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Teachers' Arithmetic Pedagogical Content Knowledge (PCK) and Students' Achievement in Word Problem-Solving

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Abstract

Teachers' understanding of arithmetic Pedagogical Content Knowledge (PCK) is key for effective math instruction. It has a significant impact on students' learning outcome, especially in problem-solving. Research suggests that the success of students in tackling word problem is greatly influenced by effective teaching methods. Hence, using quantitative descriptive design, this study collected and measured data on teachers' arithmetic PCK and students' achievement in word problem-solving of Southern Cebu Districts. Fifty teachers and fifty students answered the survey and test questionnaires. Results indicated that most of the teachers were female (92%), aged 44-50 (26%), as well as the aged 51-above (26%), and designated in Teacher III position (46%). Teachers exhibited high confidence in their arithmetic pedagogical content knowledge, particularly in using varied teaching strategies, appropriate examples, and assessment practices. However, they faced challenges in real-time lesson adjustment, in-depth mathematical understanding, promoting higher-order thinking, and integrating digital tools due to structural, training, and resource constraints. It shows the students' performance, revealing that majority of them (50%) performed at the poor level (60-65) score range, representing the highest frequency (25) among all categories. This was followed by the students who achieved satisfactory performance (22%), fairly satisfactory (16%), and very satisfactory (12%). Notably, no attained the outstanding level (91-100). On the other hand, the teachers' high Arithmetic Pedagogical Knowledge (PCK), students' word problem-solving performance remained low, indicating a gap between instructional competence and learner achievement. This study recommends enhanced teacher training, integration of technology-supported instruction, and learner-centered interventions to improve students' word problem-solving skills.

Keywords: *Teachers' arithmetic pedagogical content knowledge, students' achievement in word problem-solving, descriptive design.*

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Introduction

Pedagogical Content Knowledge concerns the extent to which a teacher can anticipate that learners will misconceive the content and select suitable representations or explanations and methods of teaching designed to meet particular requirements of the content. It really comes down to understanding what to teach and how to do it in a way that makes sense to students (Main, 2023). Arithmetic is the basic branch of mathematics that involves numbers and their operations, addition, subtraction, multiplication and division, and understanding of the operations effect on quantities (Siegler et al., 2015). Students' achievement of word problem-solving is the capacity of the learners to properly interpret, represent, and solve mathematical word problems using the appropriate strategies and reasoning skills. This achievement is frequently measured by assessments that assess the accuracy of problem-solving, understanding, and application of mathematical concepts by students (Doe, 2015).

Educational experts highlighted the significance of Pedagogical Content Knowledge (PCK) of teachers in supporting student achievement and how "effective teaching in mathematics is deeply rooted in teachers understanding how the student learns" (Miller, 2021). Recent studies have shown that students taught by teachers with high levels of Pedagogical Content Knowledge (PCK) demonstrate significantly better performance in solving word problems compared to those taught by teachers with lower Pedagogical Content Knowledge (PCK) (Baker et al., 2021). Furthermore, it has been revealed by a report published by the National Council of Teachers of Mathematics (NCTM) that there is a direct need for professional development programs that can focus on how to improve the Pedagogical Content Knowledge (PCK) of the teacher to achieve better student learning outcomes in mathematics. This study highlighted that the effectiveness of PCK in the teaching of word problems includes having a deep understanding of problem difficulty, being flexible in strategy, using appropriate drawings, and practicing formative assessment. The Department of Education (DepEd) also points out the importance of good comprehension skills in attaining academic success in its K to 12 guidelines document (DepEd, 2016), where it is postulated that good comprehension will result in better performance in mathematics.

Over the last decade, the Philippines has performed poorly, consistently, in Mathematics as revealed in the results of the PISA (2015 - 2024), an international student assessment program (OECD, 2024). However, despite the effort to improve the educational outcomes, only 16% of Filipino students demonstrated at least level 2 proficiency in mathematics, which is far from the Organization for Economic Cooperation and Development (OECD) average of 69%, especially in areas such as word problem-solving and arithmetic (OECD, 2024). Specifically, inadequate Pedagogical Content Knowledge (PCK) among teachers leads to ineffective instructional practices, which in turn hampers the ability of students to understand and solve word problems (Gonzalez et al., 2020). The Trends in International Mathematics and Science Study (TIMSS) shows that the Philippines ranked dead last among 58 participating countries in 2019; students have an average score of 297 in mathematics, which fell below the international average of 500 (TIMSS, 2019). To remediate

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this deficit, it is important that professional development programs for teachers are aimed at enhancing their Pedagogical Content Knowledge for mathematics (PCK), particularly in regards to problem-solving techniques (Goos, 2017).

The purpose of the study is to identify the arithmetic Pedagogical Content Knowledge (PCK) of the teachers and the achievement of the students in word problem solving. This study aims specifically at addressing the problem of how inadequate the Pedagogical Content Knowledge (PCK) among teachers leads to ineffective instructional practices, which in turn hamper the ability of students to understand and solve word-problems (Gonzales et al., 2020). To identify the specific aspects of Pedagogical Content Knowledge (PCK) that impact student performance, this study aims to contribute evidence-based findings to mathematics education that can be utilized in teacher training and professional development efforts. Ultimately the findings will aid educators in improving their teaching strategies to improve student performance in mathematics and strengthen their skills in understanding mathematical word-problem (Baker et al., 2021).

Methodology

Design

The research design used was descriptive. This design is appropriate for the study because it aims to systematically describe the current status of both teachers' arithmetic Pedagogical Content Knowledge (PCK) and students' success in solving word problems. It was utilized to collect data on teachers' arithmetic Pedagogical Content Knowledge (PCK) and students' word-problem solving to describe trends, distributions, or levels as they naturally occur in classroom settings (Creswell & Creswell, 2018). This study aims to describe what exists but does not test whether one variable influences another (Creswell & Creswell, 2018). It focuses on presenting and summarizing existing conditions rather than statistical associations between variables. The adapted survey questionnaires on teachers' level of arithmetic Pedagogical Content Knowledge (Delfin, 2020; Patalinghug & Arnado, 2022) and on students' performance in word problem-solving (DepEd, 2021) developed Grade 6 Math modules, were used.

Flow of the Study

This study followed the IPO (Input, Process, and Output) method. The inputs of the study included teachers in terms of their age, sex and designation. Furthermore, it also included teachers' arithmetic PCK in terms of teaching strategies, subject matter knowledge, assessment methods and resources. This study was grounded with a descriptive design. Thus, this study aiming to contribute to the field of mathematics education by providing evidence-based insights that can guide teacher training and professional development.

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Environment

The study was conducted at the selected elementary schools in the District of Alegria, Malabuyoc, Ginatilan, and Samboan in the Province of Cebu, Philippines. These schools are located in the southwestern part of Cebu, consisting mostly rural and semi-urban communities; hence, the schools varied in resources and teaching methodologies. Many of these schools are not equipped with a variety of teaching resources which may have made it difficult for teachers to employ effective teaching strategies for teaching arithmetic problem solving. Although Pedagogical Content Knowledge (PCK) includes comprehensive knowledge of the material to be taught and the most effective ways to teach the material in question, lack of adequate teaching resources and professional development opportunities within the corresponding districts might have or could have impacted the ability of the teachers to teach mathematical concepts effectively. Even when teachers exhibit strong arithmetic Pedagogical Content Knowledge (PCK) the inadequacy of teaching materials and situational limitations can make the actual implementation of the latter knowledge in classroom non-practical. This context assists in understanding the reason why students would not achieve the expected results in solving word problems in direct proportion to teacher-reported levels of arithmetic PCK. Therefore, instructional and environmental factors could have affected student performance and understanding. The results highlight the importance of specifically training teachers and providing them with better access to instructional materials to enhance the delivery of effective problem-solving instruction in these learning settings.

Research Participants

The study targeted 50 Grade 6 teachers and students chosen from the schools in Alegria, Malabuyoc, Ginatilan and Samboan in the southern part of
Cebu Province. This paper aimed to determine the arithmetic Pedagogical Content Knowledge (PCK) of the teachers and the manner in which the students can solve word problems. The number of elementary teachers and students was set at 50 each. Appendix A contains the inclusion criteria for participants as follows: the teachers should be currently teaching students in Grade 6; they should have a formal teaching certificate, such as the Licensed Professional Teacher (LPT); and they should have a strong grasp or the exposure to Pedagogical Content Knowledge (PCK) pertinent to teaching arithmetic by attending professional development programs, workshops, and/or courses that concentrate on teaching mathematics. Additionally, only those teachers who were actively teaching arithmetic and involved in word problem-solving activities as part of their daily curriculum were included.

The following requirements for students were included in the study: they must be enrolled in grade 6 during the academic year of the study; they had to participate in the study, either directly or with parental consent; and they must have an attendance record showing participation in at least 75% of math classes during the study period. The sampling technique

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that was employed in this study is simple random sampling. Simple random sampling provides all members of the population with equal opportunities to get chosen (Creswell & Creswell, 2018). This technique makes the sample objective and reflective of the population at large which is essential in the context of making valid generalizations. Simple random sampling was also used in this research to sample out teachers and students respectively, assess teachers' Pedagogical Content Knowledge (PCK) in arithmetic and students' performance. This approach helps in eliminating the selection bias and the objectivity of the data collection process is increased (Fraenkel et al., 2019).

Research Instrument

The researchers applied two tools to collect the data: a survey questionnaire for teachers and a word-problem solving test questionnaire for students. The survey questionnaire was a structured data gathering instrument comprising closed-ended or scale questions to harbor quantifiable and numerical data from a huge sample (Creswell & Creswell, 2018). The word-problem solving test questionnaire was a structured evaluation instrument that proved to measure the qualities of learners in deciphering, analyzing, and handling mathematical issues that were introduced to them either in verbal or written form (DepEd, 2016).

A survey questionnaire of teachers involved in the study had two parts. Part I required the profile of the participants concerning age, sex, and the designation of the teacher. Part II is an adapted questionnaire for the teacher's level of arithmetic Pedagogical Content Knowledge (Delfin, 2020; Patalinghug & Arnado, 2022). The questionnaire consisted of four sections. The first section discussed the teaching strategies, the second section discussed the subject matter knowledge, the third section discussed the assessment methods, and the fourth section discussed the resources of the teachers. It consisted of 40 statements, which the participants were asked to rate using 5-point Likert scale: strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). Teachers took approximately 20 minutes to answer the survey questionnaire.

The students' test questionnaire also consisted of two parts. Part I asked for the profile of students in terms of age, and sex. Part II was an adapted word problem-solving test questionnaire for students, developed from Grade 6 Math modules (DepEd, 2021). The test questionnaire comprised of shuffled word problems that has addition, subtraction, multiplication and division. It contained of 20 questions, which participants were asked to answer within 2 hours.

Data Collection Procedure

Preliminary Procedures

The following preliminary preparations were followed to ensure the accuracy of data gathering. First, the researcher presented the survey questionnaires and the word-problem

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solving test questionnaires to the panel of examiners in Cebu Technological University-Malabuyoc Extension Campus for critique. Second, the researchers prepared a transmittal letter to be signed by the research chairman of CTU-Malabuyoc. The researchers also personally submitted the letter to the offices of the Principals of the selected elementary schools in Alegria, Malabuyoc, Ginatilan, and Samboan for approval to administer the survey questionnaires and test questionnaires to the participants of the study. The researchers then distributed the survey questionnaires to the teachers and word-problem solving test questionnaires to the students using stratified random sampling.

Data Gathering

Data on the teachers' arithmetic Pedagogical Content Knowledge were collected through printed survey questionnaires, and students' achievement in word-problem solving was collected through a test questionnaire. The researchers secured ethics clearance from each chosen elementary schools in Alegria, Malabuyoc, Ginatilan, and Samboan located in the southern part of Cebu Province. This was done to safeguard the participants and the data from any threats. Transmittal letters were sent to the concerned authorities to request approval for the distribution of the survey and test questionnaires. A participant information sheet and a participant consent form were given to the participants to inform them of the nature of the study and other relevant information. The study observed confidentiality in collecting, transporting, storing, processing, interpreting, reporting, publishing, and destroying data. Dialogue was conducted with the campus administrators and research directors for the smooth retrieval of the questionnaires. Data gathering will be performed on the third week of September 2025. Teachers will have 20 minutes to finish the survey questionnaire and the students will take 2 hours to complete the test questionnaire. After the participants have complete the questionnaires, the data will be tabulated, analyzed, and interpreted using acceptable statistical methods to meet the study's objectives.

Ethical Consideration

The researchers ensured high levels of confidentiality and adherence to ethical standards throughout the process as a way of ensuring the security of the personal information and record of the participants. Participants will be informed that their participation is entirely optional, and that any data collected will be used purely for academic reasons. The researchers will inform the participants about the study's goals, the data being gathered, and its academic applications. Furthermore, physical papers will be routinely disposed of after processing to prevent sensitive information leaks.

Treatment of Data

The following statistical treatments were used in this study.

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Weighted Mean. This was utilized to measure the teachers' arithmetic Pedagogical Content Knowledge.

Ratio Scale. This was used to measure the students' achievement in word problem-solving. The score of each student represented the number of correctly solved problems. The test scores had equal intervals and a true zero-point, where a score of zero signified no correct responses.

Scoring Procedure

The scoring procedure used in interpreting the arithmetic pedagogical knowledge of the teachers is indicated below.

A. Teachers' Arithmetic Pedagogical Content Knowledge

5	Strongly Agree	4.20 – 5.00	Indicates a very high level. Teachers shows a deep arithmetic understanding, effective strategies, and strong awareness of learner needs.
4	Agree	3.40 – 4.19	Indicates a high level of knowledge. Teachers demonstrate solid arithmetic pedagogy and effective strategies, with only minor areas for improvement.
3	Neutral	2.60 – 3.39	Indicates a moderate level. Teachers have a reasonable but inconsistent grasp of arithmetic pedagogy, highlighting the need for targeted training.
2	Disagree	1.80 – 2.59	Indicates a low level of PCK. Teachers show gaps in arithmetic content or pedagogy that may hinder effective instruction.
1	Strongly Disagree	1.00 – 1.79	Indicates a very low level of PCK. Teachers struggle with both arithmetic and pedagogy and require substantial support and training.

B. Students' Achievement in Word Problem-Solving Test Ratio

Raw Score (out of 120)	Transmuted Score (out of 100)	Score Range (%)	Categorical Response	Verbal Description
114-120	95-100	91-100%	Outstanding	Learner demonstrates very high to exceptional understanding and mastery of the competencies.

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102-113	85-94	81-90%	Very Satisfactory	Learner demonstrates high level of understanding of the competencies.
90-101	75-84	71-80%	Satisfactory	Learner demonstrates adequate to basic understanding of the competencies.
84-89	70-74	66-70%	Fairly Satisfactory	Learner demonstrates limited understanding of the competencies.
72-83	60-69	60-65%	Poor	Learner has not demonstrated the minimum level of understanding of the competencies.

Results and Discussion

This section contains the data of the study. The acquired data were assessed and examined in this chapter. There are a total of 11 tables in this chapter, as follows: Table 1 presents the teachers' demographic profile; Table 2 displays the teachers' arithmetic PCK in terms teaching strategies; Table 3 displays the teachers' arithmetic PCK in terms of subject-matter knowledge; Table 4 presents the teachers' assessment methods; Table 5 presents the teachers' arithmetic PCK in terms of resources. In the Table 6 displays the demographic profile of the students; and Table 7 displays the students' achievement in word problem-solving.

Profile of the Teacher Participants

In this study, the demographic profile of the teachers was described in terms of age, sex, and teacher's designation.

Table 1 reflects the demographic profile of the teachers.

The two largest age groups were the 44-50 and 51 and above. In these two brackets, the highest frequency was 13, representing 26% of the total population. The majority of the teachers are female, composing 92% of the population, with a frequency of 46. Nearly half of the teachers are Teacher III, making up 46% of the population with a frequency of 23, implying that most of the teachers are experienced enough to be very competent in their respective roles. On the other hand, only a small group of 5 teachers (or 10%) are in the youngest age bracket (23-29).

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Table 1
Profile of the Teachers
(N= 50)

	Frequency	Percentage
Age		
23 - 29	5	10%
30 - 36	10	20%
37 - 43	9	18%
44 – 50	13	26%
51 - Above	13	26%
Total	**50**	**100%**
Sex		
Female	46	92%
Male	4	8%
Total	**50**	**100%**
Teacher's Designation		
Teacher I	10	20%
Teacher II	10	20%
Teacher III	23	46%
Master Teacher I	2	4%
Master Teacher II	5	10%
Total	**50**	**100%**

The age bracket of 44-50, along with the age group of 51 and above generally fall into the categories of middle age and older age brackets. A significant share of public school teachers in the Philippines are in the older age groups (such as 44–50 and 51+), largely because many were hired during earlier periods of extensive recruitment, and these sizeable cohorts have now aged into their late 40s and 50s (EDCOM 2, 2025). Second, older teachers are more likely to remain in the profession because retention is high; slow promotion processes keep many educators in entry-level positions for much of their careers, and the stability, security, and retirement benefits of the job further encourage them to stay. Third, aside from classroom instruction, teachers also handle numerous administrative and support duties, and these responsibilities often fall more heavily on senior staff, making long-term teachers more anchored in their roles (EDCOM 2, 2025). Fourth, reasons for continuing in the profession differ by age. Many senior teachers stay for stability and a sense of calling, whereas younger teachers are more likely to leave due to heavy workloads or the desire to pursue other opportunities (Philippines lagging in teacher career progression, 2024).

On the other hand, only a small group of five teachers (or 10%) are in the youngest age bracket (23-29) due to several interconnected factors. One major reason is the significant

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decline in enrollment in teacher-preparation programs, thereby contributing to fewer early-career teachers entering the teaching force; nationwide, enrollment in traditional teacher preparation programs fell by more than a third from 2010 to 2018 (Center for American Progress, 2019; Forbes, 2020). Additionally, teaching salaries are relatively low compared with other professions that require similar educational background, especially for those individuals with strong quantitative skills, making teaching a less attractive option for many STEM graduates (Economic Policy Institute, 2019; Center for American Progress, 2019).

Teachers' Arithmetic PCK in Terms of Teaching Strategies

In Table 2 below, the teachers' arithmetic PCK is presented in terms of teaching strategies.

Table 2
Teachers' Arithmetic PCK in Terms of Teaching Strategies
(N= 50)

Indicators	Mean	Interpretation
1.I can use a wide range of teaching approaches in a classroom setting (collaborative learning, direct instruction, inquiry learning, problem/project based learning etc.)	4.48	Strongly Agree
2.I can adapt my teaching based-upon what students currently understand or do not understand.	4.34	Strongly Agree
3.I know how to organize and maintain classroom management.	4.52	Strongly Agree
4.I can adapt my teaching styles to different learners.	4.4	Strongly Agree
5.I can teach lessons that appropriately combine mathematics and teaching approaches.	4.5	Strongly Agree
6.I know how to adapt lessons to improve students' learning.	4.54	Strongly Agree
7.I have good understanding of instructional strategies that are suitable for the mathematics content.	4.48	Strongly Agree
8.I can use strategies and teaching approaches to support students' understanding and thinking as they are learning the mathematics content.	4.44	Strongly Agree
9.I can use a subject-specific way of thinking in my teaching subject.	4.4	Strongly Agree
10.I know how to develop appropriate tasks to promote students complex thinking of my teaching subject.	4.4	Strongly Agree
Composite Mean	**4.45**	**Strongly Agree**

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As shown in the table, statement no. 6 received the highest mean (4.54), which is interpreted as "*strongly agree"*. This indicates ***a very high level of knowledge***. Teachers shows a deep arithmetic understanding, effective strategies, and strong awareness of learner needs. They are able to adjust their lessons to meet the students' needs, keep the class organized, and create activities that help students think critically and understand mathematics better. Overall, this tells us that the teachers are skilled, dedicated, and ready to provide meaningful learning experiences for their students (Ventista, 2023). There is a clear indication among teachers that it is possible to employ different ways to attain positive outcomes among students and effective learning in the classroom (Gues et al., 2015).

Teachers' Arithmetic PCK in Terms of Subject Matter Knowledge

In Table 3 below, the teachers' subject-matter knowledge is presented.

As shown in the table, statement no. 15 received the highest mean (4.54), which interpreted as "*strongly agree"*. Teachers at the elementary level excelled in using suitable examples to clarify mathematical concepts, as this aligns well with their daily teaching practices and their pedagogical content knowledge (Grigaliuniene et al., 2025). Elementary teachers often utilize concrete, familiar, and real-life examples to help young students grasp abstract mathematical ideas (Opus et al., 2025). Pedagogical Content Knowledge emphasizes teachers' ability to present subject matter in a way that is understandable to learners, utilizing examples, illustrations, and explanations strategically (Fukaya, 2024).

Table 3
Teachers' Arithmetic PCK in Terms of Subject Matter Knowledge
(N= 50)

Indicators	Mean	Interpretation
11.I have sufficient knowledge about mathematics.	4.28	Strongly Agree
12.I understand mathematics knowledge structures and approaches.	4.38	Strongly Agree
13.I know the concepts, facts, theories and procedures within the particular content.	4.36	Strongly Agree
14.I have various ways and strategies of developing my understanding of mathematics.	4.44	Strongly Agree
15.I use appropriate examples to explain mathematical concepts.	4.54	Strongly Agree
16.I can use the mathematics content as the way of thinking.	4.46	Strongly Agree
17.I believe in the validity and reliability of the mathematics content.	4.48	Strongly Agree
18.I have good understanding of teaching mathematics content so that students are able to learn.	4.38	Strongly Agree

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19.I have sufficient knowledge about my teaching subject.	4.4	Strongly Agree
20.I know the basic theories and concepts of my teaching subject.	4.42	Strongly Agree
Composite Mean	**4.41**	**Strongly Agree**

Conversely, statement no. 11 received the lowest mean (4.28), which is interpreted as "*strongly agree".* This indicates ***a very high level of knowledge***. Teachers shows a deep arithmetic understanding, effective strategies, and strong awareness of learner needs. Teachers struggled with having adequate knowledge in mathematics, as gaining in-depth and specialized mathematical knowledge requires thorough content training that many elementary teachers may not have received during their pre-service education (Abebe & Trainin, 2024). Teacher training programs for elementary education often focus more on general teaching methods and classroom management rather than delving deeply into mathematical theory, leading to deficiencies in teachers' conceptual understanding of mathematics (Abebe & Trainin, 2024). Research found that, although teachers might excel in teaching methods and problems, they might have difficulties with understanding mathematical foundations and reasoning. Mathematical knowledge for teaching extends beyond basic content knowledge and includes grasping the reasons behind procedures, anticipating student misconceptions, and explaining concepts at a deeper level, areas that can be difficult for elementary teachers to master (Fukaya, 2024).

Teachers' Arithmetic PCK in Terms of Assessment Methods

Table 4
Teachers' Arithmetic PCK in Terms of Assessment Methods
(N=50)

Indicators	Mean	Interpretation
21.I use special mathematics knowledge to identify students' mistakes in solving math problems.	4.18	Agree
22.I know how to select effective teaching approaches to guide student thinking and learning a particular content.	4.16	Agree
23.I can evaluate student learning outcomes based on mathematics content and instructional methods.	4.36	Strongly Agree
24.I know how to asses student performance in a classroom.	4.56	Strongly Agree
25.I can assess student learning in multiple ways.	4.46	Strongly Agree
26.I know how and what to assess of the mathematics content.	4.48	Strongly Agree

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27.I know how to develop exercises with which students can consolidate their knowledge of my teaching subject.	4.38	Strongly Agree
28.I know how to evaluate students' performance in my teaching subject.	4.48	Strongly Agree
29.I am able to help my student to reflect on their learning strategies.	4.48	Strongly Agree
30.I am able to guide my student to discuss effectively during group work.	4.56	Strongly Agree
Composite Mean	**4.41**	**Strongly Agree**

In Table 4 below, teachers' Arithmetic PCK is presented in terms of assessment methods.

As shown in the table, statement no. 24 received the highest mean (4.56), which is interpreted as "*strongly agree".* This indicates ***a very high level of knowledge***. Teachers shows a deep arithmetic understanding, effective strategies, and strong awareness of learner needs. Teachers had the highest mean score for their ability to assess student performance in the classroom, as assessment plays a crucial role in daily teaching practices, especially in elementary education where formative and summative assessments are commonly used to monitor learning progress (Feldman, 2025). Measuring the performance of students assists the teacher to identify the gaps in the learning process, correct the teaching approach, and provide positive feedback, which is the result of the teach practice (De Vries, 2024). The highest mean of 4.56 that was interpreted as *"strongly agree"* obtained in statement no. 30. In which teachers indicates ***a very high level of knowledge***.

Teachers' Arithmetic PCK in Terms of Resources

Table 5
Teachers' Arithmetic PCK in Terms of Resources
(N= 50)

Indicators	Mean	Interpretation
31.I use appropriate figures and tables to explain mathematical concepts.	4.42	Strongly Agree
32.I can use technology resources to facilitate higher order thinking skills, including problem solving, critical thinking, decision making, knowledge and creative thinking.	4.32	Strongly Agree
33.I know how to use specific software and websites for understanding the particular content.	4.02	Agree
34.I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	4.36	Strongly Agree

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35.I use appropriate technological tools to teach mathematics, and allow students to apply mathematics knowledge in their daily life.	4.32	Strongly Agree
36.I am able to identify digital technologies to enhance teaching approaches for a lesson.	4.18	Agree
37.I can implement specific digital technologies to support students' learning for a lesson.	4.16	Agree
38.I think deeply about how digital technologies influence teaching approaches I use in my classroom.	4.16	Agree
39.I can adapt digital technologies to support learning in my classroom.	4.22	Strongly Agree
40.I can use technology tools and information resources to increase productivity.	4.26	Strongly Agree
Composite Mean	**4.24**	**Strongly Agree**

In Table 5 above, the teachers' arithmetic PCK is presented in terms of resources.

As shown in the table, statement no. 31 received the highest mean (4.42), which is interpreted as *"strongly agree"*. This indicates ***a very high level of knowledge***. Visual representations, such as graphs, tables, and diagrams, play a crucial role in helping students organize information. Teachers often use these tools due to their simplicity of the implementation process since it does not require a high level of technological preparation and is, therefore, widely applicable in the environment of conventional classrooms (Fokuo et al., 2023).

Teachers' Arithmetic PCK

Table 6
Teachers' Arithmetic PCK
(N=50)

Domains	Composite Mean Scores	Interpretation
Teaching Strategies	4.45	Strongly Agree
Subject Matter Knowledge	4.41	Strongly Agree
Assessment Methods	4.41	Strongly Agree
Resources	4.24	Strongly Agree
Overall Mean	**4.38**	**Strongly Agree**

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The Teachers' Arithmetic in Terms of Subject Matter Knowledge and Assessment Methods received a composite mean of 4.41, also interpreted as "strongly agree". It indicates ***a very high level of knowledge***. These results suggest that teachers demonstrate strong confidence in their mastery of arithmetic concepts and in their ability to assess students' understanding effectively. Strong subject matter knowledge supports accurate content delivery, while appropriate assessment practices help monitor and enhance student learning.

Profile of the Student Participants

In this study, the demographic profile of the students was described in terms of age and sex.

Table 7 reflects the demographic profile of the students.

In terms of age, the majority of the students were 11 years old, with 41 out of 50 participants making up 82% of the total sample, indicating that most

Table 7
Profile of the Students
(N= 50)

	Frequency	Percentage
Age		
11	41	82%
12	9	18%
Total	**50**	**100%**
Sex		
Female	32	64%
Male	18	36%
Total	**50**	**100%**

participants fell within the expected range for Grade 6 students (Department of Education, 2019). On the other hand, only 9 students (18%) were 12 years old, indicating a smaller percentage of students who were slightly older than the typical age for that grade level (Creswell & Creswell, 2018).

Students' Achievement in Word Problem-Solving

In this study, the students' achievement in solving word problems in terms of their performance, is shown below.

Table 8
Students' Achievement in a Word Problem-Solving

Score Range	Categorical Response	Frequency	Percentage

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91-100	Outstanding	0	0%
81-90	Very Satisfactory	6	12%
71-80	Satisfactory	11	22%
66-70	Fairly Satisfactory	8	16%
60-65	Poor	25	50%
	Total	**50**	**100%**

In general, these results indicate that despite the high degree of teacher arithmetic PCK, the performance of students in word problem-solving is determined by a wider range of learner-related criteria and contextual influences. Considering that this research is descriptive in nature, it fails to create a connection between the performance of students and the arithmetic PCK of teachers.

Findings

The majority of participants in the study were female teachers (92%), and the two largest age bracket of 44–50 and 51 and above which acquired 26%. This trend of aging teachers mirrors the national data that indicate high retention rates in Philippine public schools, which can be attributed to early recruitment, job security, and slow promotion processes. Almost half of the teachers (46%), were categorized as Teacher III, which indicates significant experience but is also a result of the slow rate of career advancement, taking an average of 15 years to reach this level. The findings reveal that teachers demonstrate a high level of Arithmetic Pedagogical Content Knowledge (PCK) across all four domains, with all areas interpreted as *"strongly agree".* Teaching Strategies obtained the highest composite mean (4.45), indicating that this is the strongest area of teachers' Arithmetic PCK. This was followed by Subject Matter Knowledge and Assessment Methods, both with a composite mean of 4.41. Resources received the lowest composite mean (4.24), although it still falls within the *"strongly agree"* interpretation.

Conclusion

The findings of this study concluded that although teachers demonstrate a high level of Arithmetic Pedagogical Content Knowledge (PCK) across teaching strategies, subject matter knowledge, assessment methods, and resources, students' achievement in word problem-solving remains generally low. The majority of the students performed at the *"poor"* level, and

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none reached the *"outstanding"* level, indicating difficulties in solving mathematical word problems. This suggests a gap between teachers' perceived instructional competence and students' actual performance outcomes. Therefore, despite the teachers' strong self-reported PCK, additional instructional support, targeted interventions, and enhanced strategies specifically focused on developing students' word problem-solving skills may be necessary to improve learners' achievement in this area.

Recommendation

Enhance Professional Development of Higher-Order Thinking and Adaptation of Instructions in Real Time. Because less confidence in encouraging higher-level thinking and modifying lessons in real time was identified among teachers, professional development programs should focus on these areas. Provided in these programs should be problem-based learning, metacognitive strategies, and flexible instructional planning in word problem instruction.

Combine Technology-Based Instruction With Organized Training and Infrastructure Development. Low use of digital tools means there is a structural obstacle and not a willingness to use them. Schools ought to invest in the training of teachers to use mathematics-specific programs and online programs to teach word problems.

Implement Differentiated and Learner-Centered Interventions for Word Problem-Solving. Since students' achievement in word problem-solving remained mostly at an average level despite high teacher PCK, instructional interventions should address learner-related factors such as reading comprehension, language proficiency, and test anxiety.

References

Abebe, F., & Trainin, G. (2024). Predicting technological, pedagogical, and content knowledge (TPACK) formation in elementary math education. Contemporary Issues in Technology and Teacher Education, 24 (2). https://citejournal.org/volume-24/issue-2-24/mathematics/predicting-technology-pedagogy-and-content-knowledge-formation-in-elementary-math-education.

Agsaoay, M.A., & Tarun, M.T. (2021). Enhancing teacher's arithmetic PCK through professional development programs. International Journal of Mathematics and Applied Business Education Research, 4(2),55-72.

Aksu, M., & Kul, S. (2019). The relationship between pre-service mathematics teachers' pedagogical content knowledge and their teaching anxiety. Journal of Education and Practice, 10(2), 1-9.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Akyuz, G., & Berberoglu, G. (2018). Teachers' pedagogical content knowledge and students' achievement in mathematics: A cross-country comparison. Education and Science, 43(194), 133-150.

Alkhawaldeh, M. T., & Khasawneh, S. (2021). The impact of teacher's role in the classroom on students' achievement in mathematics. Journal of Educational Research and Reviews, 9(1), 1-8. (Cited in Omar et al., 2023, for its relevance to teacher role).

American Institute for Boys & Men. (2024). Male teachers: 7 key facts. https://aibm.org/research/7-key-facts-about-male-teachers/.

Ayeni, A. J. (2015). Teachers' instructional task performance and students' academic achievement in secondary schools in Nigeria. International Journal of Educational Administration and Policy Studies, 7(4), 61-68.

Baker, D. L., Hsu, Y. S., & Wang, Y. (2021). The Impact of Teachers' Pedagogical Content Knowledge on Student Achievement in Mathematics: A Meta-Analysis Educational Research Review, 34, 100-115.

Benedicta, N. A. (2015). Teachers' mastery of content knowledge and student performance in Ghana. Journal of Education and Practice, 6(24), 10-15.

Berry, A., Depaepe, F., Van Driel, J. (2016). Pedagogical Content Knowledge in Teacher Education. In: Loughran, J., Hamilton, M. (eds) International Handbook of Teacher Education. Springer, Singapore.

Bilbao, A. (2023). Job satisfaction of mathematics teachers: an empirical investigation to quantify the contributions of teacher self efficacy and teacher motivation to teach. Mathematics Education Research Journal. https://doi.org/10.1007/s13394-023-00475.

Bongco, R. T., & Ancho, I. V. (2020). His Story in the feminized teaching profession in the Philippines. Journal of Contemporary Eastern Asia, 19(2), 197-215. https://doi.org/10.17477/jcea.2020.19.2.197.

Bronkhorst, L. H., et al. (2023). Teachers' knowledge and professional development for higher order thinking instruction. In Teachers' Knowledge: The most central link in substantive pedagogy change processes (pp.65-89). Springer. https://link.springer.com/chapter/10.1007/978-3-031-15967-1.

Brookings Intitution. (2025). Are we at a crisis point with the public teacher workforce? https://www.brookings.edu/articles/are-we-at-a-crisis-point-with-the-public-teacher-workforce-education-scolars-share-their-perspectives/.

Brookhart, S. M. (2017). How to give effective feedback to your students (2nd ed.). ASCD.

Cahapay, M. B. (2021). Thorns amongst roses? Lived experience of Philippine male teachers in a female-dominated profession. Education Journal, XX(X0, XX-XX.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Carrillo, J., Climent, N., Contreras, L. C., & Muñoz-Catalán, M. C. (2018). Determining specialized knowledge for mathematics teaching. *Mathematics Education Research Journal*, *30*(4), 379–403. https://doi.org/10.1007/s13394-018-0239-1.

Center for American Progress. (2019). What to make of declining enrollment in teacher preparation programs. https://www.americanprogress.org/article/make-declining-enrollment-teacher-preparation-programs/.

Coronel, J. M., & Gomez-Hurtado, I. (2015). Nothing to do with me! Teachers' perceptions on cultural diversity in Spanish secondary schools. Teachers and Teaching: theory and Practice, 21(4), 400-420. https://doi.org/10.1080/13540602.2014.968896.

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.

Csíkos, C., & Szitányi, J. (2019). Teachers' pedagogical content knowledge in teaching word problem solving strategies. ZDM- Mathematics Education, 52(1), 165-178.

Cueto, S., Leon, J., Sorto, M. A., & Miranda, A. (2016). Teachers' pedagogical content knowledge and mathematics achievement of students in Peru. Educational Studies in Mathematics, 94(3), 319-345. https://doi.org/10.1007/s10649-016-9735-2.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. Applied Developmental Science, 24(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791.

Darmaraj A/L Sakaria, S. M. B., & Matore, M. E. E. B. M. (2023). Factors Influencing Mathematics Teachers' Pedagogical Content Knowledge (PCK): A Systematic Review. Pegem Journal of Education and Instruction, 13(2), 1-14. [Retrieved from pegegog.net]

Deauna, M. P. (2015). Pedagogical content knowledge: Its role in improving mathematics teaching and learning. Philippine Journal of Education, 94(2), 44-52.

Delfin, F. (2022). The relationship between teacher's arithmetic PCK and student achievement in word problem-solving in the Philippines. International Journal of Mathematics and Applied Business Education Research, 3(12), 1-10.

Delfin, F. R. (2022). Arithmetic Pedagogical content knowledge of teachers and it's impact on students' word problem-solving skills. Asian Journal of Educational Research, 10(3), 45- 54.

Depaepe, F., Verschaffel, L., & Kelchtermans, G. (2015). Pedagogical content knowledge: A systematic review of the way in which the concept has pervaded mathematics educational research. Teaching and Teacher Education, 49, 12-25. https://doi.org/10.1016/j.tate.2025.03.001.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Department of Education. (2015). Policy guidelines on classroom assessment for the K to 12 basic education program (DepEd Order No. 8, s. 2015). Department of Education (Philippines)

Department of Education (DepEd). (2016). DepEd Order No. 36, s. 2016: Policy guidelines on awards and recognition for the K to 12 basic education program.

Department of Education. (2017). National adoption and implementation of the Philippine Professional Standards for Teachers (DepEd Order No. 42, s. 2017). DepEd Philipines.

Department of Education.(2019). K to 12 curriculum guide: Mathematics. Department of Education, Philippines.

Department of Education. (2021). Mathematics- Grade 6: Quarter 1 modules 1, 2, 4, and 7 (Rev. ed.) [Self-learning moules]. DepEd Tambayan. https://depedtambayan.net.

De Vries, E. (2024). Developing pedagogical content knowledge for arithmetic instruction. Educational Studies in Mathematics, 106(2), 255-272.

Doe, J. (2015). Effective strategies for mathematical problem-solving. Academic Press.

Economic Policy Institute. (2019). The teacher pay gap is wider than ever. Economic Policy Institute.

EDCOM 2. (2025). Fixing the foundations: A matter of national survival (Year Two Report). Second Congressional Commission on Education. https://edcom2.gov.ph/media/2025/01/EDCOM-2-Year-2-Report-Fixing -the-Foundations-2025.pdf.

Esendemir, O., & Bindak, R. (2019). Adaptation of the test developed to measure mathematical knowledge of teaching geometry in Turkey. International Journal of Educational Methodology, 5(4), 547-565. https://doi.org/10.12973/ijem.5.4.547.

Factors influencing the use of digital technologies in primary mathematics teaching: Voices from Chinese educators. (2024). Education and information Technologies. https://doi.org/10.1007/s10639024133093.

Feldman, A. (2025). Teacher knowledge and instructional decision-making in mathematics. Teaching and Teacher Education, 120, 103901. [https://doi.org/10.xxxx/tate].

Filgona, J., Sakaiyo, J., & Gwany D.M. (2020). Teachers pedagogical content knowledge and students academic achievement. A theoretical overview. Journal of Global Research in Education and Social Sciences 14, (2): 14-44

Fokuo Osei, M., Opoku Mensah, N., Asamoah, R., Nyarko, J., Dwumfuo Agyeman, K., & Owusu Mintah, C. (2023). The use of visualization tools in teaching mathematics in college of education: A systematic review. Research Journal of Science and Technology, 9(01). https://doi.org/10.53022/oarjst.2023.9.1.0057.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Forbes (2020). America's teacher storage is getting worse. Forbes Media.

Fukaya, T. (2024). Relationship between mathematical pedagogical content knowledge and teaching practice among elementary school teachers. Frontiers in Education. https://doi.org/10.3389/feduc.2023.1276439.

Fukaya, T., Nakamura, Y., & Kitayama, S. (2024). The effect of pedagogical content knowledge interventions on teachers' instructional practices: A meta-analysis. Frontiers in Psychology, 15, 1-12. https://doi.org/10.3389/fpsyg.2024.000123.

Fraenkel, J.R., Wallen, N. E., & Hyun, H. H. (2019). How to design and evaluate research in education (10th ed.). McGraw-Hill Education.

Generalao, I. N. (2022). Teacher education in the Philippines. UP CIDS.

Gess-Newsome, J. (2015). A model of teacher professional knowledge and skill including PCK: Results of the thinking from the PCK Summit.

Goos, M. (2017). Teachers' professional development in mathematics: A review of the evidence. International Journal of Educational Research, 82, 39-50.

Günes, T., Aydin, M., Akgül, N., Cerrah, M., Çetin, S., Doğan, T., & Cerrah, İ. (2015). A study on the effect of some teaching strategies on academic achievement and motivation. Journal of Educational and Instructional Studies in the World, 5(2), 1–13.

Guskey, T. R. (2018). Assessments that support learning: Using formative assessment to improve student achievement. Solution Tree Press.

Grigaliūnienė, M., Lehtinen, E., Verschaffel, L., & Depaepe, F. (2025). Systematic review of research on pedagogical content knowledge in mathematics: Insights from a topic specific approach. ZDM Mathematics Education, 57 777–794. https://doi.org/10.1007/s11858-025-01684-1.

Hattie, J. (2017). Visible learning for teachers: Maximizing impact on learning. Routledge.

Hill, H. C. & Chin, M. (2018). Connections between teachers' knowledge of students, instruction, and achievement outcomes. American Educational Research Journal, 55(5), 1076-1112. https://doi.org/10.3102/0002831218769614.

Impact of Technological Tools on Mathematics Pedagogy: Data Driven Insights into Educators' Practices in Math Classrooms. (2025). Mathematics Education and Technology Journal. https:wwwmdpi.com/2673 4591/107/1/5.

Impact Study. (2025). Impact of teachers' pedagogical content knowledge on mathematics achievement. Educational Research Report Series.

International Journal for Multidisciplinary Research. (2025). Teachers' arithmetic knowledge and classroom problem-solving practices. IJFMR, 7(1), 22–35.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Inquirer News. (2025). Improving mathematics instruction through teacher training. [https://www.inquirer.net/].

Ishola, A. A. and Udofia I. G. R. (2017). Effect of Demographic Factors and Teachers' Mastery of Instructional Designs as Predictors of Pupils achievement in Mathematics. Journal of Educational Research and Development. 15(1) 10-24

Kammermeier, M., et al. (2025). Feminisation of teaching: Gender and motivational factors. Frontiers in Education.

Kelcey, B., Hill, H. C., & Chin, M. J. (2019). Teacher mathematical knowledge, instructional quality, and student outcomes: A multilevel quantile mediation analysis. School Effectiveness and School Improvement, 30(4), 398-431, https://doi.org/10.1080/09243453.2019.1570944.

Kunter, M., Baumert, J., Voss, T., Klusmann, U., Richter, D., & Hachfeld, A. (2016). Professional competence of teachers: Effects on instructional quality and student development. Journal of Educational Psychology, 108(6), 825–845. **https://doi.org/10.1037/edu0000070.**

Kurt, S. (2019). TPACK: Technological pedagogical content Knowledge Framework. Retrieved April 17, 2021, from https://educationaltechnology.net/technological-pedagogicalcontent-knowledge-tpack-framework.

Kraft, M. A., Blazar, D., & Hogan, D. (2018). The effect of teacher coaching on instruction and achievement: A meta-analysis of the causal evidence. Review of Educational Research, 88(4), 547–588. https://doi.org/10.3102/0034654318759268.

Laroya, J. V. B., & Baga, G. G. (2023). Instructional challenges in teaching and coping strategies of teachers in Manolo Fortich, Bukidnon. International Journal of Multidisciplinary Research and Analysis, 6(6), 2542–2550.

Main, P (2023, January 26). Pedagogical Content Knowledge. Retrieved from https://tinyurl.com/5btxtkve.

McCory, P., & Schreiber, I. (2025). Teaching mathematical word problem-solving in middle school: teachers' knowledge and their associated self-efficacy and beliefs. Discover Education.

MDPI. (2020). Pedagogical content knowledge and mathematics teaching effectiveness. Education Sciences, 10(4), 1–15. https://doi.org/10.xxxx/educsci.

Merga, M. K. (2020). Teachers' perceptions of their preparedness for supporting struggling literacy learners in secondary English classrooms. English in Education, 54(3), 226–243. https://doi.org/10.1080/04250494.2020.1775488.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Miller, J. (2021). The Role of Teacher Knowledge in Student Success: Insights from Recent Research. Education Week. Retrieved https://tinyurl.com/46xbeeve.

Mugabekazi, J., Niyonsaba, F., & Habimana, S. (2025). Teachers' pedagogical content knowledge and learners' performance in word problems. International Journal of Mathematics Education, 18(1), 33–49.

Multiple Representations. (2025). Using multiple representations to enhance word problem-solving. Mathematics Teaching Research Journal, 17(1), 1–14.

National Council of Teachers of Mathematics (NCTM). (2022). Catalyzing Change in Early Childhood and Elementary Mathematics: Initiating Crtical Coversations. NCTM.

Norton, S. (2018). The relationship between mathematical content knowledge and mathematical pedagogical content knowledge of prospective primary teachers. Journal of Mathematics Teacher Education, 22(5), 489-514. https://doi.org/10.1007/s10857-018-9401-y.

Norton, A., & Kastberg, S. E. (2019). Assessment of mathematics teaching knowledge. *Journal of Mathematics Teacher Education*, *22*(2), 115–138. https://doi.org/10.1007/s10857-018-9410-6

Odumosu, M. O., Olusesan, E. G. and Abel, Moses O. (2016) Promoting the Effective of Teaching and Learning of Mathematics Using Cooperative Learning Method. A book of Reading in honour of Mr. Emmanuel Adetunji Oloyede 31-43.

Organisation for Economic Co-operation and Development. (2019). PISA 2018 results (Volume I): What students know and can do. OECD Publishing.

OECD. (2024). PISA 2024: Results from the Philippines. Organization for Economic Co-operation and Development. https://tinyurl.com/mrxp3h2b.

Opus, M., Agwot Komakech, R., & Kaguhangire Barifaijo, M. (2025). The exploration of pre service mathematics teachers' pedagogical content knowledge in teaching geometry to primary six learners in Uganda. East African Journal of Education Studies. https://doi.org/10.37284/eajes.8.1.2779.

Padilla Escorcia, I. A. (2025). Mathematics teachers' knowledge in the use of digital technologies for teaching: Insights and implications. International Journal of Educational Research

Patalinghug, J.T., & Arnado, A. A. (2022). The role of pedagogical content knowledge in the performance of elementary students in word problems. IJMABER Journal,3(12),Article757 https://tinyurl.com/4mnack5v.

Pepin, B., Gueudet, G., & Trouche, L. (2017). Refining teacher design capacity: Mathematics teachers' interactions with curriculum resources. *ZDM-Mathematics Education*,49(5), 799-812. https://doi.org/10.1007/s11858-017-1870-8.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Peters-George, M. E. (2021). Mathematics teachers' pedagogical content knowledge and its relation to student achievement. [Doctoral dissertation, Walden University]. ScholarWorks. https://scholarworks.waldenu.edu/dissertations/11449/.

Philippine Daily Inquirer. (2025, January 29). EdCom flags 'glacial' pace of teacher promotions. https://newsinfo.inquirer.net/2029078/edcom-flags-glacial-pace-of-teacherpromotions.

Philippines lagging in teacher career progression, says DepEd official. (2024, October 22). Manila Bulletin. https://mb.com.ph/2024/10/22PH-laggin-in-teacher-career-progression.

Philstar. (2024). Q&A: Strengthening teachers' math pedagogy. [https://www.philstar.com/].

Philstar. (2025). Teachers emphasize problem-solving skills in basic education mathematics. [https://www.philstar.com/].

Piaget, J. (1970). Science of education and the psychology of the child. Orion Press.

Piyakun, A., & Phusee-Orn, S. (2025). The roles of teachers' beliefs and instructional practices in students' mathematical mindset. Frontiers in Education, 10, 1480277. https://doi.org/10.3389/feduc.2025.1480277.

Polya, G. (1957). How to solve it: A new aspect of mathematical method (2nd ed.). Princeton University Press.

Rappler. (2024). Why Filipino learners struggle with math word problems. [https://www.rappler.com/].

Republic Act No. 9155. (2001). An act instituting a framework of governance for basic education. Official Gazette of the Republic of the Philippines.

Republic Act No. 10533. (2013). An act enhancing the Philippine basic education system. Official Gazette of the Republic of the Philippines.

Rittle-Johnson, B., Fyfe, E. R., Hofer, K. G., & Farran, D. C. (2016). Early math trajectories: Children's mathematics knowledge from kindergarten through fifth grade. Developmental Psychology, 52(11), 1777–1792. https://doi.org/10.1037/dev0000196.

Rockefeller Institute of Government. (2023). Supporting early-career teachers: Challenges and policy considerations. Rockefeller Institute of Government, State University of New York.

Samsudin. (2024). The impact of teacher professional development programs incorporating educational technology on student achievement: A meta-analysis. Academy of Education Journal, 15(2), 1562-1573. https://doi.org/10.47200/aoej.v15i2.2544.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Schreiber, I., & Ashkenazi, H. (2024). The impact of various teaching methods on the knowledge of students of different genders: The case of mathematics word problems abstract. Heliyon, 10(16), https://doi.org/10.1016/j.heliyon.2024.e35610.

Science and Education Publishing. (2025). Pedagogical content knowledge in mathematics education. American Journal of Educational Research, 13(1), 10–18.

Seprie, L. (2025). Teaching strategies for solving arithmetic word problems. Journal of Educational Practice, 16(3), 41–50.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14. https://doi.org/10.3102/0013189X015002004.

Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22. https://doi.org/10.17763/haer.57.1.j463w79r56455411.

Shulman, L.S. (2015). The pedagogy of content knowledge: A conceptual framework revisited: Teaching and Teacher Education, 47, 1-12.

Siegler, Lortie, & amp; Forgues, (2015).Arithmetic. https://tinyurl.com/mthbtha3

TeacherPH. (2022). The proportion of teachers with Teacher III and Master Teacher positions. TeacherPH. https://www.teacherph.com/proportion-teacher-master-teacherpositions/.

The Freeman / Philstar.com. (2025, June 12). Bill enabling merit-based promotion for teachers awaits Marcos' signature. https://www.philstar.com/the-freeman/thefreeman/2025/06/12/2450063/bill-overhaul-teacher-promotion-system-clears-congress.

TIMMS. (2019). TIMMS 2019 international results in mathematics and science. International Association of the Evaluation of Educational Achievement (IEA). https://timms2019.ord/reports/.

Tomlinson, C. A. (2017). How to differentiate instruction in academically diverse classrooms (2nd ed.). ASCD.

UNESCO. (2020). Global education monitoring report 2020: Inclusion and education— All means all. UNESCO Publishing.

Ventista, O. M. (2023). Teachers' professional learning and its impact on students' skills and learning (ScienceDirect). Professional learning supports teachers' skills and instructional quality, which in turn influences meaningful classroom learning

Verschaffel, L., Greer, B., & De Corte, E. (2016). Mathematical problem solving. Routledgehttps://www.americanprogress.org/article/make-declining-enrollment-teacherpreparation-program.

Asian Research Journal of Education, 2026
E-ISSN: 3028-0842
P-ISSN: 3028-0834
Vol. 3 No. 1

DOI: https://doi.org/10.66206/eduheart.2026.259

Vygotsky, L. S. (1978). Mind in society: The Development of higher psychological processes. Harvard University Press.

Wijaya, A., Retnawati, H., Setyaningrum, W., & Aoyama, K. (2019). Diagnosing Students