

Instructional practices and pedagogical challenges among secondary mathematics teachers: Implications for instructional enhancement

Louie T. Gannaban

Northeastern College
Santiago City, Isabela, Philippines

ABSTRACT

Mathematics education remains a critical concern globally and locally, particularly in improving instructional quality and addressing persistent learning gaps. However, limited context-specific research exists on how instructional practices relate to the pedagogical challenges faced by secondary mathematics teachers in rural districts. This study employed a descriptive-correlational quantitative design to assess the instructional practices and pedagogical challenges of 40 junior and senior high school mathematics teachers in the Sto. Tomas District, Schools Division of Isabela, during School Year 2025–2026. Findings revealed that teachers consistently demonstrated strong instructional planning and assessment practices, while instructional implementation and use of materials were often practiced. Teachers reported slight but persistent challenges in student engagement, differentiated instruction, curriculum coverage, and technology integration. A strong positive correlation ($r = .836$, $p < .05$) was found between instructional practices and pedagogical challenges, indicating that increased instructional sophistication corresponds with heightened pedagogical demands. The study underscores the need for differentiated professional development and strengthened institutional support systems to sustain enhanced mathematics teaching strategies.

Keywords: Instructional practices, pedagogical challenges, mathematics education, differentiated instruction, technology integration

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INTRODUCTION

Mathematics is a foundational subject that plays a vital role in developing critical thinking, problem-solving, and analytical skills necessary for individual growth and societal advancement. Globally, mathematics education is regarded as essential not only for academic success but also for preparing learners to thrive in a data-driven and technologically advanced world (UNESCO, 2021).

Recent global trends in instructional practices have shifted toward more student-centered and inquiry-based approaches. These include strategies that promote conceptual understanding, real-world application, and collaborative problem-solving. Key pedagogical

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trends involve technology-enhanced instruction, formative assessment, differentiated learning, and the integration of interdisciplinary tasks (OECD, 2019). These shifts aim to cultivate deeper mathematical thinking and long-term retention.

Despite these efforts, many education systems worldwide continue to face persistent challenges in mathematics instruction. These include teacher shortages, limited professional development opportunities, inadequate instructional resources, and an overreliance on rote memorization and traditional lecture-based delivery (Cai & Wang, 2018; UNESCO, 2020). In low- and middle-income countries, such challenges are more pronounced, particularly in underserved and rural areas.

Global assessment programs such as the Programme for International Student Assessment (PISA) have played a crucial role in evaluating mathematical competencies. The 2018 PISA results revealed that a significant proportion of students across OECD countries performed below the minimum proficiency level in mathematics, with only 10% demonstrating advanced reasoning and problem-solving skills (OECD, 2019). These findings underscore the need for curriculum alignment with 21st-century skills and continuous instructional improvement.

In response, global education stakeholders have called for reforms focusing on enhanced teacher training, improved access to quality teaching materials, and the integration of equity-focused pedagogical models into national systems (UNESCO, 2021). These reforms align with Sustainable Development Goal 4 (SDG 4), which promotes inclusive and equitable quality education and lifelong learning opportunities for all (UN, 2015).

In Asia, mathematics education is prioritized due to its role in national development and global competitiveness. Countries such as Singapore, Japan, South Korea, and China consistently perform highly in international assessments like PISA and TIMSS, owing to rigorous curricula, strong teacher preparation, and research-based instructional practices (Mullis et al., 2020; OECD, 2019). These systems emphasize conceptual understanding, procedural fluency, and metacognitive strategies embedded within sustained professional learning communities and centralized curriculum planning (Cai & Wang, 2018).

Singapore, for example, adopts the Concrete–Pictorial–Abstract (CPA) approach to build deep conceptual understanding. Regular lesson study and structured mentoring further support teachers in adapting instruction to learners' needs (Huang & Leung, 2021). Similarly, Japan's structured problem-solving approach encourages students to explore and articulate mathematical ideas through guided inquiry and collaborative discourse (Isoda & Katagiri, 2012).

However, many Southeast Asian nations continue to face significant challenges in achieving comparable outcomes. In countries such as Indonesia, Malaysia, Thailand, and the Philippines, disparities in teacher competencies, limited professional development, and resource constraints hinder effective mathematics instruction (SEAMEO INNOTECH, 2020). Teacher quality remains a pressing concern, especially in rural and disadvantaged regions.

In the Philippines, mathematics education remains a persistent concern, particularly at the basic education level. International assessments consistently reveal low performance among Filipino learners. In the 2019 TIMSS, Grade 4 students ranked last among 58 participating countries (Mullis et al., 2020). Likewise, in the 2018 PISA, 80% of Filipino 15-year-old students performed below the minimum proficiency level (OECD, 2019).

These results highlight gaps in conceptual understanding, reasoning, and problem-solving skills. Contributing factors include overloaded curricula, limited instructional time, teacher competency gaps, and insufficient instructional materials (Magno, 2019). Additionally, mathematics is often perceived as difficult, leading to anxiety and disengagement (Mendoza & Velasco, 2020).

In response, the Department of Education (DepEd) implemented the K to 12 Curriculum, emphasizing spiral progression and learner-centered pedagogies, along with the Philippine Professional Standards for Teachers (PPST), which outlines competencies in planning, instruction, assessment, and professional growth (DepEd, 2017).

Despite these reforms, challenges persist at the school level. Teachers frequently encounter large class sizes, limited technological resources, time constraints, and insufficient training opportunities (Llego, 2022). These realities highlight the need to examine classroom-level instructional practices and pedagogical challenges, particularly in rural contexts such as Sto. Tomas District in the Schools Division of Isabela.

Preliminary observations in the district indicate difficulties in aligning instruction with spiral progression, differentiating instruction, integrating technology, managing formative assessment, and sustaining student engagement. These challenges are compounded by high student-teacher ratios and resource limitations.

Given these concerns, there is a need to systematically assess instructional practices and pedagogical challenges among secondary mathematics teachers in Sto. Tomas District. The findings will inform context-specific and evidence-based strategies to enhance instructional effectiveness and improve mathematics outcomes.

This study is anchored in two complementary frameworks: Shulman's Pedagogical Content Knowledge (PCK) and Mishra and Koehler's Technological Pedagogical Content Knowledge (TPACK).

Shulman (1986) introduced PCK to describe the integration of content knowledge and pedagogical knowledge necessary for effective teaching. It emphasizes understanding learners' misconceptions, selecting appropriate instructional strategies, designing curricula, and implementing suitable assessments. In this study, PCK serves as the lens for evaluating instructional planning, delivery, and assessment practices.

Mishra and Koehler (2006) expanded this model through TPACK, which incorporates technological knowledge alongside pedagogical and content knowledge. Effective technology integration requires a dynamic interplay among these domains. TPACK is particularly relevant in examining teachers' challenges in integrating digital tools into mathematics instruction.

Together, PCK and TPACK provide a comprehensive framework for analyzing how teachers plan, implement, assess, and adapt instruction while navigating contextual constraints. These frameworks guide the interpretation of findings and the development of strategies to enhance mathematics teaching in Sto. Tomas District.

Statement of the problem

This study aimed to assess the instructional practices and pedagogical challenges encountered by secondary mathematics teachers in the Sto. Tomas District, Schools Division of Isabela, and to propose strategies to enhance the effectiveness of mathematics teaching at the secondary level. Specifically, it sought to answer the following questions:

1. What is the demographic profile of the respondents in terms of age, gender, years of teaching experience, and educational background?
2. What instructional practices do secondary mathematics teachers commonly use in instructional planning, instructional implementation, instructional materials, and assessment and feedback?
3. What pedagogical challenges do teachers encounter in student engagement, curriculum coverage, differentiated instruction, and integration of technology?
4. Is there a significant relationship between teachers' instructional practices and the pedagogical challenges they encounter?

5. Is there a significant difference in the pedagogical challenges encountered when teachers are grouped according to their profile?

METHODOLOGY

This study employed a descriptive-correlational quantitative research design to examine the instructional practices and pedagogical challenges of junior and senior high school mathematics teachers in the Sto. Tomas District, Schools Division of Isabela, during the School Year 2025–2026. The descriptive component identified and analyzed teachers' instructional practices in instructional planning, implementation, use of instructional materials, and assessment and feedback. It also described the pedagogical challenges encountered in student engagement, curriculum coverage, differentiated instruction, and integration of technology. The correlational component determined whether significant relationships existed between instructional practices and pedagogical challenges, as well as whether differences were evident when grouped according to teachers' demographic profiles.

The study was conducted in Sto. Tomas District, a rural and semi-urban area in Isabela Province. All junior and senior high school mathematics teachers in public secondary schools within the district were included through total enumeration sampling. Only actively teaching mathematics teachers who voluntarily consented to participate were involved in the study.

Data were gathered using a researcher-developed structured questionnaire grounded in relevant literature and contextualized to the local setting. The instrument consisted of three sections: demographic profile, instructional practices, and pedagogical challenges. Prior to full implementation, the questionnaire underwent pilot testing in a comparable district. Cronbach's Alpha was computed to establish internal consistency, and necessary revisions were made based on statistical results and expert feedback.

After securing official approvals, the questionnaire was administered either face-to-face or through an online platform. Frequency and percentage were used to describe respondents' profiles, while mean and standard deviation determined levels of instructional practices and pedagogical challenges. Pearson Product-Moment Correlation tested relationships between variables, and ANOVA and Independent Samples t-test determined significant differences based on profile characteristics. Ethical standards were strictly observed throughout the study.

RESULTS AND DISCUSSION

This chapter presents the findings of the study conducted among 40 secondary mathematics teachers from the Sto. Tomas District, Schools Division of Isabela. The study employed a descriptive-correlational research design to assess the instructional practices and pedagogical challenges of the respondents, and to determine whether significant relationships and differences exist across demographic variables. Data were gathered through a structured survey instrument and analyzed using descriptive statistics, Pearson product-moment correlation, and tests for significant differences. All results are interpreted in direct relation to the objectives of the study, and the discussion is grounded entirely in the data gathered from the respondents.

Demographic profile of the respondents

The demographic composition of the 40 respondents reflects a professionally diverse and academically advanced teaching workforce. In terms of age, the largest group fell within the 35 to 40 years old bracket, comprising 27.5% of the sample, followed by those aged 41 to 45 years old at 20%. Teachers aged 30 and below and those aged 51 years and above each

accounted for 15% of the respondents. This distribution indicates that the teaching force is largely composed of mid-career educators, with meaningful representation from both early-career and veteran teachers, suggesting a balanced blend of instructional energy and accumulated professional experience.

Regarding gender, 70% of the respondents were female and 30% were male. This distribution is consistent with broader national patterns in Philippine basic education, where female educators constitute the dominant professional group. In terms of teaching experience, the highest proportion of respondents had 6 to 10 years of service at 27.5%, followed by those with 21 to 25 years of experience at 22.5%. Meanwhile, 20% had five years or below of teaching service, indicating the presence of novice teachers who are still in the process of consolidating their instructional competencies and professional identity.

Educational attainment further underscores the academic caliber of the respondents. Forty-five percent held a master's degree, and 20% had completed a doctorate degree, while only 5% were college graduates without advanced academic preparation. These figures collectively portray a highly qualified group whose graduate-level credentials suggest substantial exposure to research-based pedagogy and evidence-informed instructional practice. The diversity in experience levels, meanwhile, presents meaningful opportunities for mentoring relationships and professional collaboration within the district.

Instructional practices of secondary mathematics teachers

Across all four instructional domains examined in this study, teachers demonstrated consistently high levels of practice, reflecting a professionally organized and pedagogically committed teaching force. In the domain of instructional planning, the overall mean was 4.22, interpreted as always practiced. Teachers reported consistently preparing detailed lesson plans, integrating varied teaching strategies, and incorporating both technology and real-world applications into their instructional design. These findings suggest a deliberate effort to align instructional content with curriculum standards while simultaneously responding to the diverse learning needs of students.

Instructional implementation obtained an overall mean of 4.12, interpreted as often practiced. Teachers frequently initiated lessons with clearly stated objectives, modeled problem-solving processes, adjusted instruction based on observed learner understanding, and provided immediate clarification of student misconceptions. These practices reflect a structured and responsive approach to classroom delivery, characterized by strong management of the instructional flow and attentiveness to learner progress.

In the domain of instructional materials, the overall mean was 4.15, also interpreted as often practiced. Teachers consistently utilized DepEd-recommended textbooks, visual aids, and supplemental materials to support learning. While multimedia and digital tools were reported as regularly used, their integration was not yet fully maximized, indicating that further enrichment through technology remains an area with substantial room for development and systematic enhancement.

Assessment and feedback emerged as a particular strength among the respondents, recording an overall mean of 4.22, interpreted as always practiced. The highest-rated individual indicator was discussing assessment results with students, with a mean of 4.54, followed by the use of varied assessment forms, which obtained a mean of 4.45. These results demonstrate strong assessment literacy among the teachers and reflect a well-established alignment between learning objectives, instructional delivery, and evaluative practice. Taken together, the findings across all instructional domains portray teachers who are pedagogically organized, assessment-conscious, and firmly committed to structured and deliberate instructional delivery.

Pedagogical challenges encountered by teachers

Despite the strength of their instructional practices, teachers reported moderate but recurring pedagogical challenges across the four domains examined. Student engagement registered the highest overall challenge mean of 3.07, interpreted as slightly challenged. Within this domain, encouraging consistent student participation in discussions and problem-solving activities obtained a mean of 3.98, while addressing mathematics anxiety among learners yielded a mean of 3.67. These findings suggest that the affective and motivational dimensions of mathematics learning represent persistent and complex instructional realities that are not fully resolved by strong planning and delivery practices alone.

Curriculum coverage yielded an overall mean of 2.73, likewise interpreted as slightly challenged. Teachers reported mild difficulty in balancing the depth of instructional discussion with the pacing demands of the prescribed curriculum, with a mean of 3.21 for this particular concern. Nevertheless, teachers generally managed remediation and review activities effectively, suggesting a degree of professional resilience and adaptive capacity in navigating curriculum-related constraints.

Differentiated instruction registered an overall mean of 2.84, interpreted as slightly challenged. The more demanding aspects within this domain included identifying the diverse learning needs of students, which obtained a mean of 3.33, and providing individualized instructional support within large class settings, with a mean of 3.24. These results reflect the structural complexity inherent in implementing inclusive and responsive instruction in heterogeneous classroom environments, where learner variability is high and resources for individualized support are often limited.

Technology integration presented a slightly challenged overall mean of 2.88. The most salient concerns in this domain involved ensuring equal student access to digital tools, with a mean of 3.24, and meaningfully enhancing conceptual understanding through the use of technology, which obtained a mean of 3.15. These findings point to infrastructural and pedagogical constraints rather than a fundamental resistance to innovation, underscoring the need for institutional investment in both digital resources and professional development in technology-integrated instruction. Collectively, the data indicate that while the teachers are instructionally competent, the complexity of their work intensifies when addressing learner engagement, differentiation, and digital integration simultaneously.

Relationship between instructional practices and pedagogical challenges

The Pearson product-moment correlation analysis revealed a strong positive relationship between instructional practices and pedagogical challenges, with $r = .836$ and $p = .000$. This result is statistically significant at the .05 level of significance, leading to the rejection of the null hypothesis that no significant relationship exists between the two variables. The strength and direction of this correlation indicate that as teachers engage in more enhanced and diversified instructional practices, the pedagogical demands they encounter correspondingly increase.

This finding should not be interpreted as evidence of instructional inefficiency. Rather, it reflects the inherent complexity of implementing learner-centered, technology-integrated, and differentiated instructional strategies within authentic classroom settings. Teachers who actively innovate and diversify their approaches are exposed to more dynamic and multifaceted classroom variables, requiring greater cognitive effort, emotional labor, and organizational capacity. The correlation thus affirms that pedagogical ambition and instructional

sophistication naturally intensify the workload and challenges faced by teachers, a pattern well-documented in the broader literature on teacher professional practice and instructional reform.

Differences in pedagogical challenges based on profile

Significant differences in the levels of pedagogical challenges encountered were observed across several demographic variables. Teachers grouped by age yielded a significant result at $p = .002$, while those grouped by years of teaching experience produced a significant finding at $p = .032$. Educational attainment generated the most significant difference at $p = .000$, and gender differences were likewise significant at $p = .001$. These results collectively indicate that the null hypotheses of no significant differences were rejected across all four profile variables examined.

Female teachers reported higher levels of pedagogical challenge, with a mean of 4.02, compared to their male counterparts, whose mean was 3.45. This disparity may reflect differences in perceptions of workload, role expectations, and reflective professional awareness within the teaching context. The variations observed across age and experience groups suggest that generational and experiential contexts meaningfully shape instructional challenges, with younger and less experienced teachers potentially facing greater difficulties in classroom management and pacing, while veteran educators may encounter adaptation challenges related to technological change and evolving curricular reforms. The significant differences based on educational attainment further suggest that higher levels of academic preparation may heighten pedagogical sensitivity and awareness, leading graduate-degree holders to more acutely recognize and report the complexities of their instructional environments.

The findings of this study collectively portray a group of secondary mathematics teachers who are highly qualified, professionally engaged, and demonstrably strong in the core domains of instructional planning, implementation, materials use, and assessment. These teachers operate within a context of considerable instructional sophistication, as evidenced by their consistently high practice means across all domains. However, the data also reveal that this very sophistication is accompanied by heightened pedagogical complexity, particularly in the areas of student engagement, differentiated instruction, and technology integration. The statistically significant positive correlation between instructional practices and pedagogical challenges, together with the significant demographic variations in challenge levels, underscores that instructional excellence is not achieved in isolation but is deeply intertwined with contextual, experiential, and professional factors. These findings address the core objectives of the study and contribute meaningfully to the existing body of knowledge on mathematics teacher practice at the secondary level. They further establish a compelling empirical foundation for the development of targeted support structures and professional development interventions, which are explored in the succeeding chapter of this manuscript.

CONCLUSION

The findings of the study reveal that secondary mathematics teachers in the Sto. Tomas District constitutes a professionally mature and academically well-prepared workforce, predominantly composed of mid-career educators, largely female, and with a substantial proportion holding graduate degrees. The teachers demonstrate strong instructional practices, particularly in lesson planning, assessment and feedback, and the utilization of instructional materials, while instructional implementation is consistently practiced at a high level. Despite these strengths, teachers experience slight yet persistent challenges in student engagement, curriculum coverage, differentiated instruction, and technology integration. The significant

positive correlation between instructional practices and pedagogical challenges suggests that as teachers adopt more varied and learner-centered strategies, the complexity of instructional demands correspondingly increases. Moreover, the presence of significant differences in challenges across age, years of service, educational attainment, and gender confirms that pedagogical difficulties are shaped by demographic and professional characteristics rather than being uniformly experienced.

In light of these conclusions, it is recommended that the Schools Division provide targeted and differentiated professional development programs that focus on strengthening student engagement strategies, effective differentiated instruction, and meaningful technology integration tailored to teachers' specific profiles and career stages. Enhancing technological infrastructure through improved internet connectivity, sufficient digital devices, and sustained ICT training is likewise essential to support instructional innovation. Curriculum support mechanisms should also be reinforced by allocating structured time for remediation, enrichment, and strategic pacing to ensure balanced coverage of competencies. Furthermore, strengthening collaborative structures such as Learning Action Cells (LACs) can promote shared expertise, peer mentoring, and collective problem-solving among mathematics teachers. Finally, increasing access to updated instructional resources—including manipulatives, digital tools, and current reference materials—will help reduce preparation burdens and enable teachers to sustain high-quality mathematics instruction.

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