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Abstract

The rapid development of artificial intelligence (AI) technology has led to a significant change in the way that these tools are used – namely, to improve learning outcomes and teaching approaches in mathematics. This research investigated integrating ChatGPT into mathematics education, focusing on the familiarity, perceptions, and training needs of 110 mathematics teachers in Metro Manila, Philippines. Utilizing a sequential mixed-methods approach, the study used quantitative and qualitative analytical methods to examine teachers' engagement with ChatGPT through online surveys that explored demographic information, usage familiarity, perceptions of its utility in education, and perceived training needs. Findings reveal a widespread unfamiliarity with ChatGPT among educators, alongside a substantial demand for technical and pedagogical training to effectively integrate ChatGPT in teaching. The result also showed that, despite concerns about becoming overly dependent on technology, there is cautious excitement about ChatGPT's ability to improve learning outcomes and engage students. The study contributes to understanding the educational potential of AI in mathematics teaching, highlighting the urgent need for comprehensive professional development programs tailored to equip teachers with the necessary skills and knowledge to integrate AI tools like ChatGPT into the curriculum effectively.

Introduction

Education 5.0 is a developing concept that aims to redefine the function of education in the era of Industry 4.0. The focus is on enhancing students' creativity, critical thinking, and problem-solving skills by integrating cutting-edge technologies like artificial intelligence (AI), machine learning (ML), and the Internet of Things (IoT) into the classroom. Education 5.0 can offer numerous benefits in the context of mathematics instruction. One way to help students overcome learning barriers is to use chatbots powered by AI, like ChatGPT, to offer them personalized and interactive support. Using virtual and augmented reality to create immersive and captivating learning experiences, students can better grasp abstract mathematical ideas. Education 5.0 can also facilitate collaboration and communication among students, instructors, and experts from various fields through online

platforms and social media (Purnomo & Herwin, 2021).

Several investigations have investigated the mathematical potential of Education 5.0. For example, Wu (2021) discovered that when using AI in the classroom, kids' math test results are roughly 30% higher than when using traditional teaching techniques, and there is an increase in student cooperation. Mohamed et al. (2022) discovered that integrating AI into mathematics instruction helps students grasp basic geometry, algebra, and statistical problems and develop critical and responsible thinking skills. Additionally, they discovered that students acquire and enhance social skills and interpersonal talents. Furthermore, they found that AI promotes efficient learning and improves the learning environment to improve the acquisition of mathematical concepts. These results indicate that by offering students individualized and interesting learning opportunities that can support the development of 21st-century abilities, Education 5.0 has the potential to transform mathematics instruction completely.

Meanwhile, incorporating technology into education has become increasingly crucial, particularly considering the ongoing digital transformation of society. In this regard, using artificial intelligence (AI) in mathematics education is an area of interest. Chatbots enabled by AI, such as ChatGPT, have the potential to provide personalized and interactive support to students, thereby assisting them in overcoming learning barriers. Integrating ChatGPT as a tool in mathematics education provides instructors with numerous opportunities to improve their instructional practices. Teachers can effectively address the three crucial areas of number sense, rich math assignments, and differentiation by utilizing ChatGPT's capabilities (Koehler & Sammon, 2023). However, the extent to which teachers are familiar with this technology, their perceptions of its usefulness, and their training requirements concerning its implementation still need to be explored.

Several studies have investigated the application of technology to mathematics education. For example, Hui and Mahmud (2018) examined the influence of game-based learning (GBL) in mathematics education on students' cognitive and affective domains. They found that GBL can improve students' memory and understanding of abstract mathematical concepts by helping them master the concrete steps for solving various mathematical problems. They also found that GBL can enhance students' interest and motivation in mathematics, indirectly exposing them to the idea that learning can occur more engagingly and effectively. Similarly, Williams (2020) examined how computer tablets are currently used in the mathematics classroom and compared the learning outcomes of students taught with computer tablets versus those taught traditionally. The study found that the learners taught with computer tablets achieved significantly better results than those taught using traditional methods.

However, using AI-powered chatbots like ChatGPT in mathematics education is a relatively recent study area, with few studies on the subject. Kuhail et al. (2022) systematically reviewed interactions with educational chatbots. They found that chatbots were mainly designed on a web platform to teach computer science, language, general education, and other fields such as engineering and mathematics. Moreover, Lo and Hew (2023) analyzed the emergent concept of integrating AI-based chatbots into flipped learning and its potential to improve student's learning experiences. They learned that this emerging instructional strategy could increase student interaction with

learning content, enhance class preparation, and promote data-driven teaching and learning. However, these studies did not investigate teachers' familiarity with chatbots, perceptions of them, or training needs in a mathematics classroom. This study seeks to contribute to the existing literature by examining mathematics teachers' familiarity, perceptions, and training needs regarding using ChatGPT in the classroom.

Given the lack of research on using ChatGPT in mathematics instruction and the importance of understanding teachers' familiarity, perceptions, and training requirements about this technology, the present study aims to investigate these areas. The study's findings are anticipated to shed light on the potential benefits and challenges of using ChatGPT in mathematics instruction and identify areas where instructors may require additional training and support.

Statement of the Problem

Due to its abstract nature and dependence on sequential learning, mathematics as a subject presents unique educational difficulties. ChatGPT, as an innovative instructional tool, has the potential to assist teachers in overcoming these challenges. However, its integration into the classroom environment highly depends on teachers' familiarity, perceptions of the tool, and training needs.

While generative AI tools such as ChatGPT are increasingly recognized as potentially effective in supporting mathematics instruction, more is needed to know about teachers' familiarity and comfort level with these AI tools and whether they feel adequately equipped to implement them in their teaching practice. Lack of teacher preparation may result in ineffective use of the tool, diminishing its effectiveness and impact on student learning.

The following are the specific issues this research aims to address:

1. What is the level of familiarity among teachers with ChatGPT as a tool for mathematics instruction?
2. What are teachers' perceptions of ChatGPT as a teaching tool in mathematics?
3. What are the training needs of teachers for the effective implementation of ChatGPT in mathematics instruction?

Literature Review

The advent of Artificial Intelligence (AI) within the educational domain heralds a transformative era, notably in personalizing learning experiences and automating assessments, with OpenAI's ChatGPT at the forefront of this innovation for mathematics instruction (Llego, 2022; Javaid et al., 2023). The effective deployment of such AI tools necessitates a deep dive into educators' operational competencies, highlighting a gap in current research regarding educators' depth of understanding and application of AI in educational settings (Seo et al., 2021).

Investigations into educators' perceptions of AI, including its potential to streamline educational efficiency and interaction quality, reveal a dual narrative. On one side, there is optimism about AI chatbots like ChatGPT enhancing the educational process (Jamal et al., 2023). Conversely, apprehensions concerning the

depersonalization of education, alongside technical and privacy concerns, persist (Kerr, 2021). This dichotomy underscores the need for a nuanced exploration of educators' stances on leveraging ChatGPT within mathematics education.

Emphasizing the criticality of AI literacy, prompt engineering, and critical thinking, Walter (2024) advocates for a holistic educational approach that equips educators and students with the acumen to navigate and exploit AI technologies effectively. This stance aligns with the increasing discourse on optimizing AI's educational potential while preparing students for a tech-centric future. Lee (2024) proposed an innovative augmentation for ChatGPT, suggesting integrating a guidance mechanism to bolster its utility in blended learning scenarios. This mechanism is designed to provide personalized support and feedback, aiming to enrich the learner-ChatGPT interaction and, by extension, the educational experience.

Moreover, ethical considerations in deploying AI within educational practices receive attention, with Collin et al. (2023) emphasizing the importance of addressing these ethical quandaries to ensure responsible AI integration in teaching methodologies. Research by Kamoun et al. (2024) further enriches the understanding of the educational landscape's perception of ChatGPT, revealing a spectrum of familiarity and concerns, notably regarding academic integrity. This indicates a broader community interest in harnessing AI tools for education, tempered by caution over their potential misuse. The discourse is expanded by Kim & Kim (2022), who highlight the influence of teacher training on perceptions of AI, pointing to a crucial need for targeted professional development. This gap in preparedness underscores a significant barrier to integrating sophisticated AI tools like ChatGPT in mathematics education, a sentiment echoed by Trust et al. (2023), who acknowledge ChatGPT's potential yet identify a lack of teacher familiarity and integration strategies as critical hurdles.

This literature review converges on the consensus that while AI, specifically ChatGPT, holds immense potential for revolutionizing mathematics education, realizing this potential hinges on addressing educators' training needs, ethical considerations, and the development of supportive AI functionalities. The need for comprehensive professional development programs tailored to empower teachers with the requisite skills for AI integration emerges as a fundamental theme, setting the stage for future research trajectories and policy formulations.

Significance of the Study

The study explores teachers' familiarity, perceptions, and training needs on using ChatGPT in mathematics instruction, which is of immense importance in changing educational landscapes and technological advances. The findings of this study will substantially contribute to several national and regional goals and be consistent with emerging realities.

a. *Contribution to National Objectives/Strategies*: The incorporation of AI in education is a significant component of numerous national objectives and plans designed to improve the quality of education. This study will inform the effective integration of AI tools in classrooms to construct a technologically advanced, future-ready educational system by providing insights into teachers' preparedness for using ChatGPT in mathematics instruction.

b. *Contribution to National Policies*: Education and digital literacy policies emphasize the incorporation of AI and related technologies in educational practices. The findings of this study can assist policymakers in designing teacher training and professional development programs that consider the practical realities and obstacles teachers confront when utilizing AI tools such as ChatGPT, thereby enhancing the efficacy of such policies.
c. *Contribution to Emerging Realities*: With the advent of digital classrooms and remote learning, the role of technology in education is no longer an elective but mandatory. This study can contribute to developing an adaptable, resilient, and technologically advanced educational system that meets these emerging realities by determining teachers' familiarity and training needs with ChatGPT.
d. *Contribution to Regional (Local) Objectives/Plans*: Numerous regional objectives involve augmenting the quality of education and boosting student achievement in subjects such as mathematics. By facilitating the successful integration of ChatGPT into mathematics instruction, this research has the potential to enhance student outcomes and contribute to achieving these regional education goals.
e. *Contribution to Community Objectives/Plans*: Communities endeavor to provide high-quality education that prepares students for a world driven by technology. This study can help achieve this objective by informing the development of community-responsive teacher training programs, enabling teachers to utilize AI tools such as ChatGPT effectively, and ultimately enhancing student learning experiences.

Method

Research Design

The study employed a sequential explanatory mixed-method design, combining quantitative and qualitative research methods to provide a comprehensive analysis. The investigation is conducted in two phases: In the quantitative analysis phase, a questionnaire developed by the researchers was distributed via Google Forms. This questionnaire, which consists of both closed and open-ended questions, assessed teachers' familiarity with ChatGPT, their perceptions of it, and their perceived training needs. The qualitative analysis of the open-ended survey responses comprised the second phase of the research. The themes that emerged from the analysis provided rich insights into the familiarity, perceptions, and needs of mathematics teachers regarding the use of ChatGPT in mathematics instruction. During the interpretation phase, the findings from both the quantitative and qualitative phases were integrated. The integration of these two methods enhanced the comprehension of the research problem. It provided comprehensive insights into the familiarity, perceptions, and training needs of teachers regarding the use of ChatGPT in mathematics instruction.

Population and Sampling Technique

The target population for this study was the basic education mathematics teachers in Metro Manila, Philippines. There were two reasons for focusing on basic education mathematics teachers. First, mathematics instruction at the basic education level is essential to the success of students in their future academic endeavors because it provides them with the foundational knowledge they will need. Second, incorporating technology tools such as ChatGPT at this level can potentially revolutionize the teaching and learning of vital mathematical concepts.

Table 1. Demographic Profile of the Respondents

Profile		*Frequency*	*Percentage*
Level	Elementary	29	26.4
	Elementary & Junior High School	3	2.7
	Junior High School	47	42.7
	Junior and Senior High School	4	3.6
	Senior High School	27	24.5
	Total	*110*	*100.0*
School Type	Government-Owned	77	70
	Private-Owned	33	30
	Total	*110*	*100*
Gender	*Male*	*70*	63.6
	Female	*37*	33.6
	LGBT	*3*	2.7
	Total	*110*	100.0
Age	21-31 y/o	56	50.9
	32-42 y/o	35	31.8
	43-65 y/o	13	11.8
	54-65 y/o	6	5.5
	Total	*110*	100.0
Length of Teaching Experience	0-9 years	71	64.5
	10-19 years	30	27.3
	20-29 years	6	5.5
	30-39 years	3	2.7
	Total	*110*	100.0
Location	Caloocan City	7	6.4
	Mandaluyong City	27	24.5
	Manila City	12	10.9
	Parañaque City	11	10.0
	Pasig City	26	23.6
	Quezon City	12	10.9
	San Juan City	6	5.5
	Taguig-Pateros	9	8.2
	Total	*110*	100.0
Highest Educational Attainment	Complete Doctorate Degree	1	0.9
	Doctorate Degree Unit Earner	2	1.8
	Completed Master's Degree	13	11.8
	Master's Degree Unit Earner	53	48.2
	Baccalaureate Degree	41	37.3
	Total	*110*	100.0

Multiple sampling was used, which permits the use of various sampling methods at different stages of the research, thereby increasing the sample's representativeness. The two-stage cluster sampling technique was used to select the geographical location and the common characteristics of the teachers. Volunteer sampling was used to select the individual participants for the study. A total of 110 teachers volunteered to participate in the study during the study period (August to December 2023). A call for respondents is posted on popular social media platforms (such as Facebook and Instagram) among mathematics teachers in Metro Manila to collect a large and diverse pool of potential participants. Table 1 provides a comprehensive overview of the demographic profile of the respondents.

As seen in the table, most of the respondents, constituting 42.7%, are from junior high school, followed by 26.4% from elementary school and 24.5% from senior high school, indicating a diverse representation across different educational levels. In terms of school type, a significant 70% of the respondents are associated with government-owned schools, while 30% are from private-owned institutions, showcasing a predominant governmental school representation in the sample.

Gender distribution among respondents shows a female majority of 63.6%, with males representing 33.6% and LGBT community members constituting 2.7%, revealing a gender disparity in favor of female teachers in this sample. The age distribution is skewed towards the younger demographic, with 50.9% of respondents aged between 21-31 years old, followed by 31.8% in the 32-42 age bracket, indicating a relatively young cohort of teachers.In terms of teaching experience, a significant 64.5% of the respondents have 0-9 years of experience, demonstrating that the majority are relatively new to the teaching profession. This is complemented by 27.3% of respondents having 10-19 years of experience, highlighting a mixture of both novice and experienced teachers in the sample.

Moreover, the respondents are geographically distributed across various cities, with the highest representation from Mandaluyong City (24.5%) and Pasig City (23.6%), suggesting a concentration of respondents in these areas. Finally, when considering the highest educational attainment, most of the respondents, 48.2%, are master’s degree unit earners, followed by 37.3% holding a baccalaureate degree. This indicates a high level of educational attainment among the participants, with nearly half working towards or having completed a master’s degree.

Research Instrument Used

The primary tool for gathering the data is a researcher-made questionnaire, which is divided into three parts. Part 1 sought to determine the familiarity of the teachers in ChatGPT. Part 2 explored their perceptions of the use of ChatGPT in the classroom. Part 3 determined the training needs on the possible integration of ChatGPT in mathematics instruction as perceived by the respondents. Before conducting the survey, the research instrument underwent content/expert validation and reliability testing. Two experts in the field of educational administration, two experts in mathematics education, and one expert in language reviewed the questionnaire. After the validation and revision, it was pilot tested from a sample of 10 mathematics teachers teaching outside Metro Manila, as this number is sufficient to uncover any potential issues with the questionnaire while not being so large as to risk exhausting the pool of potential respondents (Bullen, 2013). The reliability analysis suggests that the 36-item

questionnaire had a Cronbach alpha of .976, which is considered an excellent value.

Data Analysis

The study employed a combination of quantitative and qualitative data analysis tools and techniques to ensure a comprehensive examination of the responses. Quantitatively, the study utilized statistical software, including frequency counts, percentages, median, and interquartile range (IQR). These measures provided insights into the central tendencies and variability of the responses regarding teachers' familiarity with, perceptions of, and training needs in using ChatGPT in mathematics education. For the qualitative data, content analysis was conducted using qualitative data analysis software, which facilitated the organization, coding, and thematic analysis of open-ended responses. This approach allowed for the identification of recurring themes and patterns in the participants' narratives about their familiarity, perceptions, and training needs regarding ChatGPT. The qualitative analysis aimed to delve deeper into the contextual and distinct aspects of the teachers' perceptions and the potential pedagogical implications of ChatGPT usage.

Ethical Considerations

Prior to posting the call for respondents, the researchers ensured that all communications clearly outlined the study's purpose, the voluntary nature of participation, and the measures in place to safeguard participant anonymity and data confidentiality. Informed consent was obtained from all participants, emphasizing their right to withdraw from the study at any point without consequence. Moreover, the research design incorporated strategies to minimize potential biases and ensure that the recruitment process did not inadvertently exclude or disadvantage any groups within the target population. This involved crafting the call for respondents in an inclusive manner that was accessible to a wide range of teachers regardless of their familiarity with AI tools or their level of engagement with social media. Additionally, the researchers are committed to ethical data handling practices, including secured storage of data and the use of anonymized responses in any publications or presentations stemming from the study.

Results and Discussions

This section examines the results from the mathematics teachers survey in Metro Manila, Philippines, gathered via social media. It highlights their familiarity with, perceptions of, and the expected influence of ChatGPT on their educational methods. The analysis uncovers the present status of adopting ChatGPT in education and initiates a comprehensive discussion on overcoming the challenges and maximizing its benefits to improve mathematics teaching.

The Level of Familiarity among Teachers with ChatGPT as a Tool for Mathematics Instruction

Table 2 provides an overview of teachers' familiarity with ChatGPT as a tool for mathematics instruction.

Table 2. Math Teachers' Familiarity with ChatGPT

Question	*NF (1)*	*SF (2)*	*MF (3)*	*VF (4)*	*EF (5)*	*IQR*	*Mdn.*	*V.I.*
How familiar are you with the use of ChatGPT in teaching mathematics?	50%	12.7%	21.8%	6.4%	9.1%	2.00	1.50	NF

Legend: 1 – NF (Not at all Familiar); 2 – SF (Slightly Familiar); 3 – MF (Moderately Familiar); 4 – VF (Very Familiar); 5 – EF (Extremely Familiar); IQR – Interquartile Range; Mdn. – Median; V.I. – Verbal Interpretation

Based on the data provided, the level of familiarity among teachers with ChatGPT as a tool for teaching mathematics is predominantly low. Specifically, most teachers (50%) indicated they are "Not at all Familiar" with using ChatGPT in teaching mathematics. This is compounded by an additional 12.7% who feel only "Slightly Familiar" with the technology. With an interquartile range (IQR) of 2.00, the responses have moderate variability. The median value is 1.50, falling between "Not at all Familiar," which suggests that the central tendency of responses leans towards a lack of familiarity.

The low level of familiarity indicates a potential lack of exposure and training regarding ChatGPT and its applications in educational settings. This can act as a barrier to the effective integration of AI tools in mathematics education. Given that only a small fraction of the respondents feel highly familiar with ChatGPT, professional development programs are likely necessary to enhance teachers' comfort with and knowledge of AI tools.

When asked to elaborate on their responses, several mathematics teachers have not yet encountered ChatGPT or are unsure of its applicability in mathematics education. For instance, one teacher mentioned, "*Based on my knowledge, ChatGPT is not applicable in teaching Mathematics."* At the same time, another said, *"I am familiar with ChatGPT and tried it one time to create a lesson plan in one of the topics in Math, but I never use it in actual teaching*." These responses highlight recognition of ChatGPT's existence but a lack of understanding or skepticism about its relevance to mathematics instruction.

Moreover, several educators who are "Not at all Familiar" have cited reasons such as lack of implementation by the school administration, lack of introduction to the technology, or no necessity felt due to existing resources: "*Not yet implemented or introduced by our school head*," and "*All of the materials that we used for teaching are collaboratively created by every department*." These responses indicate a significant gap in the institutional support and resources necessary for the adoption and integration of AI tools like ChatGPT in educational settings, highlighting the crucial role of school administrations in facilitating technological advancements.

On the other hand, some teachers have explored ChatGPT's capabilities for creating content and aiding instruction, albeit not extensively in mathematics: "*It can help you easily do your work, especially in paperwork*," and "*I have used ChatGPT to look for teaching strategies and learning activities for differentiated instruction*." However, their use is not widespread or deeply integrated into their teaching practices.

The lack of familiarity among mathematics teachers signals a critical need for targeted exposure and training. The integration of AI tools like ChatGPT in educational settings, particularly in subjects as pivotal as mathematics, demands not only awareness but a deep understanding and practical knowledge of their application. The comments from teachers, ranging from outright dismissal of ChatGPT's applicability in mathematics to limited trials devoid of actual classroom integration, highlight a significant awareness and perception challenge. The cited reasons for non-familiarity, such as lack of administrative implementation and sufficient introduction, suggest systemic barriers to the adoption of AI technologies in teaching methodologies. Conversely, the instances where teachers have engaged with ChatGPT, primarily for content creation and differentiated instruction, hint at the untapped potential of AI tools in enriching educational experiences. These sporadic explorations, though not widespread, provide a glimpse into the positive impact ChatGPT could have on teaching and learning if adequately integrated.

The results suggest an urgent need for structured professional development programs designed to bridge the familiarity gap. Such initiatives should not only aim to introduce educators to ChatGPT and similar AI tools but also provide them with the skills and confidence needed to integrate these technologies into their pedagogical practices effectively. By addressing the lack of familiarity and skepticism towards the relevance of ChatGPT in mathematics instruction, educational stakeholders can unlock new dimensions of teaching and learning, enhancing both efficiency and effectiveness.

The Teachers' Perceptions of ChatGPT as a Teaching Tool in Mathematics

Table 3 presents an overview of math teachers' perceptions of ChatGPT as an instructional tool, capturing the collective attitudes of mathematics educators toward the integration of ChatGPT into their teaching practices.The teachers are generally "Not Sure" about using ChatGPT as a teaching tool in mathematics, as shown in Table 3. For most of the statements, the highest frequency falls under the "Not Sure" category, indicating a median response of 3, which corresponds to uncertainty. This uncertainty is also reflected in the interquartile range (IQR) values, which consistently show a spread of 2.00, suggesting moderate variability in responses.

For the first statement regarding workload reduction, 20% of teachers agreed or strongly agreed (SA) that ChatGPT could lessen their workload, whereas a combined 26.4% disagreed or strongly disagreed (SD). The most significant proportion of teachers, 38.2%, were unsure about this potential benefit. This pattern of uncertainty continued across the board, with similar distributions in responses for the statements about differentiating instruction, promoting collaboration and interaction, developing critical thinking skills, increasing student engagement and motivation, achieving better learning outcomes, improving the efficiency and effectiveness of assessment, and reducing the achievement gap.

Interestingly, statement 10, which addressed time-saving in lesson preparation, had the highest agreement rate, with 44.5% of teachers agreeing or strongly agreeing that ChatGPT could save time. This suggests that while teachers are uncertain about the pedagogical impacts of ChatGPT, they see a clear benefit in terms of efficiency in lesson planning.

Table 3. Math Teachers' Perceptions of ChatGPT

Statements	*SD (1)*	*D (2)*	*NS (3)*	*A (4)*	*SA (5)*	*IQR*	*Mdn.*	*V.I.*
1. Math teachers' workloads can be reduced by using ChatGPT in the classroom.	16.4%	10%	38.2%	15.5%	20%	2.00	3	NS
2. Using ChatGPT in teaching mathematics can differentiate instruction for students with different learning needs.	15.5%	8.2%	36.4%	23.6%	16.4%	1.00	3	NS
3. The use of ChatGPT can promote collaboration and interaction among students in teaching mathematics.	20%	10%	32.7%	29.1%	8.2%	2.00	3	NS
4. ChatGPT in teaching mathematics can help students develop their critical thinking skills.	22.7%	14.5%	37.3%	16.4%	9.1%	2.00	3	NS
5. ChatGPT in teaching mathematics can increase student engagement and motivation.	18.2%	11.8%	36.4%	22.7%	10.9%	2.00	3	NS
6. Using ChatGPT in teaching mathematics can help students to achieve better learning outcomes.	17.3%	10.9%	35.5%	23.5%	12.7%	2.00	3	NS
7. Using ChatGPT in teaching mathematics can improve the efficiency and effectiveness of assessment.	18.2%	13.6%	35.5%	19.1%	13.6%	2.00	3	NS
8. Using ChatGPT in teaching mathematics can help to reduce the achievement gap between different groups of students.	15.5%	13.6%	38.2%	21.8%	10.9%	2.00	3	NS
9. The benefits of using ChatGPT in teaching mathematics outweigh the challenges.	17.3%	10%	37.3%	25.5%	10%	2.00	3	NS
10. ChatGPT in teaching mathematics can save time in lesson preparation.	14.5%	5.5%	35.5%	20.9%	23.6%	1.00	3	NS

Legend: 1 – SD (Strongly Agree); 2 – D (Disagree); 3 – NS (Not Sure); 4 – A (Agree); 5 – SA (Strongly Agree; IQR – Interquartile Range; Mdn. – Median; V.I. – Verbal Interpretation

When asked about their initial impression of using ChatGPT in teaching mathematics, the teachers expressed a

variety of initial impressions, with some recognizing potential benefits and others voicing concerns about dependency and the undermining of learning.Several teachers worry about ChatGPT fostering dependency, with one teacher stating, "*It can just help the students become lazier*," and another cautioning that it might make "*students more dependent on AI*." These concerns align with the "Not Sure" responses from Table 3, where a large proportion of teachers expressed uncertainty about ChatGPT's role in enhancing student learning outcomes.

On the other hand, some responses highlight perceived benefits, such as increased efficiency in lesson planning and the potential for differentiated instruction. For instance, one teacher mentioned, "*It can help mathematics teachers to be more efficient when it comes to lesson planning*." At the same time, another pointed out that ChatGPT could offer "*a great number of mathematical information and resources*." These perceptions support the minority of teachers in the survey who agreed or strongly agreed that ChatGPT could enhance teaching effectiveness and student engagement.

The responses also reflect a recognition of the potential for ChatGPT to provide new avenues for learning, with a teacher suggesting that it could "*promote ICT-based learning*" and help students "*develop their critical thinking skills*." However, some are skeptical or unfamiliar with the technology, with remarks like "*I did not know what ChatGPT*" and "*I am not familiar with the App*," explaining the NS responses in the survey.

Furthermore, when asked about the ways they could use ChatGPT in improving teaching and students' learning, several educators are cautious, with one stating, "*ChatGPT can only enhance the students' learning if and only if the students are on independent study*" and another asserting, "*It can just help the students lazier*." These responses corroborate the hesitancy captured in the survey, in which a substantial number of teachers reported being unsure about the benefits of ChatGPT.

Conversely, some teachers recognize potential advantages. For instance, a respondent commented, "*This ChatGPT suggests different strategies or techniques in delivering a lesson*," while another mentioned, "*ChatGPT is going to change education. It can provide learners with immediate feedback, which is also essential for effective learning*." Such insights support the smaller percentage of educators from the survey who agreed or strongly agreed that ChatGPT could positively impact teaching and learning.

Many teachers expressed a need for careful integration, with comments like "*ChatGPT could help teachers simplify complex topics*" and "*It can be used to help both teachers and students if it can be institutionalized but with proper orientation.*" The findings indicate a complex landscape where teachers are balancing the perceived efficiency and resource benefits of ChatGPT against concerns over student dependency and the quality of learning outcomes.

The results highlight a nuanced view of ChatGPT's application in teaching mathematics. For instance, while a portion of teachers acknowledged the potential of ChatGPT to reduce workload and save time in lesson preparation, with almost half of respondents seeing it as a time-saving tool, a substantial number expressed reservations about its pedagogical impact. Concerns regarding dependency on technology emerge as a significant

theme, with teachers wary of ChatGPT fostering laziness among students and over-reliance on AI for learning. Such apprehensions resonate with the broader hesitation reflected in the survey results, suggesting a need for a balanced exploration of ChatGPT's role in education.Despite these concerns, there are glimpses of optimism among teachers about the positive implications of ChatGPT for mathematics education. Some educators highlight the potential for ChatGPT to enhance efficiency in lesson planning, provide access to extensive mathematical resources, and support differentiated instruction. Moreover, the potential of ChatGPT to promote ICT-based learning and foster critical thinking skills among students is acknowledged, albeit cautiously.

The diversity of teacher responses underscores a complex landscape where the perceived benefits of ChatGPT, such as improved efficiency and resource accessibility, are weighed against potential pitfalls, including student dependency on technology. This balance points to a critical need for further research to comprehensively elucidate ChatGPT's efficacy in educational settings. Additionally, professional development initiatives appear essential to equip teachers with the knowledge and skills needed to navigate the integration of AI tools like ChatGPT effectively, ensuring they enhance rather than detract from the learning experience. Such initiatives should aim to demystify AI technologies for educators, providing them with practical strategies for leveraging these tools to enrich mathematics education while fostering an environment that encourages critical engagement with technology.

The findings are corroborated by Kamoun et al. (2024), who documented varied perceptions of ChatGPT among educators. They found that a segment of teachers lauded ChatGPT as an instrumental resource in bolstering their online teaching methodologies, particularly valuing its capacity for generating swift and precise responses, streamlining their workflow, and bolstering interactions with students. Furthermore, their research indicated that these educators highlighted ChatGPT’s utility in delivering immediate feedback to learners, a feature they deemed crucial for enriching the educational experience. On the other hand, they learned that some teachers expressed concerns about the reliability and accuracy of ChatGPT’s responses because they felt that the tool sometimes provided incorrect or irrelevant information, which could potentially mislead students.

Training Needs of Teachers for the Effective Implementation of ChatGPT in Mathematics Instruction

Table 4 displays a detailed breakdown of the training needs identified by mathematics teachers for the incorporation of ChatGPT into their instructional practice, capturing the frequency and percentage of respondents who have expressed specific training requirements.

The data from Table 4 shows that an overwhelming majority of teachers (82.7%) identify technical training as their primary need for ChatGPT. For instance, one teacher stated, “*A comprehensive technical training that goes beyond the basics*.” Another teacher noted, “*I want a step-by-step tutorial that can help me navigate ChatGPT's functionalities*. These responses underscore the most significant training need, emphasizing the importance of proficiency in the fundamental operation of ChatGPT.

Moreover, pedagogical training on incorporating ChatGPT into their teaching ranks second with a notably lower

frequency of 10.0%. For example, teachers expressed that while they have a basic knowledge of using ChatGPT, they wanted to "*incorporate ChatGPT into their lesson plans and activities*" and "*learn how to use ChatGPT not just to tell students about mathematical concepts but to enhance their problem-solving skills*. "These perspectives support the second-ranked training necessity, which focuses on the instructional application of ChatGPT in mathematics education.

Table 4. Training Needs on ChatGPT According to the Mathematics Teachers

Training	*Frequency*	*Percentage*	*Rank*
1. Technical training on how to use ChatGPT	91	82.7	1
2. Pedagogical training on how to use ChatGPT	11	10.0	2
3. Support in developing effective assessment methods when using ChatGPT	3	2.7	3.5
4. Access to a community of practice for sharing best practices and troubleshooting	2	1.8	5
5. Ongoing professional development opportunities to stay up to date in ChatGPT and related technologies	3	2.7	3.5
Total	*110*	*100.0*	

The results imply that a call for technical training underscores a fundamental barrier to the adoption of ChatGPT in educational settings—teachers' comfort with and understanding of the tool itself. Pedagogical training, being the second priority, highlights a recognition that knowing how to operate ChatGPT is not sufficient; teachers must also understand how to weave it into their instructional strategies effectively. Also, the equal importance given to the development of assessment methods and staying updated through professional development indicates that teachers are aware of the dynamic nature of AI technologies and the need to refine their assessment strategies to leverage these tools effectively.

When the teachers were asked regarding some ways they envision using ChatGPT to enhance mathematics education in the future, 43.6% said they have some vague ideas about utilizing ChatGPT but are unsure about the implementation, suggesting a need for clarification and guidance on the use of ChatGPT in an educational context. One teacher remarked, "*I see ChatGPT serving as a personalized tutor for students in the future, giving them feedback on problem sets*." This response aligns with the 43.6% of teachers who have vague ideas but need clarity on implementation, suggesting a demand for training that unlocks AI's capabilities for personalized learning.

Meanwhile, a significant portion, 25.5%, have no plans to use ChatGPT in teaching mathematics, ranking this response second in frequency. This resistance or hesitancy might be attributed to a lack of understanding of ChatGPT's potential or uncertainty about its benefits. For instance, the teacher stated, "*I value the traditional methods the most than using ChatGPT*." Another teacher said, "*I have not considered using ChatGPT yet because I am not sure of its applications.*"

On the other hand, 19.1% of respondents have concrete plans and strategies for incorporating ChatGPT, indicating

a proactive approach towards utilizing AI in education. In comparison, a minimal 2.7% have tried ChatGPT in their teaching and affirm its effectiveness. The least common response, at 1.8%, shows that a small number of teachers have no idea about the potential use of ChatGPT in mathematics education. The result asserts that the prominent indecision on how to implement ChatGPT suggests an opportunity for professional development programs that focus on practical applications of AI in teaching. The data also implies a divide in the teaching community between innovators and traditionalists, which could affect the pace at which new technologies are adopted in educational settings.The result is in concordance with Kamoun et al. (2024), who highlighted the importance of training and support for teachers when integrating AI tools like ChatGPT into their teaching practices. They emphasized the need for clear guidelines on how to effectively use such tools and address any potential challenges that may arise.

Conclusions, Recommendations, and Study Limitations

The fact that over half of the participants are not familiar with ChatGPT suggests a need for educational stakeholders to invest in awareness programs and provide opportunities for teachers to engage with and learn about AI technologies. This could potentially lead to more innovative and effective teaching methodologies that leverage the capabilities of AI to personalize learning and assist in managing classroom activities. Given the uncertainty regarding the use of ChatGPT in mathematics instruction, educators and decision-makers must seek more empirical evidence and possibly conduct training and pilot studies that measure the impact of ChatGPT on student learning and teacher workload. Furthermore, these results underscore the need for a different discussion on the integration of AI tools in education, addressing both their potential benefits and limitations.

Additionally, for ChatGPT to be effectively implemented in mathematics instruction, comprehensive training focused on technical and pedagogical competencies is crucial. The need for such structured and ongoing support highlights an urgent call to action for educational leaders and policymakers. They must facilitate the necessary training and resources to equip teachers with the skills required to harness the potential of AI in education. The development of such training programs should be considered an essential step toward the modernization of teaching practices and the enhancement of educational outcomes in mathematics. The results also reflect an emerging arena in the integration of AI tools like ChatGPT in mathematics education. There is a clear indication of the need for targeted support and education to help teachers move from ambiguity to action. With almost half of the educators uncertain about how to proceed, educational leaders must provide structured training and share effective practices to facilitate the transition towards incorporating AI technologies into teaching and learning processes.

The study, while providing insightful data on the integration of ChatGPT in mathematics education, is subject to several limitations. Primarily, the sample is confined to mathematics teachers in Metro Manila, Philippines, and may not fully represent the diverse experiences and perspectives of educators from different geographical areas or educational contexts. This regional focus limits the generalizability of the findings to other settings or disciplines. Additionally, the reliance on self-reported data through Facebook and Instagram for participant recruitment and data collection might introduce bias, as it potentially excludes teachers who are not active on

these platforms or those who may have different levels of engagement and familiarity with AI tools. Furthermore, the rapidly evolving nature of AI technology, including ChatGPT, means that the study's findings might quickly become outdated, underscoring the need for continuous research in this area. These limitations highlight areas for future research to broaden the understanding of AI's role in education, suggesting the importance of longitudinal studies and the inclusion of a broader range of participants to validate and extend the findings of this initial inquiry.

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