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Mathematics Teachers' Perspectives, Practices and Challenges in using Artificial Intelligence in Teaching and Learning

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Abstract

Artificial Intelligence (AI) has tremendous potential to revolutionize mathematics education by personalizing learning and improving instructional efficiency. However, its use in secondary schools in sub-Saharan Africa remains underexplored. This study investigated the perceptions, practices, and challenges of secondary school mathematics teachers regarding the use of AI tools in teaching and learning in Ilorin metropolis, Kwara State, Nigeria. A descriptive survey research design was adopted. The study involved all fifty (50) senior secondary school mathematics teachers in the accessible population across public and private schools in Ilorin South and Ilorin East Local Government Areas, using a census sampling approach. Data were collected using a structured, self-administered questionnaire based on a 5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The instrument was validated by two experts in mathematics education, with a benchmark mean of 3.0 adopted for decision-making. Data were analysed using descriptive statistics comprising means and standard deviations. The findings revealed that teachers had a high level of general awareness of AI (Mean = 3.6) and strongly recognised its pedagogical usefulness in reducing workload (Mean = 3.9) and making lessons more engaging (Mean = 3.9). However, direct classroom adoption of mathematics-specific AI platforms was very low (Mean = 1.9). Major challenges included inadequate AI infrastructure (Mean = 3.9), concerns about the dependability of AI tools for classroom use (Mean = 3.6), and inadequate professional training (Mean = 3.5). Teachers also strongly agreed that AI cannot replace human teachers (Mean = 4.2). The study concludes that an awareness-adoption gap limits AI integration in Nigerian secondary mathematics classrooms and recommends targeted professional training and improved institutional infrastructure to support effective AI adoption.

Keywords: artificial intelligence, mathematics education, AI integration, mathematics teachers, secondary education

1 Introduction

1.1 Background of the problem

Artificial Intelligence (AI) has emerged as a transformative force across multiple sectors, with education being no exception. Conceptually, AI is a multidisciplinary domain concerned with the design and development of intelligent systems capable of executing tasks traditionally performed by humans (Mohamed et al., 2022). Its central objective is to create autonomous systems that can learn, adapt, and function effectively in diverse environments (Ayanwale et al., 2024). At its core, AI involves the systematic study and engineering of algorithms and computational models that enable machines to perceive their surroundings, process information, and make context-driven decisions. The field encompasses a wide range of sub-disciplines, including machine learning, natural language processing, computer vision, robotics, and expert systems (de-Lima-Santos & Ceron, 2021). These components collectively contribute to the development of machines capable of emulating human intelligence and performing functions that require reasoning, pattern recognition, and decision-making. The practical applications of AI extend beyond theoretical constructs. Systems such as expert systems, speech recognition, natural language processing, and machine vision illustrate its capacity to replicate and, in certain domains, surpass human cognitive functions. In educational contexts, pedagogical agents—sometimes referred to as teachable agents represent a significant innovation. These software tools are designed with human-like attributes and are deployed to enhance learner engagement and support in online environments.

Beyond education, AI technologies have found relevance in healthcare, finance, transportation, entertainment, customer service, and several other sectors (Dwivedi et al., 2021). Widely adopted digital assistants such as Apple's Siri, Amazon's Alexa, Google Assistant, and generative AI systems such as ChatGPT exemplify how AI increasingly influences everyday interactions, decision-making, and consumer behaviour (Brill et al., 2019; Hermann & Puntoni, 2024). The capacity of these systems to process vast datasets, respond interactively, and learn from user interactions underscores AI's role as both

a practical tool and a transformative driver of innovation in contemporary society. There has been a growing scholarly interest in the application of Artificial Intelligence (AI) within education, primarily due to its potential to optimize students' learning outcomes. Scholars contend that AI can help mitigate barriers that hinder effective learning, such as shortages of qualified teachers and limited access to resources, thereby expanding the overall capacity of educational systems. Emerging empirical research supports these claims, demonstrating that AI contributes positively to student achievement and learning outcomes (Moltudal et al., 2020; Gonzalez et al., 2019). Beyond its direct influence on academic performance, AI has been linked to broader societal goals, particularly the promotion of sustainable development. UNESCO emphasizes that inclusive, equitable, and high-quality education, supported by lifelong learning opportunities for all, is central to sustainable development and that AI technologies can serve as enablers of this vision.

Within the field of mathematics education, AI introduces innovative approaches that reshape how students learn, how teachers facilitate instruction, and how institutions manage curricula. A key contribution of AI in this domain is the advancement of personalized learning. AI-enabled systems can diagnose individual learning profiles by identifying students' strengths, weaknesses, cognitive patterns, and progress rates, thereby tailoring instructional content accordingly (Jaiswal & Arun, 2021). Such personalization promotes not only mathematical competence but also broader cognitive skill development, aligning with the increasing technological sophistication of contemporary society (Gao, 2020). Furthermore, AI-based applications in mathematics facilitate enhanced visualization and problem-solving. The use of dynamic animations and interactive representations fosters creativity and strengthens students' problem-solving capacities. AI systems in education often function as intelligent tutors, adaptive learning tools, or even collaborative "tutees," while simultaneously offering policymakers data-driven insights for curriculum development and reform. Since its inception, AI research has sought to replicate human-like intelligence encompassing reasoning, language, vision, and even emotional recognition pushing the boundaries of autonomous computational capacity (Chesani et al., 2017). In this context, AI-driven educational platforms provide learners with immediate access to instructional content, encouraging independent exploration and self-directed learning beyond traditional classroom constraints.

Despite the theoretical promises of AI in education, a significant execution gap persists within classroom environments. While global literature highlights AI's potential to enhance STEM learning outcomes, actual adoption by secondary school mathematics teachers remains fragmented and under-researched in regional contexts like Kwara State, Nigeria. Traditional instructional strategies such as recitation and direct lecture continue to predominate, often failing to cultivate higher-order problem-solving skills or student engagement. Examining mathematics teachers' perceptions, current usage patterns, and operational challenges is therefore essential for understanding how AI can be effectively integrated into secondary classrooms to improve student outcomes.

1.2 Objectives of the Study

The primary objective of this study is to investigate the perspectives, current practices, and operational challenges of secondary school mathematics teachers regarding the integration of Artificial Intelligence in teaching and learning within the Ilorin metropolis, Kwara State, Nigeria. Specifically, the study seeks to:

1. Assess mathematics teachers' awareness, beliefs, and general perceptions regarding AI tools in education.
2. Determine the current level and nature of AI integration in secondary school mathematics classrooms.
3. Identify the technological, pedagogical, and institutional challenges constraining teachers' adoption of AI.
4. Provide evidence-based recommendations for policy makers and educational institutions to foster effective AI integration in mathematics classrooms.

1.3 Research Questions

1. What is the perception of mathematics teachers regarding the use of Artificial Intelligence (AI) in teaching and learning?
2. What is the importance of using AI systems and applications in teaching from the math teachers' point of view?
3. What challenges do teachers encounter when using AI for mathematics instruction?

2 Relevant Literature Review

Several researchers have worked on AI and the usefulness in teaching and learning mathematics. Few of them are discussed below. Within mathematics education, AI technologies function across three main operational domains:

Personalized Instruction: AI algorithms evaluate individual learning profiles, pacing, and error patterns to tailor instructional content (Jaiswal & Arun, 2021).

Automated Assessment & Formative Feedback: Tools such as Photomath, Mathway, Socratic, and Microsoft Math Solver provide immediate, step-by-step solutions that support self-directed practice and reduce grading loads (Davis, 2023).

Dynamic Visualization: Interactive tools and Augmented Reality (AR) applications convert abstract mathematical concepts into visual, multi-dimensional models, aiding spatial reasoning and engagement (Bower et al., 2014).

Despite these benefits, empirical studies in African secondary and tertiary contexts reveal significant implementation obstacles. Ezenwobodo (2024) observed that while mathematics educators in Anambra State, Nigeria, held positive views toward AI, practical classroom application was minimal due to poor infrastructure, lack of training, and anxieties regarding teacher displacement. Similarly, Mohamed et al. (2024) identified high deployment costs, inadequate technical support, and data privacy concerns as primary obstacles to AI implementation in mathematics instruction. Scholars emphasize that AI must complement rather than replace educators, as automated systems lack human empathy and transparent step-by-step reasoning (Cope et al., 2020). Ogoke et al. (2025) investigated application of artificial intelligence in the teaching and learning of mathematics. He discovered that students taught geometry without AI performed significantly better than those taught with AI, with mean achievement scores of 57.90 and 50.37 respectively. Students taught without AI also demonstrated higher retention, recording a mean retention score of 70.34 compared with 68.00 for the AI group. ANCOVA results confirmed significant differences in both achievement and retention between the two teaching strategies, favouring the non-AI approach. Although male students recorded slightly higher achievement and retention scores than females within the AI group, these gender differences were not statistically significant. The findings therefore suggest that AI use did not improve mathematics achievement or retention in this study. However, the authors acknowledged that AI can still support personalized learning, immediate feedback and progress monitoring when used appropriately. They recommended continued activity-based classroom teaching, close supervision of AI use, and improved technological support for effective integration in mathematics education.

3 Materials and Methods

This study adopted a descriptive survey research design to assess secondary school mathematics teachers' perceptions, practices, and challenges regarding the integration of Artificial Intelligence (AI) in mathematics teaching and learning in Ilorin metropolis, Kwara State, Nigeria. The study area was limited to Ilorin South and Ilorin East Local Government Areas. Due to the small size of the accessible population, a census sampling approach was used, and all fifty (50) senior secondary school mathematics teachers from public and private schools within the selected areas were included in the study. Data were collected using a structured, self-administered questionnaire formatted on a 5-point Likert scale: 5 = Strongly Agree (SA), 4 = Agree (A), 3 = Undecided (U), 2 = Disagree (D), and 1 = Strongly Disagree (SD). The content validity of the instrument was established by two experts in mathematics education who examined the questionnaire for clarity, relevance, and appropriateness in relation to the objectives of the study. The internal consistency of the instrument was assessed through a pilot test conducted prior to the main study. The data collected were analysed using descriptive statistics, specifically mean and standard deviation. A benchmark mean score of 3.0 was used for decision-making. Items with mean scores of 3.0 and above were regarded as accepted, while items with mean scores below 3.0 were regarded as rejected.

4 Presentation of Results

Research question 1: What is the perception of mathematics teachers regarding the use of Artificial Intelligence (AI) in teaching and learning?

Table **1**

The data below reflects teachers' awareness, understanding, usage, and perception of Artificial Intelligence (AI) as tools in teaching and learning mathematics in secondary school

SN	Items	NO	MEAN ($\bar{x}$)	S.D
1	I am aware of Artificial Intelligence (AI) and its potential applications in education.	50	3.6	1.1
2	I understand how AI tools can enhance teaching and learning in mathematics.	50	3.4	1.6
3	I know specific AI tools designed for mathematics teaching (e.g., Mathway, Photomath).	50	2.0	1.3
4	I have used AI tools in my teaching process.	50	1.9	1.1
5	I believe AI can assist in reducing the workload of teachers.	50	3.9	1.4
6	AI can personalize learning for students based on their needs and abilities	50	3.7	1.2
7	AI is an effective tool to improve students' understanding of mathematics.	50	3.9	1.2
8	Using AI tools in teaching mathematics will make lessons more engaging.	50	3.9	1.0
9	AI cannot replace the role of teachers in the classroom.	50	4.2	1.1
10	Teachers need extensive training to effectively use AI in teaching.	50	4.1	1.1
11	AI tools are too expensive or difficult to implement in my school.	50	4.1	1.0
12	Using AI in teaching could improve students' performance in mathematics.	50	2.6	1.3
13	I believe incorporating AI into teaching is essential for 21st-century education.	50	3.5	1.5
14	I am willing to integrate AI tools into my mathematics teaching if given proper training and resources.	50	3.7	1.3

The summary of the results in table 1 was 3.0 and above was used as the average mean and was the acceptable score while 3.0 below was not an acceptable score. The findings revealed a generally positive perception of AI among mathematics teachers, with varying degrees of agreement across different aspects. The mean score of Item 1 was 3.6 with standard deviation of 1.1, indicating that most teachers are aware of AI and its potential benefits. Likewise, Item 2 got a mean score of 3.4 and a standard deviation of 1.6, indicating that a lot of teachers are aware of the role AI plays in improving mathematics teaching and learning. However, Item 3 has a low mean score of 2.0 which means that many of the respondents are not aware of specific AI tools such as Mathway and Photomath. Similarly, Item 4 had a mean of 1.9 which shows that relatively few teachers have really used AI tools in their teaching activities. The responses to Items 5, 6, 7 and 8 indicate that respondents agreed that AI can minimize instructors' burden (mean = 3.9), personalize learning according to students' needs and skills (mean = 3.7), increase students' knowledge of mathematics (mean = 3.9), and make lessons and teaching more engaging (mean = 3.9). These results indicate that teachers recognize the instructional value and supportive role of AI in the teaching and learning process.

The item with the highest mean score of 4.2 reveals that instructors strongly agree that AI cannot replace teachers in the classroom, but AI can be used as an instructional assistance tool. The average score of 4.1 for Item 10 indicated that the respondents felt that enough training was needed to utilize AI effectively in education. Similarly, Item 11 showed that teachers perceived cost and implementation of AI tools as big problems in schools. On the other hand, Item 12 received a low mean score of 2.6 indicating ambiguity regarding the direct effect of AI on students' academic achievement in mathematics. Item 13 showed that most of the respondents mentioned that the integration of AI is essential in current education whereas Item 14 revealed the willingness among the instructors to use AI tools if appropriate training and resources are provided. The findings demonstrated a good attitude towards the integration of AI in mathematics instruction overall. However, practical experience, training and implementation problems are still key barriers to its effective use.

Research question 2: What is the importance of using AI systems and applications in teaching from the math teachers' point of view?

Table **2**

The tables shows the responses of mathematics teachers in regard to importance of using AI in teaching and learning of mathematics

SN	Items	NO	Mean ($\bar{x}$)	S.D
15	AI systems can provide personalized learning experiences for students.	50	3.4	1.3
16	Using AI tools makes mathematics lessons more interactive and engaging.	50	3.5	1.4
17	AI applications can help in automating repetitive tasks like grading and lesson planning.	50	3.7	1.3
18	AI-based tools assist in identifying students' strengths and weaknesses.	50	2.9	1.4
19	Incorporating AI into teaching enhances the efficiency of lesson delivery.	50	3.7	1.3
20	AI promotes active participation and interest in mathematics among students.	50	3.9	1.1
21	AI tools can simplify complex mathematical concepts for better student understanding.	50	3.4	1.5
22	AI applications can help bridge learning gaps for struggling students.	50	3.6	1.4
23	The use of AI encourages innovative teaching practices in mathematics.	50	3.6	1.3
24	AI systems contribute to improving students' overall academic performance.	50	3.4	1.3
25	AI facilitates a deeper understanding of mathematical concepts through simulation and visualization tools.	50	3.7	1.2

The whole summary about the results in Table 2 was that 3.0 and above was used as the acceptable scores since it's the average meanwhile 3.0 below was not acceptable score. The results regarding the perceived benefits of Artificial Intelligence (AI) in mathematics teaching and learning generally indicate good answers from the respondents. Item 15 had a mean score of 3.4, indicating that teachers felt that AI systems can create personalized learning experiences for students. Item 16 likewise had a favorable mean score of 3.5 indicating that AI tools make lessons more dynamic and engaging in mathematics. For item 17 with mean score of 3.7, the respondents stated that AI apps can help in automating repetitive processes such as grading and lesson planning hence lowering the workload of teachers. However, the mean score of Item 18 was 2.9 which were somewhat below the acceptable benchmark. It indicates that respondents were not sure about the ability of AI technologies to assess students' strength and weakness efficiently. Teachers saw AI integration as a way of enhancing efficiency in the delivery of lessons as seen by the mean score of 3.7 for item 19. Also, Item 20 had a high mean score of 3.9, indicating substantial agreement that AI improves students' active participation and enthusiasm in mathematics. The data also showed that the respondents concurred that AI tools can help to make tough mathematical ideas easier to understand. This can be seen from Item 21, which had a mean score of 3.4. The mean score for item 22 was 3.6 indicating that AI applications are seen as beneficial in bridging the learning gaps of challenging students. Moreover, the mean score of Item 23 was 3.6 which denotes that AI fosters new techniques in teaching mathematics. Further items 24 and 25 showed that the respondents felt that AI led to better academic performance and made it easier to understand mathematical ideas using simulation and visualisation tools. Overall, the findings indicate that teachers regard AI as a useful tool that might potentially enhance teaching effectiveness and students' learning experience in mathematics education.

Research question 3: What challenges do teachers encounter when using AI for mathematics instruction?

Table **3**

The responses of mathematics teachers on challenges they faced in using AI in teaching and learning

SN	Items	NO	Mean ($\bar{x}$)	S.D
26	Lack of access to AI tools is a major barrier in my school.	50	3.9	1.2
27	I feel AI is too complex to integrate into the teaching process.	50	3.6	1.2
28	I do not have sufficient knowledge or training on how to use AI tools.	50	3.5	1.4
29	Students may misuse AI tools in ways that affect their learning.	50	3.3	1.3
30	AI tools are not reliable enough for consistent classroom us	50	3.6	1.3

The results on the problems of using Artificial Intelligence (AI) in teaching mathematics suggest that respondents faced a number of impediments to the effective application of AI in schools. Item 26 had a high mean score of 3.9 with a standard deviation of 1.2 indicating considerable agreement among respondents that lack of access to AI tools poses a serious challenge in their schools. This indicates that the unavailability of technology resources may provide a challenge in integrating AI in teaching mathematics. The mean score for item 27 was 3.6, indicating that many teachers felt that AI was too sophisticated to be included into the teaching process. This might mean that the difficulties of understanding and using AI technology may deter teachers from adopting these tools in teaching in classrooms. Similarly, Item 28 recorded a mean score of 3.5, indicating that respondents believed they lacked sufficient knowledge and training required for the effective use of AI tools. The finding highlights the importance of professional development and training programs for teachers. Additionally, Item 29 had a mean of 3.3, indicating that respondents were concerned that students could utilize AI tools in a way that could harm their learning. This suggests concern about the overreliance on AI technologies and the prospective misuse by students in academic pursuits. Furthermore, the mean score for Item 30 was 3.6, indicating that the respondents did not find AI technologies to be reliable for repeated usage in the classroom. Overall, the results suggest that while teachers acknowledge the potential benefits of AI for teaching mathematics, various hurdles still hinder its effective adoption. These barriers encompass limited access to AI tools, absence of teacher training, complexity of integration, worries over student misuse, and uncertainties about reliability of AI technology in classroom practice.

5 Discussion

5.1 Mathematics Teachers' Perceptions of Artificial Intelligence (AI) in Teaching and Learning

The findings of this study revealed that mathematics teachers generally possess a positive perception of Artificial Intelligence (AI) and acknowledge its relevance in teaching and learning. The respondents indicated awareness of AI and its potential applications in education, suggesting that teachers recognize AI as an emerging educational innovation. This finding agrees with the position of Ezenwobodo (2024), who asserted that the integration of AI technologies can improve the effectiveness of mathematics teaching and they also observed that AI has the capacity to transform instructional delivery and enhance learning experiences in educational settings The study further revealed that teachers believed AI could reduce workload, personalize learning, improve students' understanding of mathematics, and make lessons more engaging. These findings support the assertions of Jaiswal and Arun (2021), who emphasized that AI-driven systems can provide personalized learning experiences based on students' individual learning needs and abilities. The finding also corroborates the views of researchers, who noted that AI applications improve students' creativity, engagement, and problem-solving abilities in mathematics education. However, despite the positive perception toward AI, the findings indicated that many teachers lacked familiarity with specific AI tools such as Mathway and Photomath and had limited practical experience using AI in classroom instruction. This finding suggests that awareness of AI does not necessarily translate into practical integration. The result is consistent with the observations of some researchers who argued that although AI presents significant opportunities in education, many teachers still encounter implementation difficulties due to inadequate training and limited technological exposure. The study also showed strong agreement among respondents that AI cannot replace teachers in the classroom. This finding supports the argument of Cope et al. (2020), who maintained that AI should function as a complementary instructional tool rather than a substitute for teachers. The respondents further emphasized the need for extensive teacher training before effective AI integration can occur. This aligns with the work of Ayanwale et al., (2024), who highlighted teacher professional development as a crucial factor for successful AI implementation in mathematics education.

Furthermore, the respondents perceived the cost and implementation of AI technologies as significant barriers in schools. This finding supports the observations of some researchers who identified infrastructural limitations and unequal access to educational technologies as major constraints affecting AI adoption in developing educational systems. Although teachers expressed willingness to integrate AI into mathematics teaching if adequate resources and training were provided, uncertainty still existed regarding the direct impact of AI on students' academic performance. This suggests the need for more empirical evidence and practical classroom experiences to strengthen teachers' confidence in the effectiveness of AI-based instructional approaches. Finally, Conversely, Granström and Oppi (2025) reported that not all teachers perceived AI as capable of improving teaching efficiency and supporting personalized learning. They further found that although

teachers acknowledged some instructional benefits of AI, they also expressed concerns that its use could encourage technological dependence, reduce interpersonal interaction, and negatively affect aspects of learners' development.

5.2 Importance of AI Systems and Applications in Mathematics Teaching

The findings of the study indicated that mathematics teachers perceived AI systems and applications as beneficial to teaching and learning processes. Respondents agreed that AI promotes personalized learning, enhances lesson delivery, encourages active participation, and improves students' interest in mathematics. This finding is consistent with the work of Gao (2020), who stated that AI integration in mathematics education enhances instructional innovation and supports cognitive development among learners. The study also revealed that teachers believed AI tools make mathematics lessons more interactive and engaging. This result aligns with the views of Bennani et al. (2022), who reported that AI-supported interactive learning environments and gamification techniques increase students' engagement, creativity, and participation during learning activities. Similarly, the respondents agreed that AI applications can automate repetitive tasks such as grading and lesson planning. In addition, respondents perceived AI as useful in simplifying difficult mathematical concepts and bridging learning gaps among students. This finding is in support of the argument of Bower et al. (2014), who highlighted the role of AI-enhanced visualization technologies in promoting deeper understanding of abstract mathematical concepts. Conversely, Ogoke et al. (2025), found that students who learned geometry using AI did not outperform students who learned without AI. They further reported that students who were taught without AI demonstrated higher retention. Similarly, Dasari et al. (2024) found that students who relied exclusively on ChatGPT for mathematics learning performed less successfully than students taught by teachers, either with or without ChatGPT support. However, respondents expressed uncertainty regarding the ability of AI tools to effectively identify students' strengths and weaknesses. This suggests that although teachers recognize the instructional value of AI, concerns still exist regarding the reliability and precision of AI systems in monitoring learner progress. Nevertheless, the overall findings indicate that teachers regard AI as an important instructional innovation capable of improving teaching effectiveness and enhancing students' learning experiences in mathematics education.

5.3 Challenges Associated with the Use of AI in Mathematics Teaching

The findings of the study revealed that several challenges hinder the effective integration of AI into mathematics teaching. The respondents identified lack of access to AI tools as one of the major barriers confronting schools, many teachers perceived AI as too complex to integrate into classroom instruction, technical complexity of AI systems may discourage educators from fully utilizing such technologies in teaching and learning, insufficient knowledge and training on the effective use of AI tools and AI tools are not reliable enough for consistent classroom all these results validates the recommendation of Ayanwale et al. (2024), Mohamed et al (2024). They emphasized that the necessity of continuous teacher training and professional development programs for successful AI implementation in mathematics education and supports the position of who noted that inadequate technological infrastructure and limited access to digital resources remain critical obstacles to AI adoption in education, particularly in developing countries. Conversely, Asanre, Taiwo, and Odupe (2024), revealed that high levels of teachers' perception and attitude towards AI integration, while their level of experience in using AI for mathematics teaching was moderately high. The study further showed that a considerable proportion of the mathematics teachers had previously used AI learning resources and were willing to embrace AI in their instructional practices.

6 Conclusion

In view of the above discussion, we strongly conclude that educational stakeholders and the government should prioritize targeted professional development programs to equip teachers with the knowledge and skills to effectively use AI tools in teaching mathematics. Training should focus on familiarizing teachers with subject-specific tools, such as Mathway, Photomath, and other AI tools used in teaching and learning, while showcasing their practical applications and benefits. Educational policymakers should foster collaboration between educators and AI developers to create user-friendly tools that align with curricular goals. Highlighting success stories and conducting further research on AI's impact on student performance will help bridge the skepticism and provide evidence of its value. By leveraging teachers' openness to AI, paired with adequate training and support, schools can foster a balanced integration of technology that enhances teaching while preserving the irreplaceable human element in education. It is essential to implement comprehensive professional development programs tailored to mathematics teachers, focusing on the practical use of AI tools to make lessons more

interactive and engaging. Training should include hands-on workshops, demonstrations of AI's capabilities, and strategies for effectively integrating these tools into the curriculum. Providing access to user-friendly and cost-effective AI technologies can alleviate challenges related to complexity and implementation. Additionally, fostering a collaborative learning environment where teachers can share best practices and success stories will build confidence and reduce skepticism. To overcome barriers or challenges to AI integration in schools, it is crucial to address resource allocation by ensuring equitable access to the necessary technology and infrastructure, such as reliable internet and devices. Comprehensive training programs should be implemented to equip teachers with the skills and confidence needed to integrate AI effectively, including practical guidance on preventing and managing potential misuse by students. The government should provide funding, subsidies, or partnerships to support these initiatives, while also fostering collaboration among educators to share experiences and best practices. By tackling these challenges holistically, schools can create an environment where AI enhances learning outcomes without becoming a source of concern or inequity.

7 Declarations

Ethical statements: Ethical clearance for this study was granted by the Research Ethics Committee of the Faculty of Education, Kwara State University, Malete, Nigeria. Formal administrative permission was secured from school principals in Ilorin South and Ilorin East Local Government Areas. All participating mathematics teachers provided written informed consent prior to questionnaire administration, and respondent anonymity was preserved through anonymized data coding.

Conflict of Interest: The authors declare neither financial nor non-financial conflict of interest.

Author Contributions: Conceptualization, methodology, instrument design, field data collection, data analysis, manuscript drafting, literature review synthesis, theoretical framework alignment, manuscript editing, statistical audit, manuscript review and formatting.

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8 References

Asanre, A. A., Taiwo, T. O., & Odupe, T. A. (2024). Teachers' perception towards the integration of artificial intelligence in the teaching of mathematics in senior secondary school. *Jurnal Pendidikan Matematika dan Sains, 12*(2), 154–161. doi:10.21831/jpms.v12i2.77349

Ayanwale, M. A., Frimpong, E. K., Opesemowo, O. A. G., & Sanusi, I. T. (2024). Exploring factors that support pre-service teachers' engagement in learning artificial intelligence. *Journal for STEM Education Research.* Advance online publication. https://doi.org/10.1007/s41979-024-00121-4

Bennani, S., Maalel, A., & Ben Ghezala, H. (2022). Adaptive gamification in e-learning: A literature review and future challenges. *Computer Applications in Engineering Education, 30*(2), 628–642. https://doi.org/10.1002/cae.22477

Bower, M., Howe, C., McCredie, N., Robinson, A., & Grover, D. (2014). Augmented reality in education cases, and potentials. Educational. https://doi.org/10.1080/09523987.2014.889400

Brill, T. M., Munoz, L., & Miller, R. J. (2019). Siri, Alexa, and other digital assistants: A study of customer satisfaction with artificial intelligence applications. *Journal of Marketing Management, 35*(15–16), 1401–1436. https://doi:10.1080/0267257X.2019.1687571

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access, 8,* 75264–75278. https://doi.org/10.1109/ACCESS.2020.2988510

Chesani, F., Mello, P., & Milano, M. (2017). Solving mathematical puzzles: A challenging competition for AI. *Association for the Advancement of Artificial Intelligence, 38*(3), 83–96. https://doi.org/10.1609/aimag.v38i3.2736

Cope, B., Kalantzis, M., & Searsmith, D. (2020). Artificial intelligence for education: Knowledge and its assessment in AI-enabled learning ecologies. *Educational Philosophy and Theory, 53*(12), 1229–1245. https://doi.org/10.1080/00131857.2020.1728732

Dasari, D., Hendriyanto, A., Sahara, S., Suryadi, D., Muhaimin, L. H., Chao, T., & Fitriana, L. (2024). ChatGPT in didactical tetrahedron, does it make an exception? A case study in mathematics teaching and learning. *Frontiers in Education, 8*, 1295413. DOI: 10.3389/feduc.2023.1295413.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., . . . Williams, M. D. (2021). Artificial intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, 101994. https://doi:10.1016/j.ijinfomgt.2019.08.002

Ezenwobodo, S. S. (2024). *Artificial intelligence in the teaching and learning of mathematics in colleges of education in Anambra State*. *International Journal of Research Publication and Reviews, 5*(2), 82–89.https://doi.org/10.55248/gengpi.5.0224.0404

Davis, M. (2023). Blog 7: The benefit of traceability in the age of AI. *Making sense of academic integrity.* https://sites.google.com

de-Lima-Santos, M. F., & Ceron, W. (2021). Artificial intelligence in news media: current perceptions and future outlook. *Journalism and Media, 3*(1), 13–26. https://doi.org/10.3390/journalmedia3010002

Gao, S. (2020). Innovative teaching of integration of artificial intelligence and university mathematics in big data environment. *IOP Conference Series: Materials Science and Engineering, 750*(1), 012137. https://doi.org/10.1088/1757-899X/750/1/012137

Granström, M., & Oppi, P. (2025). Assessing teachers' readiness and perceived usefulness of AI in education: An Estonian perspective. *Frontiers in Education, 10*, 1622240. doi:10.3389/feduc.2025.1622240.

Hermann, E., & Puntoni, S. (2024). Artificial intelligence and consumer behavior: From predictive to generative AI. *Journal of Business Research, 180*, 114720. doi:10.1016/j.jbusres.2024.114720

Jaiswal, A., & Arun, C. J. (2021). Potential of artificial intelligence for transformation of the education system in India. *International Journal of Education and Development using Information and Communication Technology, 17*(1), 142–158.

Mohamed, M. Z. b., Hidayat, R., Suhaizi, N. N. b., Sabri, N. b. M., Mahmud, M. K. H. b., & Baharuddin, S. N. b. (2022). Artificial intelligence in mathematics education: A systematic literature review. *International Electronic Journal of Mathematics Education*, *17*(3), em0694. https://doi.org/10.29333/iejme/12132

Ogoke, C. J., Anyanwu, A., Okolie, A., Onuoha, E., & Vivian, D.-O. (2025). Application of artificial intelligence in the teaching and learning of mathematics: Implication for achievement and retention. *Eureka: Journal of Educational Research, 3*(2), 136–143. doi:10.56773/ejer.v3i2.62

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