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Readiness and Perspectives of Science Teachers on the Use of AI in Teaching Science

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A B S T R A C T :

This study aimed to examine the readiness, access, professional development, attitudes, and perceived challenges of science educators in integrating Artificial Intelligence (AI) in classroom instruction. Despite the growing presence of AI in education, many teachers remain uncertain about how to effectively integrate these tools into their teaching practice. Concerns about technical competence, infrastructure, ethical implications, and policy clarity present significant obstacles to implementation. The study employed a descriptive research design using a validated survey questionnaire administered to science teachers. Data were analyzed using weighted mean scores and descriptive statistics to determine perceptions across five domains: perceived competence, access to AI resources, professional development, attitudes toward AI, and barriers and challenges. Results revealed that while science educators possessed a high level of conceptual understanding of AI (M = 3.43), they lacked practical confidence in applying AI tools in teaching (M = 2.30). Access to AI infrastructure and resources was found to be limited, especially in terms of hardware, connectivity, and technical support (M = 2.48). Professional development efforts were seen as inadequate, with many teachers dissatisfied with the relevance and practicality of existing training (M = 2.33). Despite these limitations, teachers exhibited positive attitudes toward AI integration (M = 3.25), though concerns remained about privacy, ethics, and the reliability of AI assessments. The study concluded that there is a clear readiness gap between theoretical knowledge and practical application of AI among science teachers. To bridge this gap, the study recommends targeted hands-on training, improved infrastructure, policy development, and ethical guidelines. Educational leaders and policymakers must invest in continuous, context-specific professional development and ensure equitable access to AI resources to fully harness its potential in science education. bNueva Ecija University of Science and Technology, Cabanatuan City, Philippines

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Introduction

Artificial Intelligence (AI) has been viewed as a revolutionary progress in the field of computer science. It was defined by its ability to mimic cognitive abilities commonly linked to human intelligence, such as learning, decision-making, reasoning, and solving problems (IBM, 2023). With advancements in AI technologies, they transformed several sectors including healthcare, commerce, and, most notably, education (Satra, 2021). In the field of education, AI brought forth novel chances to revolutionize traditional teaching and learning methods via more engaging, data-driven, and adaptive systems (Alkanaan, 2022; Karl, 2024).

In the realm of science education, AI has demonstrated efficacy in improving teaching methods and student comprehension. Research demonstrated that it encouraged the growth of vital 21st-century abilities including critical thinking, problem-solving, creativity, and digital literacy (Chiu & Chai, 2020; Esalas, 2024). By combining immersive simulations, intelligent tutoring systems (ITS), and adaptive learning platforms, AI offered students tailored and experiential learning settings that enhanced their conceptual comprehension (Dimitriadou & Lanitis, 2023; Akhmadieva et al., 2023; Ayeni, 2024). AI enabled immediate evaluations and responses, aiding in more personalized and efficient teaching (Salem, 2024).

Despite its potential, the successful integration of AI in science education largely depended on teachers' readiness and capacity to adopt and implement the technology in classroom settings. Educators' attitudes, perceptions, and willingness to use AI were critical factors influencing its effectiveness in instruction (Čipková & Karolčik, 2018; Sallam et al., 2023). Moreover, the presence of digital tools, access to professional development opportunities, and alignment with curricular goals significantly impacted teachers' ability to incorporate AI meaningfully into their teaching practices (Ayanwale et al., 2022).

In the Philippines, both the Department of Education (DepEd) and the Department of Science and Technology (DOST) initiated efforts to explore AI's potential in improving educational outcomes. DepEd established the Education Center for AI Research (E-CAIR), a hub for developing AI-driven teaching and learning tools (Department of Education, 2024). Pilot projects were launched, including AI-powered systems for early disability detection and support centers for learners with disabilities (DepEd, 2024a). Additionally, DOST implemented the SPARTA program to train Filipinos in data

science and analytics (DOST, 2023). Foreign collaborations and platforms such as LinkedIn also offered AI and data literacy courses for teachers, equipping them for the digital age (DepEd, 2023; LinkedIn, 2023). Machine learning applications were also piloted in high school science classrooms to predict student performance and personalize instructional strategies (Cruz & Mendoza, 2022). In line with these national and global developments, the present study aimed to determine the readiness and perspectives of science teachers on the use of AI in teaching science in Cluster I, Magalang Schools Division Office of Pampanga. The study sought to assess teachers' preparedness, perceptions, and willingness to integrate AI tools into their science instruction as a basis for targeted interventions and professional development programs.

1.1 Statement of the Problem

This study aimed to determine the readiness and perspectives of science teachers in Magalang Cluster I Schools Division of Pampanga in using artificial intelligence (AI) in teaching science. It sought to understand how prepared they were to adopt AI technologies in their instructional practices and how they perceived the use of AI in enhancing the teaching and learning process in science education. Specifically, the study aimed to evaluate the perceived readiness of science teachers to integrate AI into their teaching practices. It also aimed to examine differences in readiness based on gender, years of experience, and access to professional development. Additionally, the study sought to identify key barriers and challenges faced in implementing AI, and to assess teachers' attitudes, self-efficacy, and perceived benefits in using AI within the science classroom.

Methods

2.1 Research Design

This research utilized a descriptive quantitative method to investigate the preparedness and views of science educators regarding the incorporation of Artificial Intelligence (AI) into science teaching. The design aimed at gathering measurable data via a structured survey to outline the existing levels of teacher preparedness, their attitudes, and perceived obstacles concerning AI integration. Descriptive research was suitable for this study as it enabled the researcher to methodically collect data from a targeted group—specifically, science teachers from Magalang Cluster I in the Schools Division of Pampanga. The aim was to evaluate current conditions instead of altering variables, which renders this design effective for detecting trends, perceptions, and connections among important factors linked to AI utilization in science education.

2.2 Data Sources

The study gathered primary data from all 40 science teachers in Cluster I schools located in Magalang, Pampanga. These participants came from both Junior High School (JHS) and Senior High School (SHS) levels. They provided responses through a validated questionnaire that focused on their readiness and perspectives in using Artificial Intelligence (AI) for science instruction. Magalang schools were chosen for the study due to their relatively greater access to digital technologies, aligning with the study's objective to assess the preparedness of teachers for AI integration in education. The number of available science teachers in the cluster was manageable, which made it possible to include the entire group in the data collection. Secondary data were also utilized to enrich the study. These included academic journals, educational policy documents, institutional publications, and credible online sources related to AI in education. These materials supported the review of literature, helped in framing the research context, and contributed to the interpretation of the primary data collected from teachers.

2.3 Research Procedure

The study followed a systematic process to ensure the validity and reliability of the data collected. It began with the development of a structured questionnaire designed to assess science teachers' readiness and perspectives on integrating Artificial Intelligence (AI) into their teaching practices. To validate the instrument, two Master Teachers in science education reviewed the questionnaire. They evaluated each item based on its clarity, relevance, and cultural appropriateness. Their feedback was used to revise and refine the items before administration. Each item was rated using a 4-point scale to determine its relevance, and the Item Content Validity Index (I-CVI) was calculated, yielding values between 0.50 and 1.00. Items with low ratings were either revised or removed to enhance the tool's quality. Following the expert review, a pilot study was conducted with ten science teachers who were not part of the main sample. The pilot test aimed to identify any confusing or unclear questions and assess the overall reliability and clarity of the instrument. Feedback from the pilot participants was analyzed and used to make final adjustments to the questionnaire. After finalizing the instrument, the main data collection was carried out. The validated questionnaire was distributed to 40 science teachers in Cluster I schools of Magalang, Pampanga. All participants completed the instrument voluntarily, and their responses were treated with confidentiality. The collected data were then organized for analysis to address the research objectives.

Results and Discussion

3.1 Perceived Competence in AI

As presented in Table 1, the findings revealed that most science teachers understood the basic concepts of AI relevant to education, with a high weighted mean of 3.43. This indicated that, conceptually, they were aware of AI's potential role in education. Teachers also agreed that they could easily learn new AI tools (M = 3.35), evaluate their effectiveness (M = 3.18), and explain their benefits and limitations to students (M = 3.25). These findings reflected a strong cognitive readiness for AI integration, aligning with previous studies that emphasized the importance of foundational

knowledge in digital competence (Chiu & Chai, 2020). Despite this, several indicators showed low levels of practical readiness. For example, teachers disagreed that they were confident in using AI tools to teach science (M = 2.30), that they could troubleshoot minor issues with AI (M = 2.20), and that they could integrate AI tools with traditional teaching methods effectively (M = 2.20). These results suggested that while teachers understood AI theoretically, they lacked confidence and practical skills to use it effectively in the classroom. This supported the findings of Ayanwale et al. (2022), who reported that the transition from knowledge to application remained a significant challenge in technology integration.

These results implied that training programs for teachers should not only focus on introducing AI concepts but also emphasize skill-building through hands-on practice, simulations, and real-world teaching scenarios. Schools and educational policymakers needed to provide more structured and continuous professional development that addressed practical implementation, technical troubleshooting, and instructional design using AI (Dimitriadou & Lanitis, 2023). In summary, the results in Table 1 indicated a readiness gap between knowing about AI and confidently applying it in science teaching. Addressing this gap required targeted interventions, resource allocation, and sustained teacher support to ensure successful integration of AI in education.

Table 1
Perceived Competence in AI

Statement	Strongly Agree (4)	Agree (3)	Disagree (2)	Strongly Disagree (1)	Weighted Mean	Description
I understand the basic concepts of AI relevant to education.	**22**	**14**	**3**	**1**	**3.43**	**Agree**
I am confident in my ability to use AI tools for teaching science subjects.	**6**	**8**	**18**	**8**	**2.30**	**Disagree**
I can easily learn new AI tools that are introduced for educational purposes.	**20**	**15**	**4**	**1**	**3.35**	**Agree**
I feel prepared to troubleshoot minor issues with AI technology in the classroom.	**5**	**7**	**19**	**9**	**2.20**	**Disagree**
I am able to evaluate the effectiveness of AI tools in enhancing science learning.	**16**	**17**	**5**	**2**	**3.18**	**Agree**
I am comfortable explaining the benefits and limitations of AI to my students.	**19**	**14**	**5**	**2**	**3.25**	**Agree**
I can integrate AI teaching tools with traditional teaching methods effectively.	**5**	**7**	**16**	**12**	**2.20**	**Disagree**

Descriptive Meaning

Scale	Weighted Mean Range	Description	Descriptive Meaning
4	**3.50 – 4.00**	**Strongly Agree**	**The respondent demonstrates a very high level of agreement, confidence, or competence.**
3	**2.50 – 3.49**	**Agree**	**The respondent generally agrees and shows a satisfactory level of confidence or competence.**
2	**1.50 – 2.49**	**Disagree**	**The respondent shows limited agreement and has some reservations or uncertainty.**
1	**1.00 – 1.49**	**Strongly Disagree**	**The respondent does not agree at all and demonstrates very low confidence or competence.**

3.2 Access of AI Resources

Based on the results presented in Table 2, science teachers reported varying levels of access to artificial intelligence (AI) resources and infrastructure in their schools. The statement “I have access to adequate AI resources for teaching science” had a weighted mean of 2.73, described as Sometimes, indicating moderate availability. Similarly, the statement “I have access to a variety of AI software and applications for education” received a mean of 2.63 (Sometimes), and “The AI teaching resources available to me are up-to-date and relevant” had a mean of 2.65 (Sometimes). These findings suggested that while some AI resources are available, they may not be consistently accessible or uniformly distributed across classrooms.

However, areas such as hardware, technical support, and internet connectivity appeared to be more challenging. The item “My school provides sufficient hardware for utilising AI in the classroom” had a weighted mean of 2.48, interpreted as Rarely. Similar results were seen in “My school provides the necessary technical support for using AI tools” (2.48) and “I have a reliable internet connection in the classroom for AI activities” (2.48), all categorized under Rarely. These findings highlight the significant infrastructural barriers that can hinder effective AI integration in teaching.

The lack of sufficient hardware, consistent internet access, and technical support could severely restrict teachers' ability to implement AI tools effectively in their instruction. As noted by Holmes et al. (2022), equitable access to infrastructure and digital tools is a critical factor in the successful integration of AI in education. Without reliable infrastructure, teachers are less likely to adopt or sustain AI-supported pedagogies. Furthermore, the limited access may affect students' learning opportunities, widening the digital divide in science education (Luckin et al., 2016). On a more positive note, the item "I have the necessary instructional materials to complement AI tools" had a mean of 2.75 (Sometimes), indicating a moderate level of preparedness in terms of teaching content. This finding suggests that while the technological aspect may be lacking, some instructional readiness is present, which could serve as a foundation for more comprehensive AI integration if resource gaps are addressed.

Thus, data implied that while there is a willingness to incorporate AI in teaching, infrastructural limitations remain a major concern. Addressing these issues through targeted investments in hardware, internet access, and support systems will be essential to harness the full potential of AI in science classrooms. As UNESCO (2021) emphasized, ensuring equitable access to digital tools and teacher training is vital in realizing the benefits of AI in education.

Table 2
Access to AI Resources

Statement	Often (4)	Sometimes (3)	Rarely (2)	Never (1)	Weighted Mean)	Description
I have access to adequate AI resources for teaching science.	**12**	**18**	**7**	**3**	**2.73**	**Sometimes**
My school provides sufficient hardware for utilising AI in the classroom.	**10**	**17**	**9**	**4**	**2.48**	**Rarely**
I have access to a variety of AI software and applications for education.	**11**	**16**	**10**	**3**	**2.63**	**Sometimes**
My school provides the necessary technical support for using AI tools.	**8**	**15**	**12**	**5**	**2.48**	**Rarely**
I have a reliable internet connection in the classroom for AI activities.	**9**	**16**	**10**	**5**	**2.48**	**Rarely**
The AI teaching resources available to me are up-to-date and relevant.	**13**	**14**	**9**	**4**	**2.65**	**Sometimes**
I have the necessary instructional materials to complement AI tools.	**14**	**15**	**8**	**3**	**2.75**	**Sometimes**

Descriptive Meaning

Scale	Weighted Mean Range	Description	Meaning
4	**3.50 – 4.00**	**Often**	**The practice/resource is frequently observed or accessed by the respondents.**
3	**2.50 – 3.49**	**Sometimes**	**The practice/resource is occasionally accessed or practiced.**
2	**1.50 – 2.49**	**Rarely**	**The practice/resource is seldom accessed or practiced.**
1	**1.00 – 1.49**	**Never**	**The practice/resource is not accessed or practiced at all.**

3.3 Professional Development and Training for AI

Based on the results shown in Table 3, science teachers generally agreed that they received some support and opportunities for professional development in AI. However, satisfaction with the quality and relevance of this training remained low. The lowest weighted mean was found in the item stating, "I was satisfied with the training provided for AI integration" (WM = 2.33), indicating a general disagreement among respondents. This reflected a gap in the current training initiatives and suggested a need for more targeted and practical professional development.

While teachers actively sought out AI learning opportunities (WM = 2.85), institutional encouragement and tailored training were only moderately present. This implied that although there was motivation among educators to explore AI in education, system-level support lagged behind. Holmes et al. (2022) emphasized that meaningful professional development is essential for educators to keep pace with technological innovation. Similarly, UNESCO (2021) recommended that schools adopt structured, context-sensitive AI training programs to ensure teachers can confidently and effectively

integrate AI tools into instruction. According to Luckin et al. (2016), such development is vital for aligning pedagogy with the evolving demands of AI-enhanced learning environments.

Table 3
Professional Development and Trining for AI

Statement	4 (Strongly Agree)	3 (Agree)	2(Disagree)	1(Strongly Disagree)	Weighted Mean	Description
I am encouraged by my school to attend workshops or conferences about AI in education.	**10**	**12**	**13**	**5**	**2.68**	**Agree**
The professional development I receive is tailored to my subject area and grade level.	**7**	**13**	**14**	**6**	**2.53**	**Agree**
I am satisfied with the level of training provided for AI integration into the curriculum.	**6**	**10**	**15**	**9**	**2.33**	**Disagree**
I actively seek out new learning opportunities related to AI.	**11**	**16**	**9**	**4**	**2.85**	**Agree**
The training I received has been practical and applicable to my teaching context.	**8**	**14**	**13**	**5**	**2.63**	**Agree**

Descriptive Meaning

Scale	Weighted Mean Range	Description	Descriptive Meaning
4	**3.50 – 4.00**	**Strongly Agree**	**The respondent demonstrates a very high level of agreement, confidence, or competence.**
3	**2.50 – 3.49**	**Agree**	**The respondent generally agrees and shows a satisfactory level of confidence or competence.**
2	**1.50 – 2.49**	**Disagree**	**The respondent shows limited agreement and has some reservations or uncertainty.**
1	**1.00 – 1.49**	**Strongly Disagree**	**The respondent does not agree at all and demonstrates very low confidence or competence.**

3.4 Attitudes Toward AI in Education

The results presented in Table 4 indicated that science teachers generally held positive attitudes toward artificial intelligence in education. Most statements received a mean rating within the "Agree" range, suggesting that teachers acknowledged the value and potential of AI tools in improving educational outcomes. Teachers believed that AI could enhance science education (M = 3.28) and support personalized learning (M = 3.25), reflecting a forward-looking perspective on the integration of technology. However, a mean score of 2.70 for concerns about AI replacing human elements in teaching implied a level of caution and skepticism. This concern aligned with the findings of Holmes, Bialik, and Fadel (2022), who emphasized the need for a balanced approach where AI supports, rather than replaces, human instruction. Similarly, UNESCO (2021) highlighted the importance of ethical and pedagogical guidance in the deployment of AI systems. These results implied that while teachers were generally optimistic, ongoing professional development, dialogue, and safeguards were essential to foster trust and effective implementation.

Table 4
Attitudes Toward AI in Education

Statement	4 (Strongly Agree)	3 (Agree)	2 (Disagree)	1 (Strongly Disagree)	Weighted Mean	Description
I believe that AI can enhance the quality of science education.	**18**	**16**	**5**	**1**	**3.28**	**Agree**
I am excited about the potential of AI to personalize learning for my students.	**17**	**18**	**3**	**2**	**3.25**	**Agree**
I think that AI can help me to be a more effective teacher.	**15**	**17**	**6**	**2**	**3.12**	**Agree**
I am open to experimenting with AI in my teaching practice.	**16**	**15**	**6**	**3**	**3.10**	**Agree**

I believe that AI can support critical thinking and problem-solving skills in science.	**17**	**16**	**5**	**2**	**3.20**	**Agree**
I feel that AI will become an essential part of education in the future.	**19**	**14**	**5**	**2**	**3.25**	**Agree**
I am concerned about AI replacing human elements in teaching.	**10**	**13**	**12**	**5**	**2.70**	**Agree**

3.4 Barriers and Challenges in Using AI in Education

The findings in Table 5 indicate that science educators are encountering significant challenges in integrating artificial intelligence (AI) into educational settings. A predominant concern among respondents is data privacy and security, reflecting apprehensions about the collection and potential misuse of sensitive student information by AI-driven educational technologies. This concern is echoed in recent studies highlighting the risks of excessive data surveillance and the need for robust data protection measures in AI applications within schools. Additionally, educators have expressed uncertainty regarding their institutions' policies on AI usage, suggesting a lack of clear guidelines and frameworks to govern AI integration in classrooms. This ambiguity can hinder effective implementation and may lead to inconsistent practices across educational settings.

Ethical implications of AI use in education also emerged as a significant concern. Teachers are wary of potential biases embedded in AI algorithms, which could perpetuate existing inequalities and adversely affect student learning outcomes . The rapid evolution of AI technologies further compounds these challenges, making it difficult for educators to stay abreast of new tools and their appropriate applications .Moreover, there is apprehension about the reliability of AI-generated assessments in accurately evaluating student understanding. Concerns about the transparency and fairness of AI-driven evaluation methods underscore the need for careful consideration in adopting such technologies for student assessments. These findings underscore the necessity for comprehensive policies, ongoing professional development, and ethical guidelines to support educators in effectively and responsibly integrating AI into educational practices.

Table 5
Barriers and Challenges of Using AI in Education

Statement	4 (Strongly Agree)	3 (Agree)	2 (Disagree)	1 (Strongly Disagree)	Weighted Mean	Description
I am concerned about data privacy and security issues related to using AI in the classroom.	**18**	**13**	**7**	**2**	**3.17**	**Agree**
I perceive a lack of clarity in my school's policy on AI use in education.	**16**	**15**	**6**	**3**	**3.10**	**Agree**
I am worried about the ethical implications of AI in education.	**17**	**14**	**6**	**3**	**3.12**	**Agree**
I think that AI could potentially widen the gap between different groups of students.	**15**	**12**	**8**	**5**	**2.92**	**Agree**
I find it challenging to keep up with the rapid development of AI technologies.	**19**	**10**	**6**	**5**	**3.08**	**Agree**
I am concerned about the reliability of AI assessments in understanding student learning.	**18**	**11**	**7**	**4**	**3.08**	**Agree**

4. Conclusion

This research examined the preparedness, availability, professional growth, perceptions, and obstacles encountered by science teachers in incorporating Artificial Intelligence (AI) into their classrooms. The results indicated a complex situation characterized by significant conceptual understanding yet restricted practical use, infrastructural limitations, and ethical issues. Initially, science educators showed a strong sense of perceived competence in AI at an abstract level. They recognized AI's educational possibilities and were certain in grasping and articulating its advantages. Nonetheless, this preparedness did not convert into actual teaching methods, as numerous teachers were unsure and unskilled in effectively employing AI tools. This disparity between theory and practice highlights the necessity for focused training that incorporates practical experience and relevant application. Secondly, restricted access to AI resources and infrastructure surfaced as a major obstacle. Despite the availability of certain AI-focused teaching resources, educators indicated insufficient access to necessary hardware, software, internet access, and technical assistance. This reflects earlier results indicating that infrastructure disparities obstruct fair AI implementation in education and could worsen the digital divide. Regarding professional growth, teachers expressed eagerness to understand AI; however, they were mostly unhappy with the quality, relevance, and practical use of the training offered. Many training programs lacked a focus on specific subjects and practical significance, emphasizing the necessity of creating professional learning initiatives that cater to the requirements of particular content areas and grade levels.

In spite of these difficulties, science educators demonstrated optimistic viewpoints about AI. They were receptive to integrating AI tools and had faith in AI's ability to improve science teaching and customize learning. Nonetheless, worries persisted regarding AI possibly substituting human interaction and impacting essential aspects of education. These results reinforce the demand for a balanced, ethical, and pedagogically appropriate strategy for AI integration, guaranteeing it acts as a support rather than a substitute for the teacher's role.

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