Teachers' AI Integration in Teaching Mathematics Classes

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ABSTRACT

This study examined the experiences of public high school Mathematics teachers in integrating artificial intelligence (AI) into Mathematics instruction in the Division of Valencia City. Guided by a qualitative research design and thematic analysis, the study explored teachers' reasons for using AI, the challenges they encountered, the strategies they employed to address these challenges, and their recommendations for effective AI integration. Data were gathered through written interviews administered via Google Forms to fifteen Mathematics teachers with at least five years of teaching experience. Findings revealed that teachers primarily integrated AI to enhance instructional effectiveness by making Mathematics lessons more engaging, interactive, personalized, and time-efficient. AI was viewed as a supportive instructional partner that assists in lesson preparation, concept explanation, activity generation, and feedback provision, allowing teachers to focus more on meaningful classroom interactions. Despite these benefits, teachers encountered challenges such as unstable internet connection, limited access to devices, unfamiliarity with AI tools, difficulties in refining AI-generated content, and concerns about students' over-dependence on AI, which could hinder critical thinking and problem-solving skills. To address these challenges, teachers adopted adaptive strategies including self-learning and upskilling, gradual and balanced integration of AI with traditional teaching methods, preparation of offline alternatives, careful review and validation of AI outputs, and active facilitation of students' responsible use of AI. Teachers emphasized guiding learners to use AI as a support or "hint helper" rather than a substitute for thinking. The study concludes that while AI offers significant potential to improve Mathematics instruction, its effective use requires responsible, purposeful, and well-guided integration supported by continuous professional development and adequate institutional support.

INTRODUCTION

The integration of artificial intelligence (AI) in education has significantly transformed instructional practices by providing innovative tools that support lesson planning, assessment, and personalized learning experiences. In Mathematics education, AI-powered applications such as ChatGPT, GeoGebra, Wolfram Alpha, and intelligent tutoring systems have been increasingly utilized to enhance conceptual understanding, problem-solving skills, and student engagement through adaptive feedback and visualization of abstract concepts (Yi et al., 2024; Noakes et al., 2024). Recent studies highlight that AI technologies in Mathematics classrooms assist teachers by automating repetitive tasks, generating differentiated instructional materials, and providing instant feedback to learners, allowing teachers to focus more on higher-order instructional roles (Albalawi, 2025; Lin et al., 2025). These advancements position AI as a supportive instructional tool rather than a replacement for teachers, emphasizing the continued importance of pedagogical decision-making.

However, the effective integration of AI in Mathematics teaching largely depends on teachers' perceptions, confidence, and readiness to use AI tools. Research reveals that Mathematics teachers generally express positive attitudes toward AI integration, recognizing its potential to improve instructional efficiency and address diverse learner needs, yet they also report concerns related to over-reliance on technology, weakening of students' problem-solving skills, and ethical considerations (Kuzu, 2025; Asanre et al., 2024). In the Philippine context, AI integration in basic education is gradually advancing but remains challenged by issues such as limited technological infrastructure, insufficient training, and the urban–rural digital divide (Co, 2025; Rodrigo & Talandron-Felipe, 2024). Studies conducted among Filipino teachers indicate a growing awareness

of AI tools, yet emphasize the need for continuous professional development and institutional support to ensure responsible and meaningful AI use in Mathematics instruction (Magat & Sangalang, 2024; Lacuna, 2025).

Despite these challenges, AI holds strong potential to transform Mathematics classrooms by enabling personalized learning, adaptive assessment, and data-driven instruction. Understanding teachers' experiences, struggles, and strategies in integrating AI is essential in developing context-appropriate interventions and support systems. Hence, this study explores Mathematics teachers' narratives on AI integration in the Division of Valencia City, providing localized insights that can inform policy formulation, teacher training programs, and best practices for AI-assisted Mathematics teaching.

Objectives

Specifically, this study seeks to:

1. Determine the reasons of Mathematics teachers for integrating artificial intelligence in teaching Mathematics lessons.

2. Identify the struggles encountered by Mathematics teachers in integrating AI in teaching Mathematics.

3. Describe the strategies implemented by Mathematics teachers to address the challenges they face in integrating AI in teaching Mathematics lessons.

4. Elicit recommendations from Mathematics teachers for other educators who plan to integrate artificial intelligence in teaching Mathematics lessons.

Significance of the Study

This study contributes to the growing body of knowledge on the integration of artificial intelligence (AI) in Mathematics education by examining the experiences and perspectives of public-school Mathematics teachers. By focusing on teachers' reasons for integrating AI, the challenges they encounter, and the strategies they employ, the study provides context-based insights into how AI is used in actual Mathematics classroom settings.

The findings of this study aim to inform educational policymakers, curriculum developers, school administrators, and teacher educators about both the potential benefits and existing barriers to integrating AI in Mathematics instruction. Understanding teachers lived experiences with AI can support the development of responsive policies, curriculum frameworks, and professional development programs that promote responsible, effective, and pedagogically sound use of AI tools in Mathematics teaching.

Moreover, the results of this research may help optimize AI adoption strategies by identifying practical classroom-level practices and support mechanisms that enhance teaching effectiveness and student engagement in Mathematics. Ultimately, the study seeks to contribute to improved instructional quality and to support informed decision-making related to AI-assisted teaching and learning in public secondary schools.

Scope and Limitations of the Study

This study focused on public high school Mathematics teachers in the Division of Valencia City who integrate artificial intelligence (AI) in teaching Mathematics lessons. It explored teachers' reasons for integrating AI, the challenges they encounter, the strategies they employ to address these challenges, and their recommendations for effective AI integration in Mathematics instruction. Data were collected through written interview responses via Google Forms, and participation was limited to teachers who voluntarily gave their consent. The study aimed to capture rich, descriptive accounts of teachers lived experiences and instructional practices related to AI use in Mathematics classrooms.

As a qualitative study, the findings are limited to the perceptions and experiences of the selected participants and are not intended to be generalized to all Mathematics teachers or other educational settings. The study did

not include classroom observations, student perspectives, or quantitative measures of learning outcomes, nor did it assess the effectiveness of specific AI tools. Additionally, the reliance on written responses through Google Forms may have limited opportunities for deeper probing and clarification compared to face-to-face interviews. The results are also bounded by the specific context and period during which the data were collected.

REVIEW OF LITERATURE AND STUDIES

Artificial Intelligence in Education

Artificial Intelligence (AI) is rapidly transforming education by enabling personalized learning, automating administrative tasks, and enhancing both teaching and learning experiences across all levels of education. AI technologies such as intelligent tutoring systems, adaptive learning platforms, chatbots, and automated grading tools are being widely adopted to tailor educational content to individual student needs, provide real-time feedback, and free educators from repetitive tasks so they can focus on higher-order teaching activities (Chen et al., 2020). Artificial intelligence in Philippine education is emerging as a powerful but unevenly adopted tool that is reshaping teaching, learning, and administration, especially in higher education. Universities and schools use AI for lesson planning, assessment creation, student support, administrative tasks, and research, with instructors and administrators generally viewing AI as a transformative support tool rather than a replacement for teachers (Giray et al., 2024)

Teaching Math Through AI

Artificial intelligence is increasingly used to teach mathematics by making learning more personalized, interactive, and supported. AI tools such as intelligent tutoring systems, adaptive platforms, and generative AI (e.g., ChatGPT, GPT-4, Khanmigo, MathGPT, GeoGebra with AI features) can give step-by-step solutions, instant feedback, and multiple explanations, helping students understand concepts like algebra, geometry, and calculus more deeply and at their own pace (Walkington, 2025). Teaching mathematics through artificial intelligence (AI) in the Philippines is emerging as a way to make math learning more personalized, interactive, and supportive, especially for high school, college, and pre-service teachers. Studies with BSEd Mathematics students at the University of Eastern Philippines show that AI tools and chatbots provide instant solutions, detailed step-by-step explanations, and adaptive support, which help learners build independence, problem-solving skills, and confidence, while making math more accessible and engaging (Infante et al., 2025)

Teachers Perception in AI Integration

Teachers generally view the integration of artificial intelligence (AI) in education with cautious optimism, seeing clear benefits but also serious challenges and risks. Across countries and school levels, many teachers believe AI can save time, streamline administrative work, support lesson planning, generate quality learning materials, and help personalize instruction and assessment (Alwaqdani, 2024). Teachers in the Philippines generally perceive AI integration with cautious optimism—they see strong potential benefits but also significant risks and unmet needs. Many pre-service and in-service teachers report positive attitudes toward AI tools, recognizing their usefulness for lesson planning, curriculum development, assessment creation, instructional support, and streamlining administrative tasks, and they are open or ready to complement traditional methods with AI when institutional support exists (Lacuna, 2025)

Challenges in AI Integration

Integrating artificial intelligence in education offers powerful benefits but brings complex ethical, technical, and human challenges that must be managed carefully. AI can personalize learning, automate grading, and provide real-time feedback, making teaching more efficient and adaptive and freeing teachers for higher-value interaction with students (Abimbola et al., 2025). Integrating AI in Philippine education is promising but faces intertwined infrastructural, pedagogical, ethical, and policy challenges. Reviews and empirical studies show that AI is much more developed in private and urban higher education institutions than in K–12 and rural

schools, creating a strong urban–rural digital divide in access to devices, connectivity, and advanced tools (Co, 2025)

METHODOLOGY

Research Design

This study employs a qualitative research design, utilizing thematic analysis to explore the narratives of Mathematics teachers who integrate artificial intelligence (AI) in teaching Mathematics lessons. A qualitative approach is appropriate as it allows for an in-depth examination of teachers lived experiences, perceptions, and meanings associated with AI integration in classroom instruction. Through thematic analysis, the study systematically identifies, analyzes, and interprets recurring patterns and themes emerging from teachers' narratives, providing a rich understanding of how AI is used to support teaching and learning in Mathematics.

Participants

The participants in this study were 15 public high school Mathematics teachers from the Division of Valencia City, selected based on the relevance to the objectives of the study. All participants were secondary-level teachers handling Mathematics subjects and were actively involved in classroom instruction at the time of the study. The teachers ranged in age from 25 to 40 years old, with 53% male and 47% female respondents. All participants had a minimum of five years of teaching experience, ensuring that they possessed sufficient classroom exposure and professional insight to share informed perspectives on the integration of artificial intelligence (AI) in teaching Mathematics lessons.

Teachers included in the study were required to have actively used artificial intelligence (AI) tools in teaching Mathematics specifically in pre-teaching phase (Planning). In this study, active AI use was operationally defined as the intentional integration of AI-based tools or platforms, such as ChatGPT, copilot Ai, perplexity Ai, Wolfram Alpha, Photomath, Symbolab, etc., into lesson planning, classroom instruction, assessment, or instructional support. Mere awareness of AI or theoretical knowledge without instructional application was not considered sufficient for inclusion.

Verification of teachers' AI use was established through self-reported evidence obtained during the initial screening and data collection process. Participants were required to (a) identify the specific AI tools they had used in teaching Mathematics, (b) describe the instructional purposes for which these tools were employed (e.g., lesson preparation, generation of practice problems, explanation of solutions, assessment design, or learner remediation), and (c) share concrete teaching experiences that demonstrated actual classroom or instructional application of AI. Only participants whose responses showed clear, experience-based engagement with AI were included in the final sample. General or vague claims of AI familiarity without demonstrated instructional use were not accepted.

Teachers were excluded from the study if they (a) had no prior experience using AI in teaching Mathematics, (b) reported only theoretical knowledge or casual exposure to AI (such as attendance in seminars without classroom implementation), or (c) were unable to provide specific examples or descriptions of AI integration in Mathematics instruction. This screening process ensured that only participants with verified and authentic AI integration practices were retained for analysis, thereby strengthening the credibility and validity of the study's findings.

Data Collection Method

Data were collected through written interviews administered via Google Forms, guided by four key qualitative research questions aligned with the objectives of the study on teachers' AI integration in Mathematics instruction. Specifically, the written interview sought to elicit teachers' responses to the following questions: (1) What are your reasons for integrating artificial intelligence (AI) in teaching Mathematics lessons? (2) What struggles have you encountered in integrating AI in teaching Mathematics? (3) What strategies have you implemented to address the challenges you faced in integrating AI in teaching Mathematics lessons? and (4)

What recommendations can you offer to fellow teachers who are integrating AI in teaching Mathematics lessons? These guiding questions allowed participants to freely express their experiences and insights, generating rich qualitative data for thematic analysis.

Data Analysis

Thematic analysis was employed to examine the mathematics teachers' responses, following Braun and Clarke's (2006) six-phase framework. After the written interview data were collected through Google Forms, the researcher engaged in data familiarization by carefully reading and rereading the responses to gain an overall understanding of the participants' experiences. Initial codes were generated by identifying recurring ideas, significant statements, key phrases, and patterns related to the study's research questions on AI integration in Mathematics teaching.

Using an inductive, data-driven approach, the generated codes were grouped into broader categories that reflected shared meanings and common experiences among participants. In line with the guidance of the course instructor, the analysis process emphasized refining multiple categories into one overarching theme for each research question. An iterative review of the codes and categories was conducted to ensure consistency and clarity. A large language model (GPT) was utilized as an analytical support tool to assist in organizing, synthesizing, and refining the emerging themes while maintaining the researcher's interpretive authority.

To enhance the credibility and trustworthiness of the findings, the identified themes were systematically checked against the original responses and supported with direct participant quotations. Selected excerpts are presented in the results section to substantiate each theme and ensure that the interpretations accurately represent the participants lived experiences, perspectives, and instructional realities related to AI integration in teaching Mathematics.

Trustworthiness of the Study

To enhance the credibility and trustworthiness of the qualitative findings, member checking was conducted as part of the data validation process. A summary of the preliminary themes and interpretations derived from the data analysis was shared with selected participants. Participants were asked to review the findings and confirm the accuracy of the interpretations based on their experiences. Feedback from the participants indicated that the findings accurately represented their views and experiences regarding the integration of artificial intelligence in teaching Mathematics. Minor clarifications provided by participants were incorporated into the final analysis. This process helped ensure that the results reflected participants' authentic perspectives and reduced potential researcher bias.

Ethical Considerations

This study adheres to the highest ethical standards throughout the conduct of the study to ensure the protection, dignity, and rights of all participants. The participants were formally invited to take part in the study and were clearly informed of the purpose of the research, their voluntary participation, and their right to decline or withdraw at any time without any consequences. All responses collected from the public high school Mathematics teachers were treated with strict confidentiality, and anonymity was ensured throughout the data collection and analysis process. The information gathered was used solely for academic purposes related to the study on AI integration in teaching Mathematics and was handled with utmost care to protect the participants' privacy.

RESULTS AND DISCUSSION

Results

Table 1, presents a consolidated summary of Mathematics teachers' experiences in integrating artificial intelligence into instruction.

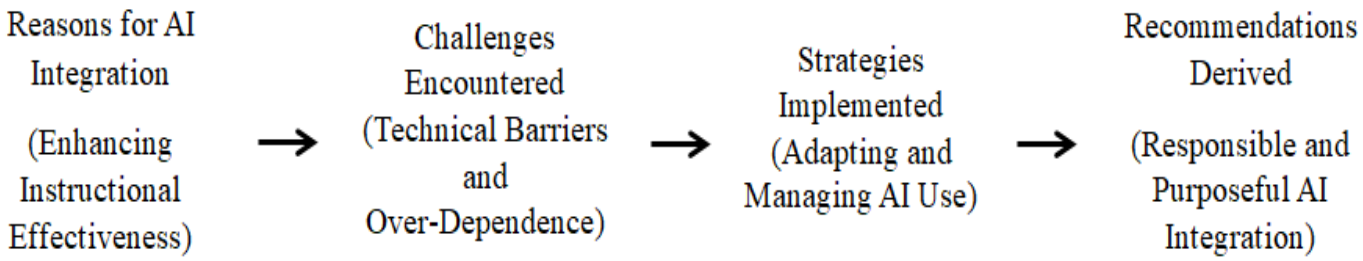
Table 1: Summary of Teachers' Experiences on AI Integration in Teaching Mathematics

Research Focus	Theme	Core Idea	Representative Quote
Reasons for integrating AI in teaching Mathematics	Enhancing Instructional Effectiveness	Teachers integrate AI to make Mathematics lessons more engaging, personalized, and time-efficient. AI supports clearer explanations, varied activities, immediate feedback, and reduced workload, thereby improving overall instructional effectiveness.	"AI enhances personalized learning by adapting to each student's pace and providing tailored feedback, which helps them understand complex mathematical concepts."
Challenges encountered in integrating AI	Navigating Technical Barriers and Over-Dependence	Teachers face technical constraints (e.g., unstable internet, limited access to devices), difficulty in crafting precise prompts, the need to simplify or verify AI-generated content, and concerns that students may become overly dependent on AI, potentially weakening critical thinking and problem-solving skills.	"Sometimes students are too dependent on AI, to the point that they will not be thinking anymore."
Strategies used to address challenges in AI integration	Adapting and Managing AI Use	Teachers address challenges by upskilling themselves, preparing lessons in advance, using offline or printed alternatives, validating AI outputs, guiding students' responsible use of AI, and balancing AI-based tools with traditional teaching methods to ensure meaningful learning.	"I always double-check the AI's math first before my students see it."
Recommendations for teachers who plan to use AI	Responsible and Purposeful AI Integration	Teachers recommend starting with simple AI tools, continuously improving AI competence, aligning AI use with lesson objectives, reviewing AI-generated content, preparing alternative plans for technical issues, and encouraging students to use AI as a 'hint helper' rather than a replacement for thinking.	"AI should guide the students, not give the final answers—human judgment is still important."

The consolidated findings reveal that Mathematics teachers view AI as a valuable instructional support that enhances engagement, personalization, and efficiency. However, effective AI integration was constrained by technical limitations, usability concerns, and the need to safeguard students' critical thinking. To address these challenges, teachers employ adaptive strategies that emphasize professional learning, instructional balance, and responsible guidance of learners. Collectively, the findings highlight that AI was most effective when used purposefully, as a complementary tool guided by teacher oversight rather than a substitute for instruction or reasoning.

Figure 1, illustrates the relationship among the four major themes that emerged from the analysis. Teachers' reasons for integrating AI serve as the starting point for AI adoption in Mathematics instruction. As integration progresses, challenges emerge, prompting teachers to develop adaptive strategies to manage technical, pedagogical, and learner-related concerns. From these lived experiences, practical recommendations naturally flow, guiding responsible and effective AI integration. The thematic map reflects the dynamic and cyclical nature of teachers' experiences rather than a linear process.

Figure 1: Thematic map of the relationship among the four themes



In this study, although recurring patterns were observed across participants' responses, thematic saturation was not formally assessed. The themes presented were derived from recurring meanings and conceptual patterns identified through iterative analysis of the dataset.

Findings

Based on the results derived from the thematic analysis of Mathematics teachers' experiences in integrating artificial intelligence (AI) in teaching Mathematics. The following finding were derived and organized according to the four major themes identified. Supporting participant quotes are included to illustrate each theme.

First, teachers reported integrating AI to enhance instructional effectiveness by making lessons more engaging, personalized, and efficient. Participants emphasized that AI supports clearer explanations and allows teachers to save time in lesson preparation. One teacher noted that AI helps "enhance personalized learning by adapting to each student's pace and providing tailored feedback," while another shared that AI enables lessons to be "more engaging and interactive."

Second, teachers identified several challenges in AI integration, including unstable internet connectivity, limited access to devices, difficulty in crafting precise prompts, and concerns about the accuracy of AI-generated content. Participants also expressed apprehension about students becoming overly dependent on AI. One teacher stated, "Sometimes students are too dependent on AI, to the point that they will not be thinking anymore."

Third, to address these challenges, teachers described implementing adaptive strategies such as upskilling, preparing lessons in advance, validating AI outputs, and balancing AI use with traditional teaching methods. One participant emphasized, "I always double-check the AI's math first before my students see it."

Fourth, teachers recommended responsible and guided use of AI, emphasizing that AI should support, not replace, teacher instruction and student reasoning. A participant explained that AI should act as a "guide or hint helper," while teachers remain responsible for ensuring meaningful learning.

These findings indicate that Mathematics teachers view AI as a valuable instructional support that enhances engagement, personalization, and efficiency. This aligns with previous studies that highlight AI's potential to support differentiated instruction and instructional productivity in Mathematics education. However, the challenges identified, particularly technical limitations and student over-dependence, echo concerns in the literature regarding equitable access and the risk of reduced higher-order thinking when AI is used without guidance. Teachers' adaptive strategies demonstrate a pedagogically sound approach to AI integration, emphasizing professional learning, instructional balance, and critical evaluation of AI-generated content. These practices align with constructivist perspectives that stress the teacher's role in mediating technology use to promote understanding rather than passive consumption. Furthermore, teachers' recommendations underscore the importance of responsible AI integration, reinforcing the view that AI is most effective when used as a complementary tool guided by teacher judgment and instructional goals.

RECOMMENDATIONS

Future studies may strengthen and extend the present findings by incorporating student perspectives and classroom observations to triangulate teachers' narratives on artificial intelligence integration in Mathematics instruction. Gathering data from students through interviews, surveys, or reflective journals can provide insights into learners' experiences, understanding, and critical-thinking development when using AI tools. Additionally, conducting structured classroom observations can capture actual instructional practices and student–AI interactions, offering empirical evidence of how AI is implemented in real classroom contexts. Triangulating teacher reports with student data and observational evidence would enhance the validity of findings and provide a more comprehensive understanding of the pedagogical impacts of AI in Mathematics education.

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