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Research Article

Teachers' Readiness, Attitude, and Perceived Challenges Toward Generative AI Integration in Science Teaching

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ABSTRACT

This descriptive research is focused on teachers' level of readiness, attitude, and perceived barriers in Generative AI integration in science teaching. It was carried out in every public Junior High Schools under the Schools Division of Ilocos Norte (SDOIN). Through total enumeration, 160 science teachers who were at least three (3) years in the service during the School Year 2025-2026 were the respondents for this study. A survey questionnaire adapted from Alshorman, (2024), which employed a four-point Likert scale, was used as the research instrument to gather quantitative data on the level of readiness, attitudes, and perceived barriers. The data gathered were analyzed using weighted mean. Results revealed a high self-perceived competence in AI (M=3.10) and adequate access to resources (M=2.64). However, formal professional development remains a critical gap (M=2.42), with only 14.4% of respondents having attended AI-specific training. Teachers' attitude toward Generative AI integration is high, signifying that they consider Generative AI to be helpful and useful in science teaching. In contrast, teachers perceive a high number of barriers in integrating Generative AI in science teaching. Overall, the findings emphasize the need for professional development and institutional support to address existing barriers and further strengthen the effective integration of Generative AI in science teaching.

Keywords: *AI integration, Attitude toward AI, Generative AI, Level of readiness, Perceived challenges, Professional development*

Background

Science education plays a vital role in determining society's future. It is through science education that critical thinking, innovation, and scientific literacy among students and educators alike are nurtured (Calo & De Vera, 2025).

In line with this, the Department of Education (DepEd) recognizes the value of science and technology, especially in a world that is rapidly becoming more complex and challenging. The department thus established a science curriculum designed to develop scientific,

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environmental, and technology and engineering literacy among learners as part of the MATATAG Curriculum. The curriculum emphasizes the goal of the department to expand technological and engineering literacy. Consequently, it aims to improve the learners' capacity to relate scientific concepts to real-world engineering and technology applications (MATATAG Curriculum, 2024). Furthermore, the Digital Rise Program initiated by DepEd promotes integrating digital literacy in various lessons, ICT Assisted teaching, and blended learning. This program clearly encourages the use of technology for both students and teachers to address the challenges in digital learning and education technology (DepEd, 2022).

Among the emerging technological innovations, one of the fastest-growing trends is the use of Artificial Intelligence (AI). AI has become more rampant now than in the last decades. It is gradually changing the norms among many aspects of society including the academic community. Due to its ability to offer a transformative experience, it was easily adopted. Its impacts in healthcare, finance, transportation, and manufacturing has rapidly broadened. In educational settings, AI function mainly functions in assisting educators in the construction of lessons that offer fun and novel experiences and in the accomplishment of tasks through automated functions. It has been used to present learning materials, conduct assessments, and provide learning feedback (Fitria, 2021). Generally, the education sector enjoys numerous benefits by using AI, both in the process of learning and delivering lessons. It is believed that AI will be a tool to revolutionize educational pedagogies (Estrellado, 2023). Despite this seemingly positive impact, AI usage is still being a subject of debate. Concerns had been raised on its possible effects to the veracity and identity of the users (Villarino, 2024). It is thus vital that AI users have a clear knowledge on the ethical and responsible use of AI technology.

Generative AI, a more specific classification of AI, are initially designed to converse with humans, merely answering input queries. Over time, Gen AI tools like ChatGPT, Claude, or Perplexity allows science teachers to generate complex rubrics, simplify scientific jargons, and

create hypothetical laboratory scenarios instantly. This functionality provides diverse benefits as it could be used as a virtual tutor or personal homework assistant (Su, 2023). Since it is relatively a new technology, the adaption of Generative AI in the educational setting should be thoroughly studied. Numerous aspects should be considered including the teachers' level of readiness.

The adoption of Generative AI in science education is significantly influenced by social, cultural, and ethical aspects. Filipino instructors and administrators recognize that it is a life-changing innovation that could potentially improve teacher performance, simplify administrative tasks, and catalyze the production of novel research (Giray, 2024). However, obstacles like lack of competence, insufficient and unavailable resources, and personal doubt about security still need to be surpassed to successfully integrate AI in science education (Songkram, 2022). Also, the extent of readiness and preparedness of teachers on the integration of AI into their teaching practices is a huge agent towards an effective Generative AI integration in science education. Specifically, teachers have varied perception towards AI's roles in education. In addition, there is also a varied range of knowledge and skill in the use of Generative AI among educators. (Estrellado, 2023).

Despite the growing research on AI, significant gaps in Generative AI integration training for teachers persist. Limited AI-specific training opportunities, together with lack of technological infrastructures and resistance to technological change are the gaps in AI integration identified by Ngongpah (2025). This aligns with the statement of Estrellado (2023) highlighting the lack of well-founded technological infrastructures and sufficient technological devices. He also highlighted the need for well-structured policies that takes into consideration the concerns on data privacy, unequal access to resources, and the pressing necessity for professional development and training. This is affirmed by Villarino (2024) stating that there is also a limited awareness of the guidelines and policies on AI usage, signifying a policy communication gap.

In the Philippine context, integration of Generative AI is far more prevalent in private

universities than in the K-12 schools. This scenario is due to various gaps in the implementation including limited infrastructures intended for AI integration, insufficient technical expertise of educators, lack of opportunities for professional development, and the digital divide between urban and rural communities (Co, 2025). More specifically, public school teachers from Ilocos Norte demonstrated only a moderate use of digital technologies despite a highly positive view on its ability to improve teaching efficacy. The constraints identified by the teachers include low digital competency, limited resources and lack of functional infrastructures. While the research on technology is growing in Ilocos Norte, there has been a few that tackles the use AI in education due to it being a new technology. Additionally, most of these studies focus on the usage and perception of the students and a few to no research emphasizing on teacher readiness in Ilocos Norte.

Anchored on the theory of Technology Acceptance Model (TAM) developed by Davis (1989) which hypothesizes that two factors namely, perceived usefulness and perceived ease of use are the fundamental determinants of user acceptance, this study seeks to describe the level of readiness, attitude towards Generative AI integration, and perceived challenges of Junior High School science teachers in Ilocos Norte. By analyzing and interpreting the data, this study aims to impart insights on the present condition of teacher readiness towards AI integration and expectantly be able to contribute to a more feasible and sustainable practice of AI integration in science education.

Methods

Research Design

This research used descriptive research design. It is focused on the evaluation the level of readiness for the integration of AI in terms of AI competency, training and resource accessibility, attitudes toward AI integration, and perceived challenges. integration of secondary school science teachers in Ilocos Norte. This research mainly aims to describe the level of readiness, attitude, and perceived barriers of junior high school science teachers on Generative AI integration in science teaching.

Population and Sampling Procedure

To meet the objectives of this research, the respondents are composed of all Science teachers from the Junior High School of the SDOIN with a minimum of three years of experience in teaching and are willing to participate in the study. This ensures that all the respondents have a stable baseline of traditional teaching experience before comparing it to AI integration. These teacher participants were identified through total enumeration wherein 186 teachers were invited from 58 different schools were identified by the SDOIN. A total of 160 valid responses (86% response rate) was collected.

Research Instrument

The instrument used is a questionnaire intended for assessment of the level of readiness, attitude, perceived challenges, and training needs of JHS science teachers on Generative AI integration in education.

The survey questionnaire was adapted from a study by Alshorman (2024) and was used as a basis for the self-administered questionnaire. It consists of five parts, each aligning with the variables measured in this research. Part I comprises six questions about the profile of the respondent. Part II includes questions relating to the perceived level of readiness of the teacher respondents on AI integration in science education. Part III contains questions regarding the attitude of the teacher respondents towards Generative AI integration in education. Part IV contains the questions that pertain to the perceived barriers in integrating Generative AI in education. Parts II to IV incorporates a four-point Likert-scale, which through the following scale: 4 (Strongly Agree), 3 (Agree), 2 (Disagree), and 1 (Strongly Disagree), the respondents must indicate how much they agree with the claims about AI integration in science education. The last part is composed of open-ended questions asking for information about the level of readiness, attitude, perceived challenges, trainings received and training needs of the respondents.

Data Gathering Procedure

To ensure ethical conduct of the research, an approval from the University Research Ethics Review Board (URERB) was acquired prior

to the conduction of the research. Subsequently, permission to conduct the study from the Schools Division of Ilocos Norte was obtained through a request letter. A similar letter of request was also sent to the school head of every public Junior High School where the study was conducted. Some help in the distribution of the survey questionnaire was also asked from the school heads as they have direct supervision over the prospective respondents.

A self-administered survey questionnaire served as the tool for data collection. For an organized and automated collection of data, the questions were crafted in Google forms. The distribution of the survey questionnaires was initially done through sending an online link. However, face-to-face distribution was also done as an alternative to those who cannot answer through the online survey. A self-administered questionnaire was the most appropriate technique of data collection because it allowed the respondents to answer the questionnaire in their own available time, without the pressure of filtering their answers, which is a possible circumstance when the data collection is done through face-to-face interview. Using this technique was also more convenient, less expensive, and less time-consuming for the researcher

Along with the survey questionnaire, a consent form was signed by the respondents. This form explained in detail the minimal risks and benefits associated with participating in the study. It also informed the respondents that no compensation will be given for their participation. It also emphasized that participation in the study is totally voluntary, and their data will be considered confidential.

The data gathered were summarized, organized, analyzed and interpreted systematically.

Data Analysis

Weighted mean is the main treatment employed to the data gathered. To quantify the levels of agreement of the respondents towards the statements related to teacher's perspective on AI and readiness, weighted mean was calculated for each item. The calculated values on the level of readiness, attitude toward Generative

AI integration, and perceived challenges in Generative AI integration were interpreted according to the following: 3.50-4.00 as *very high*, 2.50-3.49 as *high*, 1.50-2.49 as *low*, and 1.00-1.49 as *very low*.

Ethical Considerations

With the purpose of ensuring that the study does not violate any ethical standards, the researcher seek approval from the URERB for the study to be conducted. It is also a researcher's responsibility to protect the welfare and rights of all respondents. Thus, an orientation was held to inform all the respondents about the objectives and rationale of the study, their rights as respondents and all the processes they had to go through. Before participating, the respondents were asked to sign an informed consent, reminding them that their participation as respondents is totally not mandatory and that their withdrawal in participating is welcome at any time. Also included in the content of the informed consent are the terms and conditions about confidentiality. This assured the participants that no personal information will be disclosed in any way and all data gathered will be solely used for the purpose of the study. Anonymity of their responses was also assured. The observation of these ethical practices promotes the trustworthiness, integrity, and validity of the processes carried out in the study.

Results and Discussion

Level of Readiness

The mean rating of the science teachers' preparedness in terms of AI competence, resource accessibility, and professional growth and training are displayed in Table 1. The data on the table reveals that the Junior High School science teachers have high level of readiness for Generative AI integration in science teaching, having an overall mean rating of 2.72. This implies that science teachers generally perceive themselves to be ready but still have hesitations. This is indicated by the results showing that they have not reached a very high level of readiness in terms of their competence and access to resources and only have a low level of readiness in terms of trainings received.

Table 1. Mean ratings on the teachers' level of readiness on Generative AI integration

Domains		Statement	Rating	
			Mean	DI
Competence in AI	1.	I understand the basic concepts of AI that are relevant to education.	3.30	H
	2.	I am confident in my ability to use AI tools for teaching science subjects.	3.09	H
	3.	I can easily learn new AI tools that are introduced for educational purposes.	3.20	H
	4.	I feel prepared to troubleshoot minor issues with AI technology in the classroom.	2.82	H
	5.	I am able to evaluate the effectiveness of AI tools in enhancing science learning.	3.03	H
	6.	I am comfortable explaining the benefits and limitations of AI to my students.	3.14	H
	7.	I can integrate AI teaching tools with traditional teaching methods effectively.	3.14	H
Composite Mean			3.10	H
Access to Resources	8.	I have access to adequate AI resources for teaching science.	2.94	H
	9.	My school provides sufficient hardware for utilizing AI in the classroom.	2.48	L
	10.	I have access to a variety of AI software and applications designed for education.	2.63	H
	11.	My school provides the necessary technical support for using AI tools.	2.48	L
	12.	I have a reliable internet connection in the classroom to support AI activities.	2.56	H
	13.	The AI teaching resources available to me are up-to-date and relevant.	2.76	H
	14.	I have the necessary instructional materials to complement AI tools in science teaching.	2.67	H
Composite Mean			2.64	H
Professional Development & Trainings	15.	I have received training in how to use AI in teaching.	2.17	L
	16.	Ongoing professional development in AI is available to me.	2.20	L
	17.	I am encouraged by my school to attend workshops or conferences about AI in education.	2.44	L

Table 1. (continued)

	18.	The professional development I receive is tailored to my subject area and grade level.	2.53	H
	19.	I am satisfied with the level of training provided for AI integration into the curriculum.	2.36	L
	20.	I actively seek out new learning opportunities related to AI.	2.88	H
	21.	The training I received has been practical and applicable to my teaching context.	2.37	L
Composite Mean			2.42	L
Overall Mean			2.72	H
Legend:	Range of Means		Descriptive Interpretation (DI)	
	3.50 – 4.00		Very High	
	2.50 – 3.49		High	
	1.50 – 2.49		Low	
	1.00 – 1.49		Very Low	

The composite mean of 3.10 on the teachers' competence in AI suggests that the teachers claim to have enough knowledge on the basic concepts relating to AI as well as on the functions of generative AI. They are also confident about their ability to easily learn new AI tools and can comfortably explain it to the learners. Most teachers are also confident that they can effectively integrate AI teaching tools with traditional teaching methods. The drawback lies in their low level of competence in troubleshooting minor issues with AI technology, having a slightly lower mean of 2.82. While the teachers believe that they are competent enough, their level of competence is not high enough to be deemed very highly ready to integrate generative AI in science teaching. In a recent study by Piedad (2024), he emphasized that it is a fundamental requisite for effective AI integration that teachers should have sufficient knowledge of AI, its roles, benefits, and how it is used. This was also supported by Sperling, et al. (2024), stating that AI literacy and teachers' professional knowledge in other forms were conceptualized to be relevant to teacher education.

In terms of access to resources, teachers believe that the resources available to them are limited but are adequate for the integration of generative AI in science teaching. The

composite mean of 2.64 for access to resources implies that teachers are equipped with just enough resources to integrate AI in teaching. Reliable internet connection, relevant and necessary instructional materials, and variety of AI software and applications for teaching are the resources provided to some of the teachers. Others also argue that the deficiency on these things makes AI integration more challenging. Some schools lack technical support and hardware or technological devices to use for AI integration. Some teachers claim that they are provided with laptops, tablets, or mobile devices, but a few also claim the absence of such.

While teachers have enough competence and adequate resources, they claim that there is not enough professional development or training regarding the integration of generative AI in teaching. A low level of readiness due to low professional development is indicated by a composite mean of 2.42 on the latter part of Table 1. Only 14.4% of the teachers claim to have attended trainings related to AI integration. This is due to the low number of available training courses that are related to AI integration. Also, schools do not actively encourage teachers to attend workshops or conferences on the subject. On the positive light, the teachers actively seek out new learning opportunities. Majority of science teachers believe that attending

training and workshops will improve their level of readiness, boost their confidence, and increase their understanding of the integration of generative AI in science instruction. This sides with the suggestion of Zhao, et. al. (2022) stating that to improve instructors' comprehension and practical abilities in AI applications, training and professional development are essential. Additionally, Cinganotto & Montanucci (2025) emphasizes the need to realign teacher training designs in a way that could prioritize students' needs and digital literacy.

Generally, Table 1 implies that junior high school science teachers have a high level of readiness for Generative AI integration. The highest level of readiness is tied to their competence in AI, followed by their access to resources, while the small amount of training they received caused their lowest level of readiness. In relation to this, the gaps that need to be addressed include teacher's ability to effectively use AI tools, and the equality of access to technology among teachers and students. Training and workshops that allow first-hand experiences that targets these concerns are essential to enhance teacher's AI competence and ensure equal opportunities for technological advancement (Bekdemir, 2024).

Attitude

It is demonstrated in Table 2 that science teachers have a very high attitude toward

Generative AI integration in science instruction, having an overall mean of 3.26. This means that they perceive generative AI to be helpful and essential to the teaching and learning process. They highly believe that AI can enhance the quality of science education, improve the effectiveness of the teachers, and that AI will become an essential part of education in the future. With this positive attitude toward AI, teachers are excited about the potential of AI to personalize learning. They are also willing to experiment with AI in their teaching practices.

Table 2 generally implies the positive attitude of teachers toward the integration of generative AI in science teaching. According to Toncic (2021), implementing AI in science education may be more challenging if its benefits are not well understood, but positivity and an openness to investigating the potential of AI are essential. Demir, et. al. (2022) also supports this statement by stating that teachers are more likely to be inspired and prepared to incorporate AI into their science curricula if they believe that these applications would improve student learning results. Moreover, teachers' opinions of AI's usefulness and efficacy in improving students' critical thinking and problem-solving abilities also have an impact on their readiness to use it in scientific classes.

Table 2. Mean ratings on the teachers' attitude toward Generative AI integration

Domains		Statement	Rating	
			Mean	DI
Attitude	22.	I believe that AI can enhance the quality of science education.	3.30	VH
	23.	I am excited about the potential of AI to personalize learning for my students.	3.24	H
	24.	I think that AI can help me to be a more effective teacher.	3.29	VH
	25.	I am open to experimenting with AI in my teaching practice.	3.31	VH
	26.	I believe that AI can support critical thinking and problem-solving skills in science.	3.16	H

Table 2. (continued)

	27.	I feel that AI will become an essential part of education in the future.	3.28	VH
	28.	I am concerned about AI replacing human elements in teaching.	3.21	H
Overall Mean			3.26	H
Legend:	Range of Means		Descriptive Interpretation (DI)	
	3.50 – 4.00		Very High	
	2.50 – 3.49		High	
	1.50 – 2.49		Low	
	1.00 – 1.49		Very Low	

Perceived Barriers

Table 3 shows the teachers' perceived barriers in integrating Generative AI in science teaching. The overall mean of 3.12, which is interpreted as high, indicates that the teachers generally have various concerns before successfully integrating AI into their teaching materials. The first concern is data privacy and security issues which have a very high mean of 3.43. Due to the public impression that AI can be a threat to privacy and security, several teachers are hesitant to integrate it into their teaching. This issue was also highlighted by Songkram & Osuwan..(2022) stating that despite their generally upbeat outlook, teachers face obstacles such as a lack of expertise, difficulty accessing resources, and worries about their job security.

Lack of clarity in the policies on AI use raises concerns on the ethical implications of AI in education. This issue invites recent researchers to suggest a thorough implementation of the ethical standards set to regulate the use of AI, especially in education (Borenstein, 2020). Teachers also fear the effects of AI on the behavior and critical thinking ability of the students. This drives Borenstein (2020) to state that it is highly necessary for the AI users and other stakeholders to undergo training that discusses the impacts of AI on human lives and how to respond responsibly to these impacts by maximizing benefits and regulating AI's potential harms.

Table 3. Mean ratings on the teachers' perceived barriers in Generative AI integration

Domains		Statement	Rating	
			Mean	DI
Perceived Barriers	29.	I am concerned about data privacy and security issues related to using AI in the classroom.	3.43	H
	30.	I perceive a lack of clarity in my school's policy on AI use in education.	2.93	H
	31.	I believe there is insufficient time during the school day to integrate AI effectively.	2.84	H
	32.	I am worried about the ethical implications of AI in education.	3.26	H

Table 3. (continued)

33.	I think that AI could potentially widen the gap between different groups of students.	3.08	H
34.	I find it challenging to keep up with the rapid development of AI technologies.	3.08	H
35.	I am concerned about the reliability of AI assessment in understanding student progress.	3.2	H
Overall Mean		3.12	H
Legend:	Range of Means	Descriptive Interpretation (DI)	
	3.50 – 4.00	Very High	
	2.50 – 3.49	High	
	1.50 – 2.49	Low	
	1.00 – 1.49	Very Low	

Another barrier perceived by the teachers is the inability carry on with the fast-growing advancements of AI technology. On top of that, the given class hours are believed to be insufficient for effective AI integration. In relation to this, Slavkovik (2020) highlights the importance of having an in-depth education regarding the use of AI especially in education. Apparently, there exists no systematic structure on topics that focus on ethics in AI

Conclusion

Based on the results of the study, the following conclusions were made.

Junior High School science teachers generally perceive themselves to be highly ready to integrate Generative AI in science teaching in terms of their competence in AI and access to resources. However, their level of readiness in terms of professional development and training received is relatively low.

Science teachers exhibit a very highly positive attitude toward the integration of Generative AI in science teaching, considering AI to be helpful and useful in improving the quality of education. However, they highly perceive several barriers including threats to data privacy and security, unethical use, difficulty to keep up, and diminished critical thinking ability of students.

Thus, this study agrees with the Technology Acceptance Model (TAM) which hypothesizes that two factors namely, perceived usefulness

and perceived ease of use are the fundamental determinants of user acceptance. Parallel to this, for technology to be accepted by a potential user, the perceived benefits from its use must outweigh the perceived challenge in using it. If the challenges and barriers do outweigh the benefits that AI integration offers, a science teacher might show a high level of readiness.

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