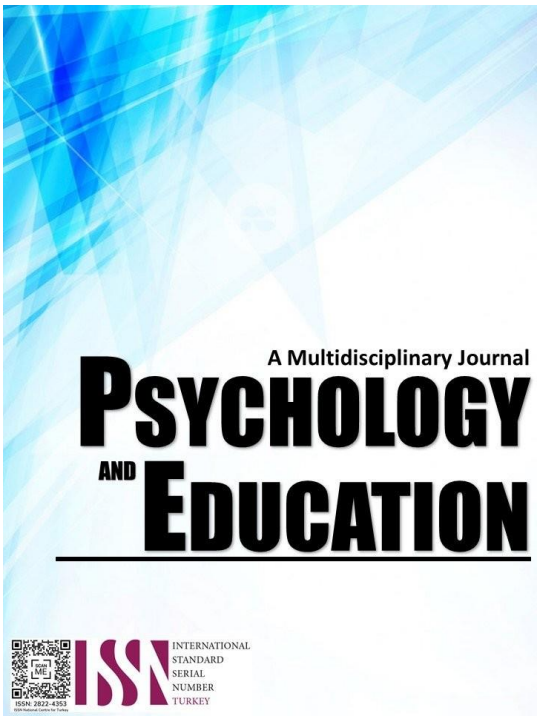
TEACHERS PEDAGOGICAL CONTENT KNOWLEDGE AND THEIR INSTRUCTIONAL MANAGEMENT PERFORMANCE IN MATHEMATICS: BASIS FOR TEACHER'S DEVELOPMENTAL PLAN



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Research Article

Teachers Pedagogical Content Knowledge and their Instructional Management Performance in Mathematics: Basis for Teacher's Developmental Plan

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Abstract

This study investigated the intricate relationship between mathematics teachers' Pedagogical Content Knowledge (PCK) and their instructional management practices, utilizing the Classroom Observation Tool (COT) within the Results-Based Performance Management System (RPMS). It provided a comprehensive description of the PCK of junior high school mathematics teachers in Cluster III, Division of Pampanga, focusing on dimensions such as pedagogical knowledge, curriculum knowledge, and content knowledge. The findings revealed strong agreement among respondents regarding PCK indicators, particularly in Content and Curriculum Knowledge, while Pedagogical Knowledge and Knowledge of Context received slightly lower ratings. Teachers were rated outstanding in all key aspects of instructional management, indicating exceptional performance. However, significant differences emerged between teachers' self-assessments and evaluations by their superiors in several areas of PCK. Although no overall significant relationship was found between PCK and instructional management performance, a weak yet statistically significant correlation was identified between Content Knowledge and instructional management. Based on data from 91 teachers, a tailored Teachers' Developmental Plan was formulated to enhance PCK and instructional management skills, addressing specific challenges identified during RPMS observations. Ultimately, this plan aims to empower teachers to improve their effectiveness in conveying mathematical concepts and managing classroom dynamics, thereby enhancing student outcomes.

Keywords: *pedagogical content knowledge, instructional management performance, mathematics, developmental plan*

Introduction

Educational foundations play a vital role in shaping Mathematics Teachers' Pedagogical Content Knowledge (PCK) and instructional management, both of which significantly impact student learning. PCK, introduced by Shulman (1986), is the intersection of subject expertise and pedagogical strategies, allowing teachers to address misconceptions, adapt teaching methods, and enhance student understanding. It extends beyond content mastery, emphasizing how mathematical concepts are conveyed effectively. Research by Hill et al. (2008) and Tatto et al. (2008) confirms that strong PCK directly influences students' ability to comprehend and apply mathematical ideas

Instructional management in mathematics education ensures effective lesson delivery through structured planning, organization, and student-centered strategies. Studies by Chen & Zhang (2019) emphasize the importance of setting clear learning objectives, providing timely feedback, and fostering student engagement. Similarly, Ndihokubwayo et al. (2022) highlight that a supportive classroom environment enhances student interaction and deepens learning. Differentiated instruction plays a crucial role in addressing diverse learning styles, while technology-driven instructional strategies improve student outcomes across various learning levels.

The synergy between PCK and instructional management creates a dynamic teaching approach that enhances both content delivery and classroom engagement. Effective instructional management ensures that PCK is applied through well-structured lessons, tailored assessments, and adaptive teaching methods that respond to students' needs. This integration prepares students for higher-order thinking and problem-solving in mathematics.

In the Philippine public education system, the Results-Based Performance Management System (RPMS) incorporates the Classroom Observation Tool (COT) to assess instructional management. The COT, aligned with the Philippine Professional Standards for Teachers (PPST) (DepEd, 2015), evaluates teachers on their ability to manage learning environments, implement effective teaching strategies, and maximize student engagement. Research by Hernandez & Cruz (2020) shows that feedback from performance evaluations leads to improved teaching practices and student learning. Dizon et al. (2018) further analyzed the RPMS framework, focusing on its phases: performance planning, monitoring, review, and rewards. Studies suggest that a well- implemented performance evaluation system enhances teaching quality, ultimately benefiting students' mathematical proficiency.

By strengthening both PCK and instructional management, mathematics educators can create a more engaging and effective learning environment, ensuring that students develop a deep understanding of mathematical concepts and problem-solving skills.

Research Objectives

The following are the objectives of the study:

1. To describe the level of pedagogical content knowledge of mathematics teachers in terms of pedagogical knowledge, knowledge of learners and learning, curriculum knowledge, content knowledge and knowledge of contexts.

2. To describe the level of instructional management performance of mathematics teachers in terms of content knowledge and pedagogy, learning environment, diversity of learners and assessment and reporting.
3. To compare the pedagogical content knowledge of mathematics teachers based on self-assessment and evaluation by their immediate superiors.
4. To determine the relationship between the level of pedagogical content knowledge and instructional management performance of mathematics teachers.
5. To develop a professional developmental plan based on the study's findings to enhance the pedagogical content knowledge and instructional management performance of mathematics teachers.

Methodology

Research Design

This study employed a quantitative descriptive-correlational design to assess the Pedagogical Content Knowledge (PCK) and Instructional Management Performance (IMP) of JHS mathematics teachers and examine their relationship. By collecting and analyzing data through surveys and statistical methods, the study identified existing associations between these variables without manipulation. This approach, as defined by Cooper and Schindler (2014) and Leedy & Ormrod (2019), provides insights into real-world teaching dynamics. The findings serve as the foundation for developing a Teacher Development Plan, aimed at enhancing instructional effectiveness and addressing identified gaps in PCK and IMP.

Respondents

The study used the universal sampling technique to include all 91 junior high school mathematics teachers in Cluster III, Division of Pampanga, ensuring comprehensive data collection. This method enhances the reliability and validity of findings by eliminating sampling error, making it effective for small populations (Sarmah & Hazarika, 2012). Universal sampling, also known as total population sampling, is useful in educational research where specific characteristics are studied (Sekaran & Bougie, 2013). By analyzing the entire population, the study provides accurate insights into the relationship between Pedagogical Content Knowledge (PCK) and Instructional Management Performance (IMP) to support the development of a Teacher Development Plan.

Instrument

The following processes were conducted by the researcher. Instrument Development. The Pedagogical Content Knowledge (PCK) Inventory was developed as a self-assessment tool to evaluate mathematics teachers' knowledge in five key domains: Pedagogical Knowledge, Knowledge of Learners and Learning, Curriculum Knowledge, Content Knowledge, and Knowledge of Contexts. Grounded in Shulman's (1986) PCK framework, the instrument used a Likert scale (1-strongly disagree to 4-strongly agree) to measure self-perceived competencies. Content Validation. Three DepEd master teachers validated the instrument for clarity, relevance, and alignment with actual teaching practices. Their feedback led to refinements, ensuring that the final PCK Inventory accurately measured the intended constructs. Reliability Testing. A pilot test was conducted to assess the internal consistency of the PCK Inventory using Cronbach's alpha, which resulted in 0.956, indicating high reliability. This confirmed that the instrument produced stable and consistent results for assessing teachers' PCK. Data Collection & Analysis. Teachers self-assessed their pedagogical content knowledge (PCK) using an inventory, while their direct supervisors provided external evaluations for comparison. The differences between self-assessments and supervisor evaluations were analyzed to identify discrepancies in perceived and observed competencies. Instructional Management Performance (IMP) was assessed using DepEd's Classroom Observation Tool (COT) for SY 2023–2024, focusing on content delivery, classroom management, and student engagement. Additionally, the relationship between PCK and IMP was examined to determine whether higher PCK correlated with more effective instructional practices.

Data Analysis

The study utilized various statistical instruments to analyze the collected data systematically. Descriptive statistics, including the mean and standard deviation, were used to determine the levels of Pedagogical Content Knowledge (PCK) and Instructional Management Performance (IMP) among teachers. To compare teachers' self-assessed PCK with the ratings given by their supervisors, an independent t-test was conducted, identifying any significant differences between the two assessments. Lastly, Spearman's Rank- Order Correlation (Spearman's rho) was used to examine the relationship between PCK and IMP, determining whether higher PCK levels were associated with stronger instructional management performance.

Results and Discussion

The study investigates mathematics teachers' Pedagogical Content Knowledge (PCK) and Instructional Management Performance (IMP) as a basis for a teacher's developmental plan.

Table 1 presents the level of pedagogical knowledge of Mathematics teachers.

Table 1. *Level of Pedagogical Knowledge*

Indicators	*Direct Superiors*		*Teachers*		*Overall*		*DI*	*VI*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*		
I am confident in my ability to implement a variety of teaching strategies to facilitate mathematics learning.	3.64	0.48	3.64	0.48	3.74	0.44	SA	HK
I use questioning techniques effectively to deepen students' mathematical understanding.	3.59	0.49	3.59	0.49	3.58	0.49	SA	HK
I utilize classroom discussions effectively to explore mathematical concepts.	3.70	0.46	3.70	0.46	3.71	0.46	SA	HK
I adapt my teaching methods based on the diverse needs of students in my mathematics class.	3.58	0.52	3.58	0.52	3.64	0.49	SA	HK
I employ assessment strategies that accurately measure students' understanding of mathematics.	3.66	0.48	3.66	0.48	3.64	0.48	SA	HK
I introduce and implement technology in my teaching to enhance learning of mathematical concepts.	3.53	0.50	3.53	0.50	3.60	0.49	SA	HK
I create a learning environment that encourages students to explore mathematical ideas and think critically.	3.65	0.48	3.65	0.48	3.71	0.46	SA	HK
I implement strategies to manage classroom disruptions effectively when teaching mathematics.	3.64	0.48	3.64	0.48	3.70	0.46	SA	HK
I use feedback effectively to improve student learning in mathematics.	3.69	0.46	3.69	0.46	3.75	0.43	SA	HK
I reflect on my teaching practices regularly to improve my instructional methods in mathematics.	3.71	0.48	3.71	0.48	3.76	0.44	SA	HK
Composite Mean	3.64	0.33	3.64	0.33	3.68	0.32	SA	HK

***Legend**: 4.20–5.00: Strongly Agree (SA) - 3.40–4.19 - Agree (A); 2.60–3.39 - Disagree (D); 1.00–2.59 - Strongly Disagree (SD); 1.00–1.74 - Not Knowledgeable (NK); 1.75–2.49 – Slightly Knowledgeable (SK); 2.50–3.24 - Moderately Knowledgeable (MK); 3.25–4.00 - Knowledgeable (K); 4.01–5.00 - Highly Knowledgeable (HK)*

The findings indicate that mathematics teachers possess a high level of pedagogical knowledge, as reflected in the overall mean score of 3.68 (SD = 0.32), with respondents strongly agreeing with the indicators. Teachers demonstrated strong competence in implementing effective teaching strategies, managing classrooms, and adapting instruction to meet diverse student needs. Notably, the highest mean score was observed for the indicator on self-reflection (Mean = 3.76, SD = 0.44), suggesting that teachers highly value evaluating and improving their instructional methods. This emphasis on continuous improvement supports the development of flexible teaching strategies that enhance student learning experiences.

However, the lowest mean score was recorded for the use of questioning techniques to deepen students' mathematical understanding (Mean = 3.58, SD = 0.49), indicating a slight uncertainty in employing effective questioning strategies. While still within the "strongly agree" range, this disparity highlights an area for professional development. Given that higher-order thinking is essential in mathematics, targeted training in questioning techniques could help improve student engagement and conceptual understanding. This aligns with Morre Jr. and Casocot (2022), who emphasize that pedagogical and mathematical knowledge alone do not guarantee student success, as contextual factors also play a crucial role. Thus, while teachers exhibit strong pedagogical knowledge, refining their questioning strategies could further enhance instructional effectiveness.

Table 2 presents the level of pedagogical knowledge of Mathematics teachers.

Table 2. *Learners and Learning*

Indicators	*Direct Superiors*		*Teachers*		*Overall*		*DI*	*VI*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*		
I understand how students' prior knowledge affects their learning of new mathematical concepts.	3.87	0.34	3.87	0.34	3.89	0.31	SA	HK
I recognize common misconceptions in mathematics and know how to address them.	3.70	0.46	3.70	0.46	3.73	0.44	SA	HK
I am aware of the developmental stages of mathematical understanding in students.	3.66	0.48	3.66	0.48	3.70	0.46	SA	HK
I can identify individual students' learning needs and adapt my teaching accordingly.	3.59	0.49	3.59	0.49	3.65	0.48	SA	HK
I apply methods to increase motivation among students in learning mathematics.	3.67	0.47	3.67	0.47	3.68	0.47	SA	HK
I am aware of the different learning styles and can tailor my teaching to accommodate them in mathematics.	3.64	0.48	3.64	0.48	3.73	0.45	SA	HK

I create a supportive learning environment that is conducive to mathematics for all students.	3.60	0.49	3.60	0.49	3.66	0.47	SA	HK
I analyze the impact of cultural and linguistic diversity on learning mathematics.	3.46	0.50	3.46	0.50	3.57	0.50	SA	HK
I recognize the signs of math anxiety in students and know how to address it.	3.55	0.52	3.55	0.52	3.58	0.51	SA	HK
I am skilled in fostering a growth mindset in students towards learning mathematics.	3.62	0.53	3.62	0.53	3.69	0.49	SA	
Composite Mean	3.64	0.32	3.64	0.32	3.69	0.31	SA	HK

***Legend**: 4.20–5.00: Strongly Agree (SA) - 3.40–4.19 - Agree (A); 2.60–3.39 - Disagree (D); 1.00–2.59 - Strongly Disagree (SD); 1.00–1.74 - Not Knowledgeable (NK); 1.75–2.49 – Slightly Knowledgeable (SK); 2.50–3.24 - Moderately Knowledgeable (MK); 3.25–4.00 - Knowledgeable (K); 4.01–5.00 - Highly Knowledgeable (HK)*

The findings reveal that mathematics teachers demonstrate a high level of knowledge of learners and learning, with an overall mean score of 3.69 (SD = 0.31), indicating strong agreement with the indicators. Teachers exhibit a deep understanding of students' needs, learning styles, and developmental stages, enabling them to create supportive and effective learning environments. The highest mean score (Mean = 3.89, SD = 0.31) was recorded for the indicator on recognizing how students' prior knowledge influences their learning of new mathematical concepts. This suggests that teachers effectively build on students' existing knowledge to introduce new ideas, reinforcing the importance of prior learning in mathematical instruction. The relatively low standard deviation indicates consistent agreement among respondents, highlighting a shared perspective on the factors that impact student learning.

However, the lowest mean score (Mean = 3.57, SD = 0.50) was found in addressing cultural and linguistic diversity in mathematical learning, suggesting a need for improvement in this area. While still within the "strongly agree" range, the findings indicate that teachers may feel less confident in adapting instruction to students' diverse cultural backgrounds and language skills. This aligns with Granström et al. (2023) and McCombs (2021), who emphasize the importance of explicitly teaching learning strategies and adopting a learner-centered approach to enhance student achievement. Similarly, Rivera (2024) highlights the benefits of culturally responsive teaching in creating inclusive learning environments that validate students' identities and leverage their prior knowledge. These insights suggest that professional development focused on culturally responsive pedagogy could help teachers refine their instructional strategies, ensuring a more inclusive and effective mathematics learning experience.

Table 3 shows the curriculum knowledge of Mathematics teachers.

Table 3. *Curriculum Knowledge*

Indicators	*Direct Superiors*		*Teachers*		*Overall*		*DI*	*VI*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*		
I have a deep understanding of the mathematical concepts I teach.	3.78	0.42	3.78	0.42	3.86	0.35	SA	HK
I solve mathematical problems using multiple approaches and can demonstrate these to students.	3.69	0.46	3.69	0.46	3.77	0.42	SA	HK
I explain mathematical concepts clearly and effectively.	3.73	0.47	3.73	0.47	3.78	0.43	SA	HK
I stay updated with recent developments in mathematics education and research.	3.49	0.55	3.49	0.55	3.55	0.52	SA	HK
I connect mathematical concepts to real-world applications to enhance understanding.	3.62	0.49	3.62	0.49	3.69	0.46	SA	HK
I am proficient in the use of mathematical language and symbols.	3.69	0.49	3.69	0.49	3.77	0.43	SA	HK
I trace the historical development of mathematical concepts.	3.37	0.55	3.37	0.55	3.54	0.53	SA	HK
I critically evaluate the accuracy of mathematical information from various sources.	3.48	0.54	3.48	0.54	3.60	0.51	SA	HK
I encourage students to appreciate the beauty and logic of mathematics.	3.80	0.40	3.80	0.40	3.84	0.37	SA	HK
I have a thorough knowledge of the math content that precedes and follows what I teach.	3.77	0.42	3.77	0.42	3.82	0.39	SA	HK
Composite Mean	3.64	0.35	3.64	0.35	3.72	0.32	SA	HK

***Legend**: 4.20–5.00: Strongly Agree (SA) - 3.40–4.19 - Agree (A); 2.60–3.39 - Disagree (D); 1.00–2.59 - Strongly Disagree (SD); 1.00–1.74 - Not Knowledgeable (NK); 1.75–2.49 – Slightly Knowledgeable (SK); 2.50–3.24 - Moderately Knowledgeable (MK); 3.25–4.00 - Knowledgeable (K); 4.01–5.00 - Highly Knowledgeable (HK)*

The findings indicate that mathematics teachers possess a high level of curriculum knowledge, with an overall mean score of 3.70 (SD = 0.32), suggesting strong agreement with the indicators.

Teachers demonstrate confidence in aligning their instruction with curriculum standards, planning lessons effectively, and ensuring coherence in their teaching. The highest mean score (Mean = 3.81, SD = 0.40) was observed in teachers' ability to align their teaching objectives with curriculum goals, highlighting their preparedness in structuring lessons to meet learning outcomes. This suggests that teachers feel equipped to implement curriculum-aligned instruction, which is essential for effective teaching and student success.

However, the lowest mean score (Mean = 3.52, SD = 0.51) was recorded in modifying the curriculum to accommodate diverse learners,

indicating a gap in curriculum differentiation skills. While teachers strongly agree that they understand the curriculum, they may need additional training to adapt their instruction for varied student needs.

Table 4 shows the Content Knowledge of the Mathematics teachers.

Table 4. *Content Knowledge*

Indicators	*Direct Superiors*		*Teachers*		*Overall*		*DI*	*VI*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*		
I am well-versed in the mathematics curriculum and its learning objectives.	3.65	0.50	3.65	0.50	3.75	0.45	SA	HK
I can align my teaching objectives with the curriculum goals effectively.	3.74	0.47	3.74	0.47	3.81	0.40	SA	HK
I follow the proper sequence and schedule in Math curriculum effectively to maximize student learning.	3.65	0.50	3.65	0.50	3.72	0.46	SA	HK
I integrate other subjects in my math teaching.	3.58	0.50	3.58	0.50	3.66	0.47	SA	HK
I am familiar with the resources and materials that support the mathematics curriculum.	3.71	0.48	3.71	0.48	3.75	0.45	SA	HK
I understand how the mathematics curriculum prepares students for future mathematical learning and real-life application.	3.70	0.46	3.70	0.46	3.79	0.41	SA	HK
I can evaluate and select appropriate instructional materials to support the curriculum objectives.	3.57	0.50	3.57	0.50	3.63	0.49	SA	HK
I am capable of modifying the curriculum to meet the diverse needs of my students.	3.52	0.52	3.52	0.52	3.52	0.51	SA	HK
I regularly update my knowledge of the mathematics curriculum and its changes.	3.57	0.52	3.57	0.52	3.63	0.49	SA	HK
I can effectively communicate the goals and expectations of the mathematics curriculum to students and parents.	3.58	0.50	3.58	0.50	3.71	0.45	SA	HK
Composite Mean	3.63	0.35	3.63	0.35	3.70	0.32	SA	HK

***Legend**: 4.20–5.00: Strongly Agree (SA) - 3.40–4.19 - Agree (A); 2.60–3.39 - Disagree (D); 1.00–2.59 - Strongly Disagree (SD); 1.00–1.74 - Not Knowledgeable (NK); 1.75–2.49 – Slightly Knowledgeable (SK); 2.50–3.24 - Moderately Knowledgeable (MK); 3.25–4.00 - Knowledgeable (K); 4.01–5.00 - Highly Knowledgeable (HK)*

The findings indicate that mathematics teachers possess a high level of content knowledge, with an overall mean score of 3.72 (SD = 0.32), suggesting strong agreement with the indicators. Teachers demonstrate confidence in their understanding of mathematical concepts, principles, and procedures, which enables them to provide clear explanations and support student learning. The highest mean score (Mean = 3.86, SD = 0.35) was observed in teachers' deep understanding of the mathematical concepts they teach, emphasizing their ability to promote higher-order thinking and adapt lessons to student needs. This highlights the importance of strong conceptual knowledge in effective mathematics instruction.

However, the lowest mean score (Mean = 3.54, SD = 0.53) was recorded in integrating the historical development of mathematical concepts, indicating a gap in how teachers incorporate historical context into their lessons. While this aspect remains within the "strongly agree" range, it suggests an area for improvement, as historical perspectives can enrich student engagement and deepen their understanding of mathematics. Refugio et al. (2020) and Kim & Ko (2020) emphasize the need for continuous professional development to enhance teachers' subject-matter expertise. Addressing this gap through specialized training on the historical evolution of mathematical ideas can improve instructional strategies and provide students with a more comprehensive and meaningful learning experience.

Table 5. *Knowledge of Context*

Indicators	*Direct Superiors*		*Teachers*		*Overall*		*DI*	*VI*
	Mean	*SD*	*Mean*	*SD*	*Mean*	*SD*		
I adapt my teaching strategies to the specific cultural context of my students.	3.47	0.50	3.47	0.50	3.54	0.50	SA	HK
I incorporate local examples into my math teaching.	3.59	0.49	3.59	0.49	3.71	0.46	SA	HK
I consider the socio-economic background of my students when planning lessons.	3.55	0.50	3.55	0.50	3.67	0.47	SA	HK
I am aware of the impact of community values on math education.	3.59	0.52	3.59	0.52	3.68	0.48	SA	HK
I seek to understand and utilize the educational resources available in my community.	3.54	0.54	3.54	0.54	3.62	0.51	SA	HK
I align my teaching with the educational policies and regulations.	3.68	0.47	3.68	0.53	3.76	0.43	SA	HK
I am sensitive to the cultural norms that may affect students' participation in math.	3.65	0.48	3.65	0.48	3.72	0.45	SA	HK

I use community events as opportunities for relevant math lessons.	3.57	0.50	3.57	0.49	3.62	0.49	SA	HK
I collaborate with other teachers to create a cohesive learning environment.	3.69	0.51	3.69	0.50	3.76	0.43	SA	HK
I understand how global trends in education can impact my teaching practices.	3.66	0.50	3.66	0.50	3.73	0.46	SA	HK
Composite Mean	3.60	0.38	3.60	0.38	3.68	0.32	SA	HK

***Legend**: 4.20–5.00: Strongly Agree (SA) - 3.40–4.19 - Agree (A); 2.60–3.39 - Disagree (D); 1.00–2.59 - Strongly Disagree (SD); 1.00–1.74 - Not Knowledgeable (NK); 1.75–2.49 – Slightly Knowledgeable (SK); 2.50–3.24 - Moderately Knowledgeable (MK); 3.25–4.00 - Knowledgeable (K); 4.01–5.00 - Highly Knowledgeable (HK)*

The findings indicate that mathematics teachers possess a high level of knowledge of context, with an overall mean score of 3.68 (SD = 0.33), suggesting strong agreement with the indicators. This reflects their ability to understand the teaching and learning environment, including student diversity, school culture, and community context, allowing them to adapt instruction effectively. The highest mean scores (Mean = 3.76, SD = 0.43) were observed in indicators related to recognizing the significance of real-world applications in teaching mathematics, highlighting teachers' awareness of the importance of connecting mathematical concepts to practical scenarios to enhance student engagement.

However, the lowest mean score (Mean = 3.54, SD = 0.50) suggests that while teachers acknowledge the importance of contextual learning, there is room for improvement in adapting lessons to specific contexts. Sigus and Madamurk (2024) emphasize that real-world connections improve students' problem-solving skills, aligning with the study's findings. Similarly, Tesfaw et al. (2024) highlight the benefits of context-driven problem-solving strategies in enhancing student interest and comprehension. This suggests a need for further professional development to strengthen teachers' ability to integrate real-world applications more effectively, ensuring that mathematical concepts are both meaningful and relevant to students' experiences.

Table 6. *Summary of Pedagogical Content Knowledge*

Indicators	*Mean*	*SD*	*DI*	*VI*
Pedagogical Knowledge	3.68	0.32	Strongly Agree	Highly Knowledgeable
Knowledge of Learners and Learning	3.69	0.31	Strongly Agree	Highly Knowledgeable
Curriculum Knowledge	3.70	0.32	Strongly Agree	Highly Knowledgeable
Content Knowledge	3.72	0.32	Strongly Agree	Highly Knowledgeable
Knowledge of Contexts	3.68	0.32	Strongly Agree	Highly Knowledgeable
Overall	3.69	0.28	Strongly Agree	Highly Knowledgable

***Legend**: 3.25–4.00 - Strongly Agree (SA; 2.50–3.24 - Agree (A); 1.75–2.49 - Disagree (D); 1.00–1.74 = Strongly Disagree (SD); SD - Standard Deviation; DI - Descriptive Interpretation; VI - Verbal Interpretations*

The findings indicate that mathematics teachers exhibit a high level of Pedagogical Content Knowledge (PCK), with an overall mean of 3.69 (SD = 0.28). Among the PCK components, Content Knowledge received the highest rating (Mean = 3.72, SD = 0.32), suggesting that teachers feel most confident in their understanding of mathematical concepts and principles. This aligns with Shulman's (1986) assertion that strong content knowledge is fundamental to effective teaching, as it allows educators to anticipate students' challenges and deliver material in a way that fosters deeper comprehension. Similarly, high ratings in Curriculum Knowledge (Mean = 3.70, SD = 0.32) and Knowledge of Learners and Learning (Mean = 3.69, SD = 0.31) highlight teachers' ability to align instruction with curriculum standards and understand how students process mathematical concepts. These components reinforce the importance of integrating content with pedagogy to enhance student learning outcomes.

However, slightly lower ratings in Pedagogical Knowledge and Knowledge of Context (both with Mean = 3.68, SD = 0.32) suggest areas where teachers may require further professional development, particularly in adapting instructional strategies and addressing diverse learning contexts. Research by Aksu & Kul (2020) and Sarkar et al. (2024) emphasizes the role of PCK in student achievement, underscoring the need for structured professional development to strengthen instructional strategies. Similarly, Forsler et al. (2023) advocate for reflective teaching practices, such as Content Representation (CoRe) and video analysis, to enhance pedagogical skills. Moreover, Sakaria et al. (2023) highlight that professional development and teaching experience are key factors in shaping PCK, reinforcing the need for targeted training programs to help teachers refine their instructional approaches. These findings collectively suggest that while mathematics teachers demonstrate strong PCK, continuous professional development in pedagogical strategies and contextual adaptation is essential to further enhance instructional effectiveness.

Part II. Instructional Management Performance (IPCRF)

Table 7. *Instructional Management Performance*

Objectives	*Mean*	*SD*	*DI*	*VI*
OBJ 1. Applied knowledge of content within and across curriculum teaching areas	4.97	0.15	Outstanding	Exemplary
OBJ 2. Used a range of teaching strategies that enhance learner achievement in literacy and numeracy skills	4.93	0.28	Outstanding	Exemplary
OBJ 3. Applied a range of teaching strategies to develop critical and creative	4.91	0.31	Outstanding	Exemplary

thinking, as well as other higher-order thinking skills				
OBJ 4. Used Mother Tongue, Filipino and English to facilitate teaching and learning	4.96	0.22	Outstanding	Exemplary
Content Knowledge and Pedagogy	4.94	0.16	Outstanding	Exemplary
OBJ 5. Established safe and secure learning environments to enhance learning through the consistent implementation of policies, guidelines and procedure	4.97	0.16	Outstanding	Exemplary
OBJ 6. Maintained learning environments that promote fairness, respect and care to encourage learning	4.96	0.18	Outstanding	Exemplary
Learning Environment	4.96	0.16	Outstanding	Exemplary
OBJ 7. Established a learner-centered culture by using teaching strategies responsive to their linguistic, cultural, socio-economic and religious background	4.92	0.19	Outstanding	Exemplary
OBJ 8. Planned and used culturally appropriate teaching strategies to address the needs of diverse learners	4.93	0.20	Outstanding	Exemplary
Diversity of Learners	4.93	0.16	Outstanding	Exemplary
OBJ 10. Used strategies for providing timely, accurate and constructive feedback to improve learner performance	4.95	0.17	Outstanding	Exemplary
Assessment and Reporting	4.95	0.17	Outstanding	Exemplary
Overall	4.95	0.12	Outstanding	Exemplary

***Legend**: 4.50–5.00 - Outstanding; 3.50–4.49 - Very Satisfactory; 2.50–3.49 – Satisfactory; 1.50–2.49 - Unsatisfactory; Below 1.49: Poor; SD - Standard Deviation; DI - Descriptive Interpretation; VI - Verbal Interpretation*

The findings highlight the crucial role of instructional management in enhancing teachers' effectiveness and adaptability, aligning with Mallillin et al. (2023). The high rating in the IPCRF classroom observation tool (M = 4.95, SD = 0.12) supports the assertion that strong instructional management enables teachers to create inclusive learning environments, implement diverse strategies, and address students' needs effectively. Studies by Patalinghug and Arnado (2021) and Manigbas et al. (2024) further emphasize how teachers' ability to adapt lessons and use evidence- based methods enhances student learning. Additionally, research by Siegler (2024) and Mohamad (2024) underscores the importance of supportive classroom environments in fostering mathematical thinking and engagement, reinforcing the link between instructional management and high teaching performance.

Teachers also demonstrate exceptional competence in differentiated instruction and fair, competency-based assessments, as supported by Insorio (2024), Ardiawan et al. (2024), Zhan et al. (2022), and Guskey and Bailey (2024). Their ability to tailor instruction to diverse student needs promotes inclusivity and improves mathematical proficiency. The study by Mamigo (2021) found that teachers generally performed well in the COT-RPMS parameters, with no significant correlation between their profiles and performance ratings. Meanwhile, Obispo et al. (2021) highlight the importance of an authoritative management style in fostering positive learning environments, student engagement, and well-being. Overall, with an outstanding overall mean of 4.94, the findings confirm that teachers exhibit high instructional competence, excelling in content mastery, pedagogical strategies, and classroom management, ultimately contributing to meaningful learning experiences.

Part III. Comparison

Table 8. *Pedagogical Content Knowledge vis-à-vis Position*

Variables	*Group*	*Mean*	*SD*	*Sig.*	*Decision on H_0*	*Interpretation*
Pedagogical Knowledge	Immediate Superiors	3.73	0.30	0.062	Failed to Reject	Not Significant
	Teachers	3.64	0.33			
Knowledge of Learners and Learning	Immediate Superiors	3.74	0.29	0.026	Reject	Significant
	Teachers	3.64	0.32			
Curriculum Knowledge	Immediate Superiors	3.77	0.27	0.003	Reject	Significant
	Teachers	3.63	0.35			
Content Knowledge	Immediate Superiors	3.80	0.26	0.001	Reject	Significant
	Teachers	3.64	0.35			
Knowledge of Contexts	Immediate Superiors	3.76	0.27	0.001	Reject	Significant
	Teachers	3.60	0.38			
Pedagogical Content Knowledge	Immediate Superiors	3.76	0.25	0.002	Reject	Significant
	Teachers	3.63	0.30			

Note: Significance level at 0.05.

The Independent Sample t-test results reveal a significant difference in how teachers and their direct superiors assess Pedagogical

Content Knowledge (PCK), with superiors generally rating PCK higher (mean = 3.76) than teachers (mean = 3.63). This discrepancy is particularly evident in areas such as Knowledge of Learners and Learning, Curriculum Knowledge, Content Knowledge, and Knowledge of Context, while Pedagogical Knowledge shows no significant difference. The variance may stem from differences in evaluation perspectives—superiors assess based on broader criteria such as adherence to standards and student outcomes, while teachers may provide more critical self-assessments based on their day-to-day challenges. Cultural or relational factors could also influence the results, as superiors might give higher ratings to maintain positive relationships or encourage professional growth.

The findings emphasize the need for open communication between teachers and superiors to align evaluation criteria and professional expectations. Studies by Forsler (2024) and Fukaya et al. (2024) highlight the importance of reflective tools and professional development in strengthening PCK, particularly in subject areas like sustainability, mathematics, and science. Additionally, Cordova and Linaugo (2022) reinforce that instructional effectiveness is closely tied to a teacher's mastery of both subject matter and student assessment strategies. These findings suggest that addressing the observed discrepancies through targeted training programs can enhance instructional practices, promote collaboration, and improve overall teaching effectiveness.

Part IV. Correlation

Table 9. *Relationship between Variables*

Variables	*Content Knowledge and Pedagogy*	*Learning Environment*	*Diversity of Learners*	*Assessment and Reporting*	*Instructional Management*
Pedagogical Knowledge	r = 0.073 Sig. = 0.489	r = 0.107 Sig. = 0.312	r = 0.165 Sig. = 0.119	r = 0.131 Sig. = 0.216	r = 0.171 Sig. = 0.104
Knowledge of Learners and Learning	r = 0.012 Sig. = 0.913	r = 0.089 Sig. = 0.400	r = 0.153 Sig. = 0.149	r = 0.120 Sig. = 0.257	r = 0.123 Sig. = 0.247
Curriculum Knowledge	r = - 0.047 Sig. = 0.658	r = 0.007 Sig. = 0.947	r = 0.054 Sig. = 0.613	r = 0.063 Sig. = 0.556	r = 0.037 Sig. = 0.725
Content Knowledge	r = 0.041 Sig. = 0.697	r = 0.149 Sig. = 0.157	r = 0.181 Sig. = 0.086	r = 0.185 Sig. = 0.080	r = 0.209* Sig. = 0.046
Knowledge of Contexts	r = 0.016 Sig. = 0.878	r = 0.133 Sig. = 0.207	r = 0.092 Sig. = 0.386	r = 0.183 Sig. = 0.083	r = 0.102 Sig. = 0.335
Pedagogical Content Knowledge	r = 0.033 Sig. = 0.755	r = 0.107 Sig. = 0.310	r = 0.156 Sig. = 0.141	r = 0.146 Sig. = 0.168	r = 0.165 Sig. = 0.165

Note: correlations at 0.01 level.

The Spearman Rho Correlation analysis indicates no significant relationship between Pedagogical Content Knowledge (PCK) and Instructional Management Performance ($r_s = 0.147$, $p = 0.165$), suggesting that variations in teachers' pedagogical understanding do not directly correspond to differences in their instructional management effectiveness. However, a weak but statistically significant correlation exists between Content Knowledge and Instructional Management Performance ($r_s = 0.209$, $p = 0.046$), implying that a deeper understanding of subject matter may have a slight influence on instructional practices. This suggests that while content mastery is essential, it does not automatically translate into effective classroom management, as instructional effectiveness also depends on factors such as communication, student motivation, and adaptability to diverse learners.

The Proposed Mathematics Teacher's Developmental Plan

The proposed Mathematics Teacher's Developmental Plan aims to enhance teachers' Pedagogical Content Knowledge (PCK) and Instructional Management Performance (IMP) through a structured and targeted approach. Using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation), the plan aligns with the Individual Performance Commitment and Review Form (IPCRF) and the Results-Based Performance Management System (RPMS) to ensure continuous professional growth. To address the lowest-rated component of PCK, Pedagogical Knowledge, monthly workshops on differentiated instruction and active learning strategies will be conducted, equipping teachers with effective classroom strategies. Additionally, Knowledge of Context will be strengthened through quarterly community immersion programs and case studies, allowing teachers to incorporate local contexts into their lesson planning and instruction.

To bridge the gap between teachers' self-assessed PCK and their supervisors' evaluations, the plan includes regular teacher-supervisor dialogue sessions and co-observations to ensure aligned assessment criteria and expectations. Since Content Knowledge was highly rated but significantly linked to IMP, monthly subject-focused seminars and peer-sharing sessions will be implemented to further deepen teachers' expertise in mathematics instruction. Moreover, to sustain teachers' outstanding IMP ratings, peer mentoring and collaborative assessment design workshops will be conducted quarterly, fostering a culture of continuous learning and instructional innovation. Recognizing the importance of student feedback in teaching effectiveness, the plan also introduces quarterly student feedback mechanisms, providing teachers with insights into their instructional impact.

To ensure long-term growth, a longitudinal tracking system will be established to monitor teachers' professional development over time, using data-driven insights to refine future interventions. The plan's sustainability will be supported through regular budget

allocations for professional development, community partnerships to enhance contextual learning, and continuous evaluation through pre- and post-training assessments, feedback forms, and performance tests. Furthermore, teacher empowerment initiatives such as action research and peer-led activities will encourage professional ownership and innovation. By implementing these strategies, the developmental plan seeks to strengthen teachers' pedagogical and instructional competencies, ultimately leading to improved teaching effectiveness and enhanced student learning outcomes in mathematics.

These findings emphasize the multifaceted nature of instructional management, which extends beyond content expertise to include pedagogical skills, classroom strategies, and external influences such as teaching environments and resource availability. While teachers with strong content knowledge may better implement instructional strategies, their effectiveness is shaped by broader teaching competencies. This highlights the need for further research into the complex interplay of PCK components and instructional management. Understanding these dynamics can inform targeted professional development programs that enhance both content mastery and classroom management skills, ultimately fostering more effective teaching and learning environments.

Conclusions

The study's findings highlight important insights into the Pedagogical Content Knowledge (PCK) and Instructional Management Performance (IMP) of mathematics teachers. The results indicate that while teachers demonstrate strong overall PCK, there are variations across different components. Specifically, Content Knowledge and Curriculum Knowledge were rated the highest, suggesting that teachers are confident in their understanding of mathematical concepts and curriculum structure. However, slightly lower ratings in Pedagogical Knowledge and Knowledge of Context suggest that some teachers may require additional support in instructional strategies and contextualizing lessons to meet diverse learner needs. This underscores the need for targeted professional development in these areas to ensure a well-rounded and effective teaching approach.

The study also found that teachers' instructional management performance was rated outstanding across all assessed domains, indicating their strong ability to manage classroom instruction, create a conducive learning environment, address learner diversity, and effectively assess and report student progress. However, a significant difference was observed between teachers' self-assessments of their PCK and the evaluations given by their supervisors. This gap suggests that teachers may overestimate or underestimate their competencies compared to how their direct superiors perceive them. The misalignment in perception highlights the need for a more structured and collaborative feedback mechanism, where teachers receive regular, constructive input from their supervisors to bridge any disparities in understanding their professional strengths and areas for growth.

Furthermore, the study revealed that PCK and IMP, when examined holistically, do not exhibit a significant correlation. This suggests that possessing strong pedagogical content knowledge does not automatically translate into higher instructional management performance. However, a weak but significant relationship was found between Content Knowledge and IMP, indicating that a solid grasp of mathematical content may contribute to more effective instructional management. This finding reinforces the importance of continuous subject-matter training, ensuring that teachers not only master mathematical concepts but also translate this knowledge into effective teaching strategies that improve student engagement and learning outcomes.

To address these findings, a Mathematics Teachers' Developmental Plan was proposed, structured around the ADDIE model and aligned with the Individual Performance Commitment and Review Form (IPCRF) under the Results-Based Performance Management System (RPMS). This plan aims to enhance PCK and IMP through professional development programs that focus on differentiated instruction, contextualized learning, and collaborative assessment strategies. Additionally, it promotes ongoing dialogue between teachers and supervisors, ensuring alignment in evaluation criteria and fostering a culture of continuous professional growth. By strengthening teachers' pedagogical and instructional management skills through structured training, mentorship, and performance monitoring, the plan aims to sustain improvements in teaching effectiveness, ultimately leading to better student learning outcomes in mathematics.

Conduct targeted workshops focusing on enhancing teachers' Pedagogical Knowledge and Knowledge of Context, such as differentiated instruction and inclusive education. These workshops should be scheduled quarterly within the next six months, with success evaluated through pre- and post-workshop assessments and feedback surveys, aiming for a 90% satisfaction rate. Organize specialized Content Knowledge seminars and training sessions on advanced mathematical concepts to deepen subject expertise. Partner with local universities or experts, and assess the impact through pre- and post-seminar tests, targeting at least a 20% improvement in scores. Two seminars should be conducted within the next academic year. Facilitate regular dialogue sessions and co-observation practices between teachers and their immediate supervisors to synchronize evaluation criteria and foster professional growth. Allocate one session per quarter, starting next month, and track progress through quarterly feedback forms.

Develop community immersion programs to enhance teachers' contextual understanding by allowing them to better understand students' socio-cultural backgrounds. These programs should be conducted twice in the next six months, with a target of 80% teacher participation in the cluster. Implement performance monitoring tools, such as surveys and performance tests, to evaluate progress in pedagogical content knowledge and instructional management performance. The tools should be in place within the next three months, with semi-annual reviews to ensure that 90% of teachers show improvement. Encourage teachers to develop personal action plans for

professional growth, aligned with the IPCRF criteria. Provide templates and guidelines for these plans, and require all teachers to submit and implement them within two months.

Conduct regular workshops on differentiated instruction to address diversity in learners and enhance the teaching environment. Workshops should be held twice a year, with specific outcomes tied to improved teaching strategies and inclusivity practices. Organize assessment and reporting training to strengthen teachers' ability to align their assessments with learning goals. These sessions should occur annually, with a focus on creating valid and reliable evaluation tools for better reporting and decision-making. Establish specialized mentoring programs where expert teachers can guide less experienced peers. These programs should focus on building pedagogical confidence and expertise, with a goal of at least 50% of new teachers being mentored within the next academic year.

Based on the finding of a weak relationship between Content Knowledge and Instructional Management Performance, it is recommended that teacher development programs integrate both content knowledge and instructional management skills. Specifically, professional development should include training that enhances teachers' pedagogical skills, such as classroom management, student engagement, and adaptive teaching strategies, alongside content mastery. To measure success, pre- and post-assessment evaluations should be conducted, including classroom observations and student surveys about the learning environment. The program can be implemented using existing school or district resources, with experienced trainers leading the sessions. This approach will ensure that teachers are equipped not only with deep content knowledge but also with the pedagogical strategies needed to create an engaging and supportive classroom environment. The program should be rolled out within the next academic year, with a follow-up evaluation six months after completion to assess improvements in both teaching practices and classroom management. This holistic approach will help teachers manage diverse classroom dynamics while delivering high-quality instruction.

Adopt the Teachers' Developmental Plan, modeled on the ADDIE framework and aligned with the IPCRF and RPMS. This plan systematically enhances pedagogical content knowledge and instructional management performance through structured phases: analysis, design, development, implementation, and evaluation. It includes targeted workshops, community immersion programs, and regular evaluation tools to promote teacher empowerment and sustained professional growth.

References

Aksu, Z., & Kul, Ü. (2019). The mediating role of mathematics teaching efficacy on the relationships between pedagogical content knowledge and mathematics teaching anxiety. SAGE Open, 9(3). https://doi.org/10.1177/2158244019871049

Ardiawan, I. K. N., Lasmawan, I. W., Dantes, N., & Dantes, G. R. (2024). The impact of differentiated learning materials on students' understanding of nationalism and global diversity. Journal of Education and e- Learning Research, 11(1), 107–112.

Chen, J., & Zhang, L. (2019). The impact of structured lesson planning on teacher reflection and student engagement. Journal of Education and Learning, 8(4), 123- 135.

Cooper, D. R., & Schindler, P. S. (2014). Business research methods (12th ed.). McGraw- Hill Education.

Cordova, W. M., & Linaugo, J. D. (2022). Pedagogical content knowledge practices of public-school science teachers. Technium Soc. Sci. J., 37, 37

Department of Education (Philippines). (2015). "DO 2, s.2015–Guidelines on the Establishment and Implementation of the Results-Based Performance Management System (RPMS)." Retrieved from DepEd Official Website

Dizon, A. D., Pedro, A. B. S., Munsayac, M. M., Padilla, J., & Pascual, M. C. G. (2018). Level ofimplementation of the results-based performance management system in the department of education division of gapan city, philippines. Zenodo (CERN European Organization for Nuclear Research). https://doi.org/10.5281/zenodo.1172398

Forsler, A., Nilsson, P., & Walan, S. (2023). Capturing and developing teachers' pedagogical content knowledge in sustainable development using content representation and Video-Based reflection. Research in Science Education, 54(3), 393–412. https://doi.org/10.1007/s11165-023-10149-y

Granström, Mikk & Härma, Eliis & Kikas, Eve. (2023). Teachers' knowledge of students' learning strategies: recommendations and evaluations. Nordic Studies in Education. 43. 10.23865/nse. v43.5501.

Guskey, T. R., & Bailey, J. M. (2024). Developing grading and reporting systems for student learning. Corwin Press.

Hernandez, R., & Cruz, J. (2020). The impact of performance evaluation tools on teachers' instructional practices and classroom management. International Journal of Educational Research, 109, 10185

Hill, H. C., Ball, D. L., & Schilling, S. G. (2008). Unpacking pedagogical content knowledge: conceptualizing and measuring teachers' topic- specific knowledge of students. Journal for Research in Mathematics Education, 39(4), 372-400. T

Insorio, A. O. (2024). Addressing student diversity to improve mathematics achievement through differentiated instruction. International Journal of Professional Development Learners and Learning, 6(1), ep2406.

Kim, Insook & Ko, Bomna. (2020). Content knowledge, enacted pedagogical content knowledge, and student performance between teachers with different levels of content expertise. Journal of Teaching in Physical Education.111-120. 10.1123/jtpe.2018-0292.

Leedy, P. D., & Ormrod, J. E. (2019). Practical research: Planning and design (12th ed.). Pearson Education.

M. P. (2024). Teachers' Competency in Content Knowledge and Pedagogy in Buhi South District, Philippines. International Education Trend Issues, 2(1), 21– 30. https://doi.org/10.56442/ieti.v2i1.365

Mallillin, Leovigildo Lito & Mallillin, D. (2023). Instructional Management System Theory. 10.47991/2835-6764/AJSER-136.

Manigbas, J. I., Ollet, A. L., Noble, M. P. L., Angeles, J. R., Cayetano, N. M., & Fucio,

Mccombs, Barbara. (2001). What Do We Know about Learners and Learning? The Learner Centered Framework: Bringing the Educational System into Balance. Educational Horizons. 79.

Mohamad, S. L. (2024). Learning environment and academic engagement in science of junior high school students. International Journal of Research Publications, 141(1). https://doi.org/10.47119/ijrp1001411120246031

Morre, Michael C. Jr. and Noel T. Casocot, (2022). Teachers' pedagogical knowledge and mathematical skills as predictors of students achievement in the new normal. United International Journal for Research & Technology (UIJRT), 3(6), pp.35-43.

Ndihokubwayo, J., Umulisa, M., & Niyomugabo,A. (2022). Factors influencing motivation: the role of learning environment in Rwandan secondary schools. International Journal of Learning, Teaching and Educational Research, 21(5), 1-15.

Patalinghug, J. S., & Arnado, A. A. (2021). Mathematics teachers' technological pedagogical and content knowledge and their capacity for differentiated instruction. International Journal of Multidisciplinary Applied Business and Education Research, 2(7), 574–586. https://doi.org/10.11594/ijmaber.02.07.05

Refugio, Craig & Bulado, Maria & Galleto, Patrick & Noblefranca, Clint. (2020). Content knowledge level of elementary mathematics teachers: The case of a school district in the Philippines. Cypriot Journal of Educational Sciences. 15. 604-618. 10.18844/cjes.v15i3.4551.

Rivera, J. (2024). Culturally responsive teaching and learning achievement. Education Dissertations,80. https://digitalcommons.spu.edu/soe_etd/80

Sarmah, H. K., & Hazarika, B. B. (2012). Importance of the size of sample and its determination in the context of data related to the schools of greater Guwahati. Bulletin of the Gauhati University Mathematics Association, 12(1), 55- 76.

Shulman, L. S. (1986). Those who understand: knowledge growth in teaching. Educational Researcher, 14(2), 4-14.

Siegler, R. S. (2024). Connecting learning environments to learning: Two examples from children's mathematics. Developmental Review,73, 101138.https://doi.org/10.1016/j.dr.2024.101138

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Peck, R., Rowley, G.(2008). Teacher Education and Development Study in Mathematics (TEDS-M): Policy, practice, and readiness to teach primary and secondary mathematics. Conceptual framework. Teacher Education and Development International Study Center, College of Education, Michigan State University. https://www.iea.nl/sites/default/files/2019-04/TEDS-M_Framework.pdf

Tesfaw, B. K., Ayele, M. A., & Wondimuneh, T. E. (2024). Context-based problem- posing and solving instructional approach and students' engagement in learning data handling. Cogent Education, 11(1).

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