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Teachers' Readiness, Perceptions, and Use of Generative Artificial Intelligence in Educational Practice

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Abstract: This study examines teachers' readiness, usage patterns, perceived benefits, barriers, and professional development needs related to integrating Generative Artificial Intelligence (Gen AI) into educational practice. A quantitative descriptive exploratory survey design was employed. Data were collected via online questionnaires from 80 teachers across multiple educational levels (early childhood to vocational secondary) in Bengkulu. Descriptive statistics and thematic analysis were used to analyse the data. Teachers reported high functional readiness and positive perceptions of Gen AI, particularly for lesson planning and content development, while its application for learning analytics and reflective pedagogical inquiry remained limited. The most significant barriers were lack of training and unclear school policies, whereas teachers did not view Gen AI as a threat to their professional role. Key professional development needs included practical training, ethical guidance, curriculum integration, and peer communities. The study provides empirical evidence on teachers actual pedagogical workflows in a developing-country context, distinguishing functional readiness from conceptual literacy. Findings offer a clear agenda for policy development and teacher professional learning programmes. The research advances understanding of Gen AI integration in resource-constrained settings and provides an evidence base for pedagogically grounded, ethically responsible AI adoption in education.

Keywords: Artificial Intelligence in Education, Educational Technology Adoption, Generative Artificial Intelligence, Teacher Readiness

A. Introduction

The world of education has experienced fundamental disruption with the emergence of technology integration, namely Generative Artificial Intelligence (GenAI). This technology has shifted the educational paradigm, no longer just digitalization in education, but also transforming how we think and work. In education, GenAI holds vast potential This can include personalized learning experiences through intelligent content generation, customizable assessments, and increased student engagement. For example, GenAI's capabilities enable the development of customized educational materials to meet individual students' learning needs, thus fostering a more inclusive

educational environment (Chan & Hu, 2023). Its ability to generate prompts and provide tailored feedback enables a shift toward precision teaching, where algorithms can analyze a wide range of student responses to provide personalized recommendations (Zhang & Dong, 2024). This individualization capacity can lead to improved educational outcomes as students receive support specifically tailored to their learning styles and pace.

Despite these opportunities, the rapid integration of Gen AI into educational settings presents significant challenges. Concerns related to academic integrity, ethical use, data privacy, and algorithmic bias have become central in scholarly and policy debates. Undisclosed student reliance on AI generated content risks undermining academic integrity (Barrett & Pack, 2023) while the absence of clear institutional guidelines exacerbates uncertainties surrounding responsible use and data security (Akpan & Akpan, 2024). As a result, educators are increasingly required to navigate ambiguous boundaries regarding acceptable AI practices, balancing innovation with the preservation of educational values (Toncelli Rachel & Kostka Ilka, 2024).

The success of GenAI integration, therefore, depends not only on technology availability but also on educators' readiness to adopt and apply these tools meaningfully. Teachers play a crucial role as mediators between GenAI technology and pedagogical goals, requiring both technological competence and pedagogical judgment. Recent studies have shown that perceived ease of use significantly influences teachers' intention to adopt educational technology(Nazari & Saadi, 2024), while self-efficacy has been identified as an important determinant of effective AI integration in teaching practice (Fütterer et al., 2023). The use of tools such as ChatGPT for developing learning materials has been widely documented (Baidoo-Anu & Owusu Ansah, 2023; Zhai, 2025a). Emerging research has also examined the application of GenAI in STEM and programming education (Jang et al., 2022; Yang et al., 2025), and there has been extensive discussion about the risks of plagiarism and algorithmic bias in AI-generated content (Rudolph Jurgen et al., 2023; Tlili Ahmed et al., 2023) as well as implications for teacher education and professional identity (Heine & König, 2025).

Despite the growing body of literature on AI in education, significant gaps remain. Perception-based surveys and theoretical debates continue to dominate most investigations. Few empirical studies examine how teachers actually use GenAI in their daily pedagogical workflows and how this integration affects teaching competency and professionalism. Specifically, it remains unclear whether using GenAI merely reduces cognitive strain or, through practices such as prompt engineering, reflective design, and educational experimentation, actively promotes professional development. Furthermore, there is a dearth of information from developing-nation contexts, which face unique infrastructural, policy, and professional development challenges. Most existing research originates from high-income countries or higher education settings, leaving a critical gap in

understanding how teachers in resource-constrained environments engage with GenAI.

Preliminary observations by the researchers with five secondary school teachers in Bengkulu City, Indonesia, illustrate this gap. Initial interviews revealed three patterns: (1) teachers use AI to create lesson plans, but 80% admitted to making extensive manual revisions due to cultural or curriculum inconsistencies; (2) confusion arose over developing effective prompts for Higher Order Thinking Skills (HOTS) assessments; and (3) teachers felt they were "learning new things" when interacting with AI but did not recognize this as a form of professional development in learning digitalization. These observations indicate that AI use in the field has occurred but is not yet optimal and has not been systematized within a scientific pedagogical framework. Moreover, many teachers continue to express concerns about ethical implications, data privacy, and the reliability of AI-generated output, contributing to hesitation and inconsistent adoption (Alshorman, 2024; Seo et al., 2021). This tension is exacerbated by concerns that GenAI could reduce teacher autonomy or even replace human roles in education (Kefi et al., 2024). Thus, while we know that teachers are experimenting with GenAI, we do not fully understand the extent of their readiness, the specific patterns of use across different pedagogical activities, the perceived benefits and barriers in actual practice, or the professional development needs that would enable more effective and responsible integration particularly in developing-country school contexts.

The current state of research on GenAI in education can be characterized by three main trajectories. First, a substantial body of work has focused on technology acceptance, applying and extending models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) to explain teachers' intentions to adopt AI tools (Scherer et al., 2019; Teo, 2011). These studies consistently identify perceived usefulness, ease of use, and self-efficacy as key predictors of adoption intention. However, they rarely move beyond intention to actual classroom practice. Second, a growing number of studies have examined the ethical and policy dimensions of GenAI in education. Scholars have raised important concerns about academic integrity, data privacy, algorithmic bias, and the potential for AI to undermine authentic learning (Barrett & Pack, 2023; Floridi & Cowls, 2019; Holmes & Tuomi, 2022). While these contributions are vital for establishing normative frameworks, they often remain at a theoretical or prescriptive level, with limited empirical grounding in teachers' lived experiences. Third, recent research has begun to explore specific applications of GenAI, such as using ChatGPT for lesson planning, content development, and assessment design (Baidoo-Anu & Owusu Ansah, 2023; Zhai, 2025a). Studies have also investigated GenAI in STEM and programming education (Jang et al., 2022; Yang et al., 2025). Yet these studies tend to be either tool focused or context specific, rarely providing a comprehensive picture of how teachers across different educational levels and subject areas integrate GenAI into their overall pedagogical workflow. Notably, the vast majority of this research originates from

developed countries or higher education institutions. There is a conspicuous absence of large scale empirical studies from developing countries, where infrastructure limitations, policy gaps, and professional development constraints may produce very different patterns of adoption and use. Moreover, existing studies rarely distinguish between functional readiness (knowing how to operate AI tools) and conceptual literacy (understanding how AI systems work, including their limitations and biases). This distinction is critical because functional readiness without conceptual understanding may lead to uncritical, potentially harmful adoption.

This study offers several novelties that distinguish it from previous research. First, it provides empirical data on teachers actual use of Gen AI in daily pedagogical practice, moving beyond perception only surveys and theoretical debates. By collecting quantitative data on specific activities from lesson planning and material development to learning analytics and classroom action research the study captures the granular reality of Gen AI integration. Second, the study explicitly measures and contrasts two dimensions of teacher readiness: functional readiness (basic concepts, tool naming, training participation) and conceptual literacy (understanding of machine learning, natural language processing, and Gen AI mechanisms). This distinction allows the study to identify a readiness paradox that has been overlooked in most prior work: teachers may be confident in using tools while lacking the deep understanding needed for critical, reflective integration. Third, the study is situated in a developing country context specifically in Bengkulu, which has received little attention in the international AI in education literature.

This context provides insights into the infrastructural, policy, and professional development challenges that are often invisible in studies from high income countries. Fourth, the study examines not only barriers but also teachers self identified professional development needs, offering a needs based rather than a deficit based perspective. This positive orientation is rare in the literature, which often focuses on what teachers lack rather than what they request. Finally, the study explores an under researched question: whether Gen AI serves merely as a cognitive efficiency tool or whether it can contribute to professional growth through practices such as prompt engineering, reflective design, and pedagogical experimentation. By examining usage patterns across routine and analytical tasks, the study sheds light on the transformative potential or lack thereof of current Gen AI integration.

This study makes four major contributions. First, it supplies comprehensive data on teacher readiness, Gen AI usage, perceived benefits, barriers, and professional needs, helping shape policy from school to national levels particularly in developing countries seeking to use AI safely and effectively. Second, it advances theory by separating functional readiness from conceptual literacy and showing the pedagogical impact of that gap. It challenges the idea that positive attitudes and basic tool skills are enough, emphasizing the need for deeper, more critical AI understanding. Third, it provides practical direction for teacher development. By identifying specific needs

practical training, ethics and policy guidance, curriculum integration, and peer communities it offers a clear blueprint for responsive professional learning. Fourth, it adds developing country voices to the global AI conversation. As Gen AI spreads worldwide, understanding how diverse teachers handle its promises and risks is vital for fair, context-sensitive policy.

To address the gaps identified above and achieve the study's aims, the following research questions guide this investigation: 1) What is the level of teachers readiness to integrate Generative Artificial Intelligence into educational practice, and how does functional readiness compare to conceptual literacy? 2) What are the patterns of GenAI use across different pedagogical activities, from routine planning to analytical and research-based tasks? 3) What benefits do teachers perceive from using GenAI, and what barriers hinder its effective integration? 4) What professional development needs do teachers identify as essential for responsible and pedagogically sound GenAI integration?

B. Methods

This study employed a quantitative descriptive-exploratory survey design to examine teachers' readiness, practices, perceptions, barriers, and professional development needs related to the integration of Generative Artificial Intelligence (GenAI) in educational contexts. This approach was chosen because it allows for systematic data collection from a large and diverse population, enabling researchers to discover patterns, trends, and variations in perceptions (Creswell & Creswell J. David, 2017). The descriptive component of this design aims to describe the current state of teachers' engagement with GenAI. At the same time, the exploratory dimension seeks to uncover emerging issues and unmet needs that have not been extensively examined in previous empirical research, particularly in developing country contexts. This design is considered appropriate for research areas characterized by rapid technological change and evolving pedagogical practices, where the primary objective is not hypothesis testing but the generation of empirical insights to inform theory development, policy formulation, and future experimental studies (Hwang & Chen, 2023).Given that research on GenAI in education is still at an early stage, especially with respect to teachers' pedagogical workflows, a descriptive–exploratory approach provides a robust foundation for understanding real-world practices and constraints.

Participants were 80 in-service teachers from various educational levels in Bengkulu, including early childhood education (PAUD), elementary schools (SD), junior high schools (SMP), senior high schools (SMA), and vocational high schools (SMK). A purposive stratified sampling strategy was used to ensure representation across levels and teaching experience categories. The majority of respondents (67.5%) had more than six years of teaching experience, with 42.5% having over ten years. Subject areas included language, science, mathematics, social studies, and vocational fields. Previous studies have highlighted that teachers' engagement with educational

technology can vary significantly depending on the level of institution, field of study, and professional experience (Tondeur et al., 2020).

A structured online questionnaire was developed specifically for this study, based on an extensive review of AI in education literature, technology acceptance models (Scherer et al., 2019; Teo, 2011). This instrument consists of six sections, 5 items for demographics and teaching context, 8 items for readiness and knowledge about GenAI, 10 items for frequency of use of GenAI in specific pedagogical activities (activities included developing teaching materials, designing lesson plans, creating quizzes, grading, analyzing student learning outcomes, and conducting action research in the classroom), 9 items for perceived benefits of GenAI, 9 items for perceived barriers, 8 items for professional development needs. Each instrument uses a 5-point Likert scale from 1 = strongly disagree to 5 = strongly agree, plus two open-ended questions: "What challenges do you face when using GenAI?" and "What support do you need most?".

The instrument's reliability was determined through a review by three experts: one in educational technology, one in educational development, and one in language. Internal consistency was acceptable, with a Cronbach's α of 0.87 for the full scale. Data were collected over a four-week period using an online survey platform (Google Forms). Especially for reaching heterogeneous populations, such as teachers in various regions and institutional contexts. Research shows that online data collection has many benefits, including efficiency in distribution and accessibility, which are especially important for education professionals with diverse schedules and locations (Monib, 2024; Tella, 2015). The survey link was distributed through official teacher WhatsApp groups and school coordinator networks in Bengkulu. To mitigate social desirability bias, an introductory statement guaranteed anonymity and explained that there were no right or wrong answers, and that the purpose was to understand actual practice, not to evaluate individual teachers. All participants provided informed consent before beginning the survey. Quantitative data were analyzed using SPSS version 26. Descriptive statistics mean, standard deviation, frequency, percentage were calculated for all Likert-scale items. Responses to open-ended questions were analyzed using thematic analysis (Braun & Clarke, 2006).

C. Results and Discussion

Result

This study involved 80 teachers from various levels of education (elementary school, junior high school, senior high school, and vocational high school) with varying ages, subjects, and teaching experience. The majority of respondents had more than six years of teaching experience (67.5%), and 42.5% had more than a decade of experience in the profession. This provides a strong basis for assessing teachers' professional readiness to adopt Generative Artificial Intelligence (GenAI) in educational practice.

Table 1 Mean Score of Teacher Readiness and Knowledge of GenAI

Indicators	Mean	SD
Understands basic AI concepts	4,36	0,72
Names ≥3 educational AI tools	4,21	0,78
Has participated in AI training	4,05	0,83
Familiar with ML, NLP, and GenAI	3,62	0,94

The study's results revealed a correlation between teacher readiness and integrating GenAI into educational practice. Teachers demonstrated high functional readiness, meaning they possess practical and applied knowledge of AI. Most teachers reported an understanding of basic AI concepts (mean = 4.36 out of 5) and could name at least three AI tools useful for education (mean = 4.21). Furthermore, teachers had moderate participation in AI training (mean = 4.05), indicating some formal exposure to AI-related professional development. However, a striking contrast emerged when examining conceptual literacy, a deeper understanding of how AI systems actually work. Teachers scored significantly lower on understanding technical terminology such as machine learning, natural language processing (NLP), and generative AI mechanisms (mean = 3.62). The standard deviation for this indicator (SD = 0.94) was also larger than for other readiness indicators, indicating considerable variation among teachers. Some had a reasonable conceptual understanding, while others remained at a very shallow level. High functional readiness alongside modest conceptual literacy has important implications. Teachers know what AI can do and what tools to use, but they don't fully understand how or why AI systems produce certain outputs. This gap suggests that teachers may be able to operate AI tools effectively for routine tasks, but may lack the critical understanding needed to evaluate AI outputs for bias, accuracy, or pedagogical appropriateness. In other words, functional readiness enables use, but conceptual literacy is necessary for critical and reflective use.

Table 2 Mean Score for Use of GenAI in Educational Practice

Activities	Mean	SD
Developing teaching materials	4.38	0.69
Designing lesson plans	4.31	0.73
Creating questions/quizzes	4.24	0.77
Correction and grading assignments	3.71	0.91
Analysis of student learning outcomes	3.02	1.01
Classroom action research	2.94	1.05

The second theme relates to patterns of GenAI use across various pedagogical activities. Based on Table 2, the results show a clear hierarchy. Teachers most frequently used GenAI for content planning and production tasks: developing teaching materials (mean = 4.38), designing lesson plans (mean = 4.31), and creating questions or quizzes (mean = 4.24). These activities share common characteristics: they are routine, time-consuming, and carry relatively low pedagogical risk if the AI output is imperfect. In contrast, teachers reported significantly lower use of GenAI for tasks

requiring more in-depth pedagogical analysis and assessment. Analyzing student learning outcomes received an average score of only 3.02, and using GenAI for classroom action research was the least frequently used activity (mean = 2.94). Assignment grading and correction fell in the middle range (mean = 3.71), indicating that some teachers are beginning to use GenAI for assessment but remain cautious. This pattern suggests that GenAI currently functions primarily as a productivity tool rather than a transformative pedagogical instrument. Teachers use AI to save time and reduce routine workload, but they do not yet fully rely on it for data-driven decision-making, reflective inquiry, or research activities. The relatively high standard deviations for analytical activities (SD = 1.01 for learning outcome analysis; 1.05 for action research) suggest that a small proportion of teachers are experimenting with these advanced uses, but they are not yet commonplace.

Table 3 Perception of GenAI's Positive Impact

Positive Impacts	Mean	SD
Saving preparation time	4.55	0.63
Increasing learning creativity	4.48	0.67
Efficiency of teacher administration	4.44	0.69
Supporting professional development	4.39	0.71
Improving learning quality	4.41	0.66
Supporting personalized feedback	4.02	0.81

Based on Table 3, Teachers perceptions of Gen AI's positive impacts were overwhelmingly favourable. All benefit items scored above 4.0 on the 5 point scale. The highest-rated benefit was saving preparation time (mean = 4.55), followed closely by increasing learning creativity (4.48), improving teacher administrative efficiency (4.44), and enhancing learning quality (4.41). Teachers also believed Gen AI supported their professional development (4.39). However, the benefit related to supporting personalised feedback received the lowest score among the benefit items (mean = 4.02), still positive but noticeably lower than others. This suggests that while teachers perceive Gen AI as highly useful for general tasks, they are less convinced or less able to use it for tailoring feedback to individual student needs. The gap between perceived general benefits and more limited personalised application is a recurring theme.

Table 4 Mean Score of Barriers to GenAI Utilization

Barriers	Mean	SD
Lack of AI training	4.12	0.82
Teacher workload	4.05	0.86
Lack of school policies	4.08	0.84
Data privacy & security issues	4.01	0.88
AI bias & hallucinations	3.97	0.89
Internet connection	3.76	0.93
Device limitations	3.71	0.95
AI threatens the role of teachers	2.41	1.07

Based on table 4, the results show that the most significant obstacles are structural and competency-based, not technical or ideological. The highest-rated barrier was lack of AI training (mean = 4.12), followed closely by lack of clear school policies (4.08) and teacher workload (4.05). Data privacy and security concerns (4.01) and AI bias/hallucinations (3.97) were also rated as substantial barriers.

Notably, technical barriers such as internet connection (3.76) and device limitations (3.71) were rated lower, indicating that infrastructure, while not perfect, is not the primary constraint. Most strikingly, the barrier "AI threatens the role of teachers" received the lowest score of all (mean = 2.41), with a large standard deviation (1.07). This indicates that teachers overwhelmingly do not view GenAI as a professional threat. Instead, they see it as a supporting tool that requires proper management and regulation. The wide standard deviation, however, suggests that a small minority do harbour some anxiety about job replacement.

Table 5 Teacher Professional Development Needs

Needs	**Mean**
Practical AI training	4.61
AI ethics & policy guidance	4.54
AI integration into the curriculum	4.46
Community of teacher practitioners	4.33

Based on table 5, Teachers articulated very clear professional development priorities. The highest need was for practical AI training (mean = 4.61) hands on, classroom embedded learning, not abstract theory. The second highest need was for AI ethics and policy guidance (4.54), reflecting teachers' desire for clear rules about acceptable use, data privacy, and academic integrity. Teachers also strongly endorsed the need for AI integration into the official curriculum (4.46), meaning they want Gen AI use to be structured and legitimised, not left as an individual experiment. Finally, teachers expressed a need for a community of teacher practitioners (4.33) collaborative spaces to share strategies, reflect on practice, and solve problems together. These needs form a coherent set: training, guidelines, curriculum structure, and peer support. They suggest that teachers are not resistant to AI but rather seek systematic, supported integration.

Discussion

The first research question sought to examine the level of teachers readiness to integrate Gen AI and how functional readiness compares to conceptual literacy. The findings reveal what can be termed a readiness paradox: teachers demonstrate high functional readiness with understanding basic concepts, naming tools, and having some training exposure but only modest conceptual literacy with understanding of machine learning, NLP, and Gen AI mechanisms. This gap has significant pedagogical implications. The high level of functional readiness aligns with previous research by Zhai (2025), who found that teachers tend to adopt AI primarily for task automation

and content generation (Zhai, 2025). Similarly (Fütterer2023) reported that teachers self-efficacy and perceived ease of use strongly influence their intention to adopt AI tools, (Fütterer et al., 2023). However, the gap between practical and conceptual literacy identified in this study has also been observed by Chen (2025), who emphasised the importance of AI pedagogical literacy beyond mere tool operation (Chen et al., 2025).

What does this mean for critical versus uncritical AI integration? Teachers who know how to prompt Chat GPT for a lesson plan but do not understand how the model generates text including its probabilistic nature, training data biases, and tendency to hallucinate are unlikely to critically evaluate the output. Such teachers may accept AI generated content as authoritative, overlook embedded cultural or curricular inconsistencies, and fail to recognise when the tool produces biased or inaccurate material. Indeed, the preliminary interviews revealed that 80% of teachers admitted to making extensive manual revisions due to cultural or curriculum inconsistencies, suggesting that they already encounter these problems but may not fully understand their origin. Conversely, critical integration requires conceptual literacy. Teachers must understand that Gen AI systems are not neutral or omniscient. They are statistical models that reflect the biases in their training data. Without this understanding, teachers cannot effectively evaluate AI outputs, design prompts that mitigate bias, or teach students to use AI responsibly. Therefore, professional development must move beyond tool demonstration to explain underlying mechanisms and limitations.

The second research question examined patterns of Gen AI use across different pedagogical activities, from routine planning to analytical and research-based tasks. The findings reveal a clear hierarchy: teachers most frequently use Gen AI for planning and content production (developing teaching materials, designing lesson plans, creating quizzes) and much less frequently for analytical and research-based tasks (analysing student learning outcomes, classroom action research). This pattern reinforces Alam (2021) argument that AI in schools still functions primarily as a teaching assistant rather than a learning analytics engine(Alam, 2021). The low use of AI for learning outcome analysis indicates that teachers are not yet fully prepared, both methodologically and ethically, to manage AI-based learning data.

This finding is consistent with Williamson and Eynon (2020), who noted that positive perceptions of AI do not automatically translate into continued or sophisticated practice(Williamson & Eynon, 2020). The relatively high standard deviations for analytical activities suggest that a small minority of teachers are experimenting with advanced uses, but they are not yet typical. This variation likely reflects differences in prior training, access to resources, and individual initiative. Importantly, the pattern is consistent across all levels of education, suggesting that challenges to Gen AI integration are driven not solely by educational attainment but rather by structural factors such as limited advanced training, a lack of policy based pedagogical guidance,

and low data and research literacy among teachers. Thus, the study confirms that current Gen AI use remains operational and administrative, with a primary focus on saving time and simplifying routine tasks. This finding underscores the importance of shifting the paradigm of teacher professional development from simply using Gen AI as a technical tool to a more strategic use that supports learning analysis, pedagogical reflection, and continuous improvement of learning quality.

The third research question explored what benefits teachers perceive from using Gen AI and what barriers hinder effective integration. Teachers perceptions of Gen AI positive impacts were overwhelmingly favourable, with the highest-rated benefit being saving preparation time (mean = 4.55), followed by increasing learning creativity and improving administrative efficiency. These findings align with Brada and Dahmani (2024) and AlSagri and Sohail (2024), who emphasised AI potential to improve learning efficiency and quality(AlSagri & Sohail, 2024; Brada & Dahmani, 2024). However, the benefit related to supporting personalised feedback received the lowest score among benefit items (mean = 4.02). This suggests that while teachers perceive Gen AI as highly useful for general tasks, they are less convinced or less able to use it for tailoring feedback to individual student needs. This gap between perceived potential and actual personalisation practice is likely a training and support gap, not a motivational one. Regarding barriers, the most significant obstacles were structural and competency-based, not technical or ideological. Lack of AI training (mean = 4.12) and lack of clear school policies (mean = 4.08) were the highest-rated barriers. These findings align with research by Floridi and Cowls (2019) and Holmes and Tuomi (2022), who emphasised that ethical frameworks and institutional policies must be embedded into teacher training(Floridi & Cowls, 2019; Holmes & Tuomi, 2022). Technical barriers such as internet connection and device limitations were rated lower, indicating that infrastructure, while not perfect, is not the primary constraint. Most strikingly, the barrier "AI threatens the role of teachers" received the lowest score of all (mean = 2.41). This contradicts studies that suggest teachers view AI as a professional threat (Kefi et al., 2024; Veledar et al., 2024). In the context of this study, teachers actually view AI as a supporting tool that enhances, rather than replaces, their pedagogical role. This finding challenges deficit based narratives that portray teachers as resistant or fearful. Instead, it suggests that with appropriate support, teachers are willing and able to integrate AI in ways that align with their professional values.

The fourth research question identified what professional development needs teachers consider essential for responsible and pedagogically sound Gen AI integration. Teachers articulated very clear priorities. The highest need was for practical AI training (mean = 4.61) hands on, classroom embedded learning, not abstract theory. The second highest need was for AI ethics and policy guidance (4.54), reflecting teachers desire for clear rules about acceptable use, data privacy, and academic integrity. Teachers also strongly endorsed the need for AI integration into the official curriculum (4.46), meaning they want Gen AI use to be structured and legitimised, not left as an individual experiment. Finally, teachers expressed a need

for a community of teacher practitioners (4.33) collaborative spaces to share strategies, reflect on practice, and solve problems together. These four needs map directly onto a coherent framework for teacher professional development. They suggest that teachers are not resistant to AI but rather seek systematic, supported integration. The findings imply that the sustainable adoption of Gen AI requires integrated training, policy, and support from a professional ecosystem. Therefore, future efforts should move beyond technology centric approaches to achieving transformative AI literacy that integrates conceptual understanding, pedagogical design, and moral reflection.

D. Conclusions

This study investigated teacher readiness, Gen AI usage patterns, perceived benefits and barriers, and professional development needs within a developing-country educational context. Using survey data from 80 teachers in Bengkulu, Indonesia, the research provides empirical answers to four key questions. Teachers demonstrated high functional readiness they possessed strong basic AI knowledge, could name multiple AI tools, and had moderate training exposure. However, their conceptual literacy understanding of machine learning, natural language processing, and how Gen AI systems actually generate outputs was only modest. This creates a readiness paradox, teachers know what AI can do but lack deep understanding of how it works. Without conceptual literacy, teachers risk uncritical adoption, accepting AI generated content without adequately evaluating it for bias, accuracy, or cultural appropriateness. Thus, readiness is currently instrumental rather than reflective. Gen AI use was heavily concentrated on operational, routine tasks. Teachers most frequently employed Gen AI for developing teaching materials, designing lesson plans, and creating quizzes activities that save time and reduce administrative workload. In contrast, use of Gen AI for analytical and research-based tasks such as analysing student learning outcomes and conducting classroom action research – remained very limited. This pattern indicates that Gen AI currently functions primarily as a productivity tool rather than a transformative pedagogical instrument. Teachers leverage AI for efficiency but have not yet integrated it into data driven decision-making or reflective professional inquiry. Teachers perceived overwhelmingly positive benefits, particularly time savings, increased creativity, and administrative efficiency. However, the benefit of personalised feedback was rated notably lower, suggesting teachers are either less convinced or less capable of using Gen AI for individualised student support. Regarding barriers, the most significant obstacles were structural and competency based, lack of training and unclear school policies were rated higher than technical infrastructure limitations such as internet connectivity or device shortages. Importantly, teachers did not view Gen AI as a threat to their professional role, instead, they saw it as a supportive tool requiring proper management and regulation. Teachers articulated four clear priorities practical, hands on training, ethics and policy guidance, curriculum integration, and communities of practice. These four needs form a coherent framework for systematic support. Teachers want classroom-embedded learning, not abstract theory, clear rules about

acceptable use and data privacy, structured, legitimised integration within the official curriculum, and collaborative spaces to share strategies and solve problems together. Successful Gen AI integration depends not on overcoming teacher resistance or improving technology access alone, but on building conceptual literacy alongside functional readiness, establishing clear institutional policies, and providing sustained, practice embedded professional development. Future efforts should focus on transforming Gen AI from a productivity tool into a driver of pedagogical improvement and professional growth, particularly in developing-country contexts where such guidance is urgently needed

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References

Akpan, I. J., & Akpan, A. A. (2024). *Evolutionary Trends in Decision Sciences Education Research From Simulation and Games to Data Analytics and Generative Artificial Intelligence*. https://doi.org/10.20944/preprints202407.1294.v1

Alam, A. (2021). Should Robots Replace Teachers? Mobilisation of AI and Learning Analytics in Education. *2021 International Conference on Advances in Computing, Communication, and Control (ICAC3)*, 1–12. https://doi.org/10.1109/ICAC353642.2021.9697300

AlSagri, H. S., & Sohail, S. S. (2024). Evaluating the role of Artificial Intelligence in sustainable development goals with an emphasis on "quality education." *Discover Sustainability*, *5*(1), 458. https://doi.org/10.1007/s43621-024-00682-9

Alshorman, S. (2024). THE READINESS TO USE AI IN TEACHING SCIENCE: SCIENCE TEACHERS' PERSPECTIVE. *Journal of Baltic Science Education*, *23*(3), 432–448. https://doi.org/10.33225/jbse/24.23.432

BAİDOO-ANU, D., & OWUSU ANSAH, L. (2023). Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning. *Journal of AI*, *7*(1), 52–62. https://doi.org/10.61969/jai.1337500

Barrett, A., & Pack, A. (2023). Not quite eye to A.I.: student and teacher perspectives on the use of generative artificial intelligence in the writing process. *International Journal of Educational Technology in Higher Education*, *20*(1), 59. https://doi.org/10.1186/s41239-023-00427-0

Brada, A., & Dahmani, F. (2024). Artificial Intelligence Technologies and Their Significance in Enhancing the Quality of Adaptive E-Learning. *Journal of Science and Knowledge Horizons*, *4*(02), 30–47. https://doi.org/10.34118/jskp.v4i02.4007

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, *20*(1), 43. https://doi.org/10.1186/s41239-023-00411-8

Chen, F., Li, Y., Chen, Y., Bian, Z., Duo, L., Zhou, Q., & Zhang, L. (2025). Strategies for the Analysis and Elimination of Hallucinations in Artificial Intelligence Generated Medical Knowledge. *Journal of Evidence-Based Medicine*, *18*(3). https://doi.org/10.1111/jebm.70075

Creswell, J. W., & Creswell J. David. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (fifth Edition).

Floridi, L., & Cowls, J. (2019). A Unified Framework of Five Principles for AI in Society. *Harvard Data Science Review*. https://doi.org/10.1162/99608f92.8cd550d1

Fütterer, T., Fischer, C., Alekseeva, A., Chen, X., Tate, T., Warschauer, M., & Gerjets, P. (2023). ChatGPT in education: global reactions to AI innovations. *Scientific Reports*, *13*(1), 15310. https://doi.org/10.1038/s41598-023-42227-6

Heine, S., & König, J. (2025). Applying artificial intelligence in teacher education: preservice teachers' attitudes and reflections in using ChatGPT for teaching and learning. *European Journal of Teacher Education*, *48*(5), 934–963. https://doi.org/10.1080/02619768.2025.2540791

Holmes, W., & Tuomi, I. (2022). State of the art and practice in <scp>AI</scp> in education. *European Journal of Education*, *57*(4), 542–570. https://doi.org/10.1111/ejed.12533

Hwang, G. J., & Chen, N. S. (2023). Editorial Position Paper: Exploring the Potential of Generative Artificial Intelligence in Education: Applications, Challenges, and Future Research Directions. *Educational Technology and Society*, *26*(2). https://doi.org/10.30191/ETS.202304_26(2).0014

Jang, J., Jeon, J., & Jung, S. K. (2022). Development of STEM-Based AI Education Program for Sustainable Improvement of Elementary Learners. *Sustainability*, *14*(22), 15178. https://doi.org/10.3390/su142215178

Kefi, H., Khelladi, I., Mani, Z., & Veg-Sala, N. (2024). AI-enabled social support chatbot usage: flowing ambivalence and liminalities. *Journal of Decision Systems*, 1–24. https://doi.org/10.1080/12460125.2024.2443226

Monib, W. K. (2024). Afghan undergraduate students' perceptions toward e-learning. *E-Learning and Digital Media*, *21*(6), 535–558. https://doi.org/10.1177/20427530231180029

Nazari, M., & Saadi, G. (2024). Developing effective prompts to improve communication with ChatGPT: a formula for higher education stakeholders. *Discover Education*, *3*(1), 45. https://doi.org/10.1007/s44217-024-00122-w

Rudolph Jurgen, Tan Shannon, & Aspland Tania. (2023). Editorial 6(2): Personal digital assistant or job killer? Generative AI and the teaching profession in higher education. *Journal of Applied Learning & Teaching*, *6*(2). https://doi.org/10.37074/jalt.2023.6.2.1

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, *128*, 13–35. https://doi.org/10.1016/j.compedu.2018.09.009

Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, *18*(1), 54. https://doi.org/10.1186/s41239-021-00292-9

Tella, A. (2015). Electronic and paper based data collection methods in library and information science research. *New Library World*, *116*(9/10), 588–609. https://doi.org/10.1108/NLW-12-2014-0138

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education*, *57*(4), 2432–2440. https://doi.org/10.1016/j.compedu.2011.06.008

Tlili Ahmed, Huang Ronghuai, Yasir Mustafa Muhammad, Zhao Jialu, Bozkurt Aras, Xu Lin, Wang Huanhuan, Salha Soheil, Altinay Fahriye, Affouneh Saida, & Burgos Daniel. (2023). Speaking of transparency: Are all Artificial Intelligence (AI) literature reviews in education transparent? *Journal of Applied Learning & Teaching*, *6*(2). https://doi.org/10.37074/jalt.2023.6.2.15

Toncelli Rachel, & Kostka Ilka. (2024). A Love-Hate Relationship: Exploring Faculty Attitudes Towards GenAI and Its Integration into Teaching. *International Journal of TESOL Studies*. https://doi.org/10.58304/ijts.20240306

Tondeur, J., Scherer, R., Siddiq, F., & Baran, E. (2020). Enhancing pre-service teachers' technological pedagogical content knowledge (TPACK): a mixed-method study. *Educational Technology Research and Development*, *68*(1), 319–343. https://doi.org/10.1007/s11423-019-09692-1

Veledar, B., Bašić, M., Demirović, L., & Beširević, E. (2024). Does Artificial Intelligence Represent a Threat to the Accounting Profession? *Journal of Forensic Accounting Profession*, *4*(2), 67–85. https://doi.org/10.2478/jfap-2024-0010

Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology*, *45*(3), 223–235. https://doi.org/10.1080/17439884.2020.1798995

Yang, Y., Sun, W., Sun, D., & Salas-Pilco, S. Z. (2025). Navigating the AI-Enhanced STEM education landscape: a decade of insights, trends, and opportunities. *Research in Science & Technological Education*, *43*(3), 693–717. https://doi.org/10.1080/02635143.2024.2370764

Zhai, X. (2025). Transforming Teachers' Roles and Agencies in the Era of Generative AI: Perceptions, Acceptance, Knowledge, and Practices. *Journal of Science Education and Technology*, *34*(6), 1323–1333. https://doi.org/10.1007/s10956-024-10174-0

Zhang, Y., & Dong, C. (2024). Unveiling the Dynamic Mechanisms of Generative AI in English Language Learning: A Hybrid Study Based on fsQCA and System Dynamics. *Behavioral Sciences*, *14*(11), 1015. https://doi.org/10.3390/bs14111015