), 1.50-2.49 (Low), 1.00-1.49 (Very low)

They went on to say that technology-literate teachers had been trained, modeled, and employed technology in their classrooms. According to the research, 21st-century public school teachers are digitally competent. The "new educated," according to Nawaz and Kundi (2010), are people who are computer or digitally literate. They went on to say that in order to thrive in the "digital developing society," both teachers and pupils must have ICT skills. Furthermore, teachers are required to be ICT and digitally educated nowadays. Teachers must undertake "skills demonstration" during their employment by the Department of Education, and the most prevalent skill presented by teacher candidates is computer literacy. The demand for ICT or technologically competent teachers stems from their lives being dominated by ICT and technology (Oliver, 2002 as cited in Nawaz &Kundi, 2010). When it comes to the efficient use of technology in education, teachers are crucial.

They are encouraged to keep improving their computer literacy and to use it to teaching and learning (Asan, as cited by Jamon, Boholano, Cabanes-Jamon, & Pardillo, 2021).

Achievement Level in Mathematics of the Learners

The frequency and percentage distribution of the learners' mathematics achievement levels are shown in Table 3. The table revealed that the learners' mathematical achievement levels differed, as demonstrated by their percentage. The highest percentage of pupils, 45.35 percent, has an outstanding mark of 90-100, and 0 percent of pupils have a good grade. Only 39 pupils were rated outstanding, 16 were rated very satisfactory, no pupils were rated satisfactory, 7 were rated fairly satisfactory, and 9 were rated did not meet expectations, according to the table.

It implies that pupils should focus more on primary mathematics since almost half of them only got the outstanding performance. Teachers also should give importance of the least mastered skills of mathematics and provide intervention to lessen the problems in mathematics.

This study is comparable to Suarez and Casinillo's (2020) study, which found that students in primary grades were exposed to a greater variety of learning activities but still performed below expectations, indicating that they should be given proper intervention and strategy to address these persistent issues.

As a result, it is the job of teachers to address such weaknesses; they should figure out how to recover pupils' least mastered skills so that they may be properly equipped for nation-building (Okobia, 2011). Furthermore, it must make use of teachers' creativity to catch learners' attention and interest so that, despite being among the least learned competencies, we can entice learners to a completely different style of remediation and learn best via it (Patalinghug, 2022).

There are various elements impacting their learning experiences that contribute to low academic achievement, according to Casinillo (2019) and Casinillo et al. (2020).

Table 3. Frequency and Percentage Distribution of the Achievement Level in Mathematics of the Learners

Grading Scale	Frequency	Percentage	Description
90 – 100	39	45.35	Outstanding
85 – 89	16	18.60	Very Satisfactory
80 – 84	0	0.00	Satisfactory
75 – 79	7	8.14	Fairly Satisfactory
Below 75	9	10.47	Did Not Meet Expectations
	15	17.44	
Total	**86**	**100.00**	

According to Govindaraju and Venkatesan (as cited by Suarez and Casinillo, 2020), inadequate teaching strategies, learning challenges, and poor performance lead to school dropouts. As a result, deliberate intervention is required to pique students' attention and advance their level of success.

Conclusion and Recommendations

Among the seven (7) components of TPACK that elementary school teachers possess are Technological Knowledge, Content Knowledge, Pedagogical Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge, and Technology Pedagogy and Content Knowledge, with Technological Pedagogical Knowledge being the highest and Technological Knowledge being the lowest. As a result, the participants had a thorough understanding of the seven (7) components of TPACK. The degree of mathematical performance of the learners influences their excellent performance.

Teachers teaching primary mathematics may be asked to attend webinars on TPACK or related seminars/webinars to improve their knowledge in dealing with the technological knowledge in mathematics specifically word problems and their concerns about achievement levels of learners. Teachers teaching primary mathematics may encourage developing intervention program to aid the problems in mathematics. Teachers may also conduct action research on mathematics teaching to equip themselves with the skills and competencies needed to improve the achievement levels of mathematics. If given an opportunity, it would be a good practice for teachers to pursue advance degrees like master's degree or even higher degrees. They may also undergo training in their field of specialization to improve their level of technological knowledge.

The proposed action plan developed based on the study's findings is strongly recommended for use by Deped Butuan City Division.

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