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Artificial Intelligence Readiness Among General Science Teachers: Evidence for Developing the AI-READY Professional Development Framework

Jhon Ryan P. Hijastro*
Curriculum and Instruction Division, Philippine Science High School-Caraga Region Campus, Butuan City, Philippines

***Abstract*: Artificial Intelligence (AI) is transforming educational practice by enhancing instructional planning, assessment, personalized learning, and classroom management. As AI technologies become increasingly integrated into education, teachers must possess the knowledge, skills, confidence, and practical competencies required for their effective, ethical, and pedagogically sound implementation. However, empirical evidence on the AI readiness of science teachers in the Philippine basic education context remains limited. This study assessed the Artificial Intelligence readiness of General Science teachers in public secondary schools in Agusan del Sur, Philippines, and generated empirical evidence for the development of the AI-READY (Artificial Intelligence Readiness Enhancement and Development for Educators) Professional Development Framework. A descriptive-correlational research design was employed involving 100 General Science teachers selected through purposive sampling. Data were collected using the researcher-developed Artificial Intelligence Readiness Questionnaire (AIRQ), which demonstrated excellent reliability (Cronbach's α = .947). Descriptive statistics, independent-samples t-test, one-way analysis of variance (ANOVA), and Pearson product-moment correlation were used to analyze the data. Findings revealed a high overall level of AI readiness (M = 4.05, SD = 0.49), with AI Knowledge obtaining the highest mean (M = 4.19), followed by AI Confidence (M = 4.11), AI Skills (M = 3.97), and AI Usage (M = 3.91). Significant differences in AI readiness were observed according to AI-related training, educational attainment, teaching experience, and frequency of AI tool usage, while no significant difference was found based on sex. Moreover, strong positive correlations among AI knowledge, AI skills, AI confidence, and AI usage confirmed that AI readiness is a multidimensional and interconnected construct. The findings generated the empirical basis for the AI-READY Professional Development Framework, a competency-based model designed to strengthen teachers' AI literacy, instructional integration, and ethical AI practice. The study contributes to the growing body of knowledge on AI in education and provides evidence to inform teacher professional development initiatives and educational policy within Philippine secondary education.**

***Keywords*: Artificial intelligence readiness, science education, teacher readiness, AI literacy, educational technology, professional development.**

1. Introduction

Artificial Intelligence (AI) has become one of the most influential technological innovations transforming educational systems worldwide. Recent advances in machine learning, natural language processing, computer vision, and generative AI have enabled intelligent systems to support instructional planning evidence-based educational decision-making (Kasneci et al., 2023; UNESCO, 2023). Unlike earlier educational technologies that primarily functioned as information delivery platforms, contemporary AI systems actively assist teachers in generating lesson plans, designing instructional materials, producing assessments, analyzing learner performance, and providing immediate instructional feedback. Consequently, AI is increasingly recognized as an instructional partner capable of improving teaching efficiency while enriching students' learning experiences (Garzón et al., 2025).

The widespread adoption of generative AI applications has significantly accelerated educational innovation across different learning environments. AI-powered platforms such as large language models enable teachers to create instructional resources, laboratory activities, differentiated learning materials, and formative assessments within a considerably shorter period than traditional instructional preparation. These technologies also promote personalized learning by adapting educational content according to students' individual needs and learning progress **(**Long & Magerko, 2020; UNESCO, 2023**)**. Nevertheless, the growing reliance on AI has also raised important concerns regarding information accuracy, algorithmic bias, data privacy, copyright, academic integrity, and responsible technology use. As a result, successful AI implementation requires teachers to possess not only technological competence but also critical thinking, ethical judgment, and pedagogical expertise necessary for evaluating AI-generated outputs before integrating them into classroom instruction (Kasneci et al., 2023; Tlili et al., 2023; UNESCO, 2023).

Recent educational research has shifted from examining

*Corresponding author: jphijastro@crc.pshs.edu.ph

technology availability toward investigating teachers' readiness to utilize AI effectively. AI readiness has emerged as a multidimensional construct encompassing teachers' conceptual understanding of AI, practical competencies, instructional confidence, and actual classroom utilization of AI technologies (Long & Magerko, 2020; Ng et al., 2021). These competencies collectively determine whether teachers can translate technological innovations into meaningful learning experiences. Previous studies consistently report that teachers with stronger AI knowledge and higher levels of self-efficacy demonstrate greater willingness to integrate AI into instructional practice, whereas insufficient preparation and limited professional development remain among the primary barriers to successful AI adoption (Crompton & Burke, 2024; Kasneci et al., 2023).

Among the various educational disciplines, science education presents particularly promising opportunities for AI integration because of its emphasis on inquiry, experimentation, scientific reasoning, and evidence-based problem-solving. AI technologies facilitate virtual laboratories, intelligent tutoring systems, adaptive simulations, automated assessment, scientific data visualization, and personalized feedback that enhance inquiry-based science instruction (Garzón et al., 2025). These innovations enable science teachers to create authentic learning experiences while reducing the time devoted to repetitive instructional tasks. However, the successful implementation of AI in science classrooms depends largely on teachers' readiness to integrate these technologies appropriately and responsibly. Current evidence indicates that although AI has demonstrated considerable potential for improving science teaching and learning, inadequate teacher preparation continues to hinder its effective classroom implementation (Zawacki-Richter et al., 2019; Kasneci et al., 2023; Tlili et al., 2023).

In the Philippine educational context, AI integration aligns with the continuing digital transformation initiatives of the Department of Education. The Basic Education Development Plan (BEDP) 2030 emphasizes innovation, digital literacy, and teacher capacity-building as strategic priorities for improving educational quality and preparing learners for the demands of the twenty-first century (Department of Education, 2022). Similarly, higher education institutions and teacher education programs have begun incorporating AI-related competencies into professional preparation initiatives. Despite these national efforts, opportunities for AI-related professional development remain inconsistent across schools, resulting in substantial differences in teachers' AI knowledge, confidence, and classroom implementation. These disparities suggest that access to technology alone is insufficient to ensure meaningful AI integration; rather, continuous professional learning and competency development are equally essential (Dilek et al., 2025).

Existing literature reveals several important research gaps. First, while research on AI in education has expanded rapidly, most investigations have focused on teachers' perceptions, attitudes, or technology acceptance rather than examining AI readiness as a multidimensional construct composed of AI knowledge, AI skills, AI confidence, and AI usage (Kasneci et al., 2023; Ng et al., 2021). Second, relatively few empirical studies have translated findings into competency-based professional development frameworks that directly address teachers' identified needs ((Tlili et al., 2023; Kasneci et al., 2023). Third, evidence regarding AI readiness among General Science teachers in Philippine secondary schools remains limited despite their crucial role in developing learners' scientific literacy, critical thinking, and responsible technology use. Addressing these gaps is necessary to support evidence-based educational planning and sustainable AI integration.

Guided by these considerations, the present study assessed the Artificial Intelligence readiness of General Science teachers by examining four essential dimensions: AI knowledge, AI skills, AI confidence, and AI usage. It also investigated whether AI readiness differed according to selected demographic variables, including sex, educational attainment, teaching experience, attendance in AI-related training, and frequency of AI tool usage. Finally, the study generated empirical evidence that informed the development of the AI-READY Professional Development Framework, a competency-based model intended to strengthen teachers' preparedness for ethical and sustainable AI integration in science education.

2. Methodology

A. Research Design

This study employed a descriptive-correlational research design to assess the Artificial Intelligence (AI) readiness of General Science teachers and examine whether significant differences existed according to selected demographic variables. Descriptive research was appropriate because it systematically described teachers' readiness in terms of AI knowledge, AI skills, AI confidence, and AI usage without manipulating any variables (Creswell & Creswell, 2023). The correlational component further examined the relationships among the dimensions of AI readiness and identified demographic factors associated with teachers' preparedness for AI integration.

The findings generated empirical evidence that informed the development of the AI-READY Professional Development Framework.

B. Research Locale

The study was conducted in public secondary schools across the Schools Division of Agusan del Sur, Philippines. Agusan del Sur is one of the provinces in the Caraga Administrative Region (Region XIII) and comprises diverse municipalities with varying levels of educational resources, technological infrastructure, and access to professional development opportunities. The Schools Division of Agusan del Sur supervises public secondary schools that serve geographically dispersed communities, making the division an appropriate setting for examining teachers' readiness to integrate Artificial Intelligence (AI) into classroom instruction.

Conducting the study across public secondary schools within the province provided a broader representation of General Science teachers working under different school contexts while

remaining within the same administrative education system. This setting enabled the study to generate empirical evidence that may inform division-level and regional initiatives on AI-related teacher professional development.

C. Research Participants

The respondents consisted of 100 General Science teachers from public secondary schools across the Schools Division of Agusan del Sur, Philippines. Participants were selected through purposive sampling, ensuring that only teachers actively handling General Science subjects during the conduct of the study were included. Eligible respondents were required to (1) be currently teaching General Science, (2) possess teaching experience in the secondary level, and (3) provide informed consent to participate in the study. Teachers from other learning areas were excluded to maintain consistency with the objectives of the investigation. The selected participants represented varying levels of educational attainment, teaching experience, attendance in AI-related professional development activities, and frequency of AI tool utilization, providing a diverse sample for examining AI readiness among science educators.

D. Research Instrument

Data were collected using the Artificial Intelligence Readiness Questionnaire (AIRQ), a researcher-developed instrument designed to measure teachers' preparedness for AI integration in science education. The questionnaire was constructed following an extensive review of contemporary literature on Artificial Intelligence literacy, educational technology, teacher readiness, and technology integration (Bandura, 1997; Davis, 1989; Mishra & Koehler, 2006; Long & Magerko, 2020; Ng et al., 2021; UNESCO, 2023).

The AIRQ consisted of 40 Likert-scale items distributed equally across four dimensions:

- AI Knowledge (10 items)
- AI Skills (10 items)
- AI Confidence (10 items)
- AI Usage (10 items)

Responses were measured using a five-point Likert scale, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Higher scores indicated greater readiness for Artificial Intelligence integration.

Prior to data collection, the questionnaire underwent expert validation to establish content validity. Reliability analysis demonstrated excellent internal consistency, with an overall Cronbach's alpha coefficient of .947, indicating that the instrument was highly reliable for measuring AI readiness among General Science teachers.

E. Data Gathering Procedure

Approval to conduct the study was obtained from the appropriate educational authorities before data collection commenced. After securing institutional permission, prospective participants were informed of the purpose of the research, the voluntary nature of their participation, and the confidentiality of the information they would provide.

The questionnaire was administered through Google Forms, allowing respondents to complete the survey electronically at their convenience. Participants received standardized instructions regarding the completion of the questionnaire, and sufficient time was provided for submission. Completed responses were screened for completeness before being organized and prepared for statistical analysis.

F. Data Analysis

Descriptive and inferential statistical techniques were employed to analyze the data. Descriptive statistics, including frequency, percentage, weighted mean, and standard deviation, were used to summarize respondents' demographic characteristics and determine the level of AI readiness across the four dimensions. The internal consistency of the AIRQ was evaluated using Cronbach's alpha coefficient.

To determine whether AI readiness significantly differed across demographic groups, an independent-samples *t*-test was performed for dichotomous variables, while one-way analysis of variance (ANOVA) was employed for variables consisting of three or more categories. When significant differences were identified, appropriate post hoc comparisons were conducted to determine the specific groups that differed. Pearson product-moment correlation analysis was likewise performed to examine the relationships among AI knowledge, AI skills, AI confidence, and AI usage. All statistical analyses were conducted using IBM SPSS Statistics, with statistical significance established at the 0.05 level.

G. Ethical Considerations

The study adhered to established ethical principles governing educational research involving human participants. Participation was entirely voluntary, and informed consent was obtained from all respondents before data collection. Participants were informed of the objectives of the study, their right to withdraw at any stage without penalty, and the intended use of the collected information.

Confidentiality and anonymity were maintained by excluding personally identifiable information from the dataset. Survey responses were used solely for research purposes and were stored securely throughout the conduct of the study. The research procedures complied with institutional ethical standards and the principles outlined in the Philippine Data Privacy Act of 2012 (Republic Act No. 10173) to safeguard participants' privacy and data security.

3. Results and Discussion

A. Profile of the Respondents

Understanding the demographic characteristics of respondents provides important context for interpreting teachers' Artificial Intelligence (AI) readiness. Previous studies have demonstrated that teacher characteristics such as educational attainment, teaching experience, professional development participation, and exposure to AI technologies significantly influence technology adoption and instructional innovation (Kasneci et al., 2023; Tlili et al., 2023). Accordingly, the present study examined respondents' demographic profile in terms of sex, age, highest educational

attainment, teaching experience, attendance in AI-related training, and frequency of AI tool usage.

Table 1
Demographic profile of the respondents (N = 100)

Variable	Category	Frequency	Percentage
Sex	Male	42	42.0
	Female	58	58.0
Age	21–30 years	27	27.0
	31–40 years	45	45.0
	41–50 years	20	20.0
	Above 50 years	8	8.0
Educational Attainment	Bachelor's Degree	28	28.0
	Master's Units	35	35.0
	Master's Degree	30	30.0
	Doctoral Units/Degree	7	7.0
Teaching Experience	1–5 years	19	19.0
	6–10 years	32	32.0
	11–15 years	24	24.0
	More than 15 years	25	25.0
AI-related Training	Yes	63	63.0
	No	37	37.0
Frequency of AI Usage	Daily	31	31.0
	Weekly	43	43.0
	Monthly	18	18.0
	Rarely	8	8.0

The respondent profile indicates that the majority of General Science teachers were female (58%), belonged to the 31–40-year age group (45%), possessed graduate-level qualifications, and had more than six years of teaching experience. Notably, nearly two-thirds (63%) had previously attended AI-related professional development activities, while approximately three-fourths reported using AI tools either daily or weekly in their instructional practice.

The relatively high exposure to AI technologies among respondents may partly explain their favorable readiness toward AI integration observed in the succeeding analyses. Previous investigations have consistently shown that teachers who participate in AI-related training and regularly utilize AI applications exhibit greater technological competence and stronger intentions to integrate AI into classroom instruction than teachers with limited AI exposure (Crompton & Burke, 2024; Ng et al., 2021; Kasneci et al., 2023). Likewise, (Kasneci et al. 2023) emphasized that continuous engagement with AI technologies strengthens teachers' confidence, pedagogical decision-making, and practical AI competencies necessary for effective instructional implementation.

These demographic characteristics suggest that the respondents represent a teaching population that has already begun engaging with AI technologies, thereby providing an appropriate context for assessing AI readiness and identifying areas requiring further professional development.

B. Level of Artificial Intelligence Readiness

The primary objective of this study was to determine the level of Artificial Intelligence readiness among General Science teachers across four dimensions: AI Knowledge, AI Skills, AI Confidence, and AI Usage. AI readiness is widely recognized as a multidimensional construct that reflects teachers' preparedness to understand, utilize, evaluate, and integrate AI technologies within educational settings (Long & Magerko, 2020; Ng et al., 2021). Teachers possessing higher levels of readiness are generally more capable of implementing AI-supported instructional strategies while maintaining sound pedagogical judgment and ethical responsibility (Tlili et al., 2023; Kasneci et al., 2023).

Table 2
Overall artificial intelligence readiness among general science teachers

Dimension	Mean	SD	Interpretation
AI Knowledge	4.19	0.53	High Readiness
AI Skills	3.97	0.58	High Readiness
AI Confidence	4.11	0.55	High Readiness
AI Usage	3.91	0.62	High Readiness
Overall	**4.05**	**0.49**	**High Readiness**

Table 2 presents the overall level of Artificial Intelligence readiness among General Science teachers. The findings revealed an overall mean of 4.05 (SD = 0.49), indicating that respondents demonstrated a high level of readiness for AI integration in science education.

Among the four dimensions, AI Knowledge obtained the highest mean (M = 4.19), suggesting that teachers generally possess adequate conceptual understanding of AI principles, educational applications, and responsible AI utilization. This finding indicates that respondents recognize the educational potential of AI and possess sufficient foundational knowledge to support instructional implementation. Similar findings were reported by Long and Magerko (2020), who argued that AI literacy encompasses conceptual understanding, practical competence, and critical evaluation skills that form the cornerstone of teachers' preparedness for responsible AI integration. Likewise, Dilek et al. (2025) emphasized that AI knowledge enables educators to critically evaluate AI-generated content and make informed pedagogical decisions.

The second highest dimension was AI Confidence (M = 4.11), indicating that respondents generally believed in their capability to utilize AI technologies for instructional purposes. This finding aligns with Bandura's (1997) Social Cognitive Theory, which posits that individuals with stronger self-efficacy demonstrate greater willingness to adopt innovative instructional practices. Previous studies likewise reported that teacher confidence significantly predicts technology adoption because confident educators are more willing to experiment with emerging digital tools and persist despite implementation challenges (Kasneci et al. 2023).

Respondents also demonstrated high AI Skills (M = 3.97), suggesting that they were capable of utilizing AI applications for lesson preparation, instructional material development, assessment creation, and classroom support. These findings corroborate those of Garzón et al. (2025), who reported that practical AI competencies enhance teachers' instructional productivity while enabling more personalized and engaging learning experiences.

Although AI Usage received the lowest mean (M = 3.91), the dimension remained within the high readiness category. The relatively lower score suggests that while teachers possess favorable knowledge, confidence, and practical skills,

opportunities remain for increasing the frequency and diversity of AI implementation during classroom instruction. Previous studies similarly observed that teachers often demonstrate strong perceptions of AI readiness but integrate AI less frequently because of institutional constraints, limited access to advanced AI tools, or concerns regarding ethical implementation (Zawacki-Richter et al. 2019); (Tlili et al. 2023; Kasneci et al. 2023)

Collectively, these findings indicate that General Science teachers are generally prepared to integrate AI into classroom instruction. Nevertheless, the comparatively lower score in AI Usage highlights the need for sustained professional development that emphasizes authentic classroom implementation rather than conceptual understanding alone. Such initiatives may strengthen teachers' ability to translate AI competencies into routine instructional practice, thereby promoting more effective and sustainable AI integration in science education.

C. Artificial Intelligence Knowledge

Table 3
Level of artificial intelligence knowledge among general science teachers (N = 100)

Artificial Intelligence Knowledge	**Mean**	**SD**	**Interpretation**	**Rank**
I understand the basic concepts and principles of Artificial Intelligence.	4.32	0.62	High Readiness	2
I understand how AI can improve teaching and learning.	4.41	0.58	High Readiness	1
I can distinguish AI-generated information from other digital resources.	4.21	0.65	High Readiness	4
I understand the ethical issues associated with AI in education.	4.18	0.67	High Readiness	5
I am familiar with AI applications commonly used in education.	4.27	0.60	High Readiness	3
I understand the limitations of AI-generated outputs.	4.10	0.70	High Readiness	7
I understand responsible AI use in classroom instruction.	4.12	0.69	High Readiness	6
I know how AI supports personalized learning.	4.06	0.72	High Readiness	8
I understand the importance of verifying AI-generated information before classroom use.	4.02	0.73	High Readiness	9
I continuously update my knowledge regarding AI technologies.	4.19	0.66	High Readiness	5
Overall Mean	**4.19**	**0.53**	**High Readiness**	

Interpretation: 4.21–5.00 = Very High Readiness; 3.41–4.20 = High Readiness; 2.61–3.40 = Moderate Readiness; 1.81–2.60 = Low Readiness; 1.00–1.80 = Very Low Readiness.

Artificial Intelligence knowledge constitutes the cognitive foundation of teachers' readiness for AI integration because it enables educators to understand the principles, capabilities, limitations, and ethical implications of AI technologies. Teachers with adequate AI knowledge are more likely to evaluate AI-generated outputs critically, select appropriate AI applications for instruction, and integrate AI into pedagogically meaningful classroom practices (Long & Magerko 2020). Within science education, AI knowledge is particularly important because science teachers are expected to cultivate scientific literacy, critical thinking, and evidence-based reasoning while guiding learners in the responsible use of emerging technologies (Dilek et al., 2025).

Table 3 presents the level of Artificial Intelligence knowledge among General Science teachers. The results revealed an overall mean of 4.19 (SD = 0.53), indicating a high level of AI knowledge. The findings suggest that respondents generally possess a strong conceptual understanding of AI and recognize its relevance to teaching and learning. Such preparedness provides a solid foundation for meaningful AI integration because teachers who understand the principles and applications of AI are more likely to implement these technologies effectively and responsibly in educational settings.

The highest-rated indicator, "I understand how AI can improve teaching and learning" (M = 4.41), demonstrates that respondents strongly acknowledge the instructional value of AI technologies. This finding reflects the growing acceptance of AI as a tool for enhancing lesson preparation, instructional differentiation, assessment, and learner engagement. Similar findings were reported by (Kasneci et al. 2023), who observed that teachers increasingly perceive AI as an effective instructional partner capable of improving classroom efficiency and supporting personalized learning experiences. Likewise, Garzón et al. (2025) emphasized that AI technologies enhance instructional quality by enabling educators to create adaptive learning environments that respond to students' diverse academic needs.

The second-highest indicator, understanding the basic concepts and principles of AI (M = 4.32), suggests that respondents possess adequate foundational knowledge necessary for responsible AI adoption. Conceptual understanding enables teachers to recognize both the capabilities and limitations of AI systems while making informed pedagogical decisions regarding classroom implementation. According to (Long & Magerko 2020). AI literacy extends beyond operational competence and encompasses conceptual knowledge that allows educators to evaluate AI-generated outputs critically and integrate AI in ways that support meaningful learning.

Respondents also reported high familiarity with educational AI applications (M = 4.27), indicating that many teachers have already explored AI-powered tools for instructional purposes. This finding may reflect the increasing accessibility of generative AI platforms, which have become widely used for lesson planning, content generation, assessment design, and instructional resource development. Kasneci et al. (2023) similarly reported that teachers with greater exposure to AI applications demonstrate higher levels of readiness and stronger intentions to integrate AI into classroom instruction.

Although all indicators were interpreted as demonstrating high readiness, comparatively lower mean scores were observed for understanding the importance of verifying AI-

generated information before classroom use (M = 4.02) and understanding how AI supports personalized learning (M = 4.06). These findings suggest that while teachers recognize AI's instructional potential, additional professional development is needed to strengthen competencies related to evaluating AI-generated content and maximizing AI for differentiated instruction. Generative AI systems may occasionally produce inaccurate, biased, or fabricated information, making verification an essential component of responsible AI use (UNESCO (2023); Kasneci et al. (2023). Likewise, UNESCO (2023) emphasized that educators should develop critical AI literacy to ensure that AI technologies complement rather than replace professional instructional judgment.

The findings indicate that General Science teachers in public secondary schools of Agusan del Sur possess a strong knowledge base regarding Artificial Intelligence, providing a favorable foundation for AI-enhanced science instruction. However, sustaining this level of readiness requires continuous professional learning that keeps teachers updated on rapidly evolving AI technologies, ethical standards, and emerging pedagogical applications. As AI continues to advance, professional development programs should move beyond introductory AI awareness and emphasize critical evaluation, responsible implementation, and evidence-based instructional decision-making to ensure that AI contributes positively to science education.

D. Artificial Intelligence Skills

Artificial Intelligence (AI) skills represent teachers' practical ability to utilize AI technologies to support instructional planning, classroom teaching, assessment, and learner engagement. While conceptual knowledge enables teachers to understand AI, practical skills determine whether AI can be effectively integrated into authentic teaching and learning experiences. Previous studies emphasize that AI skills are among the strongest predictors of successful AI adoption because they allow educators to transform theoretical knowledge into meaningful instructional practice (Kasneci et al. 2023). Likewise, (Garzón et al. 2025) argued that teachers who possess stronger AI competencies demonstrate greater instructional innovation, higher productivity, and improved classroom engagement.

Table 4 presents the level of Artificial Intelligence skills among General Science teachers. The findings yielded an overall mean of 3.97 (SD = 0.58), indicating a high level of AI skills among the respondents. The results suggest that teachers are generally capable of utilizing AI technologies to support instructional preparation, develop learning resources, and facilitate classroom instruction. These findings indicate that AI has become more than a supplementary technology; rather, it is increasingly being incorporated into teachers' routine instructional practices.

The highest-rated indicator, "I can use AI to generate instructional materials" (M = 4.24), demonstrates that respondents are highly competent in employing AI applications to produce teaching resources efficiently. This finding reflects the growing reliance on generative AI platforms for preparing presentations, worksheets, laboratory activities, and instructional content. Recent studies have shown that AI significantly reduces teachers' preparation time while improving the quality and diversity of instructional resources available for classroom use (Kasneci et al. 2023). Similarly, Garzón et al. (2025) reported that AI-supported instructional design enables teachers to focus more on pedagogical decision-making rather than routine content production.

Table 4
Level of artificial intelligence skills among general science teachers (N = 100)

Artificial Intelligence Skills	Mean	SD	Interpretation	Rank
I can use AI tools to prepare lesson plans.	4.16	0.63	High Readiness	2
I can use AI to generate instructional materials.	4.24	0.60	High Readiness	1
I can create quizzes and assessments using AI applications.	4.05	0.69	High Readiness	5
I can develop effective prompts to obtain useful AI-generated outputs.	3.91	0.72	High Readiness	8
I can evaluate the accuracy of AI-generated content before using it in class.	4.02	0.66	High Readiness	6
I can modify AI-generated outputs to suit my students' learning needs.	4.09	0.65	High Readiness	4
I can integrate AI into classroom discussions and learning activities.	3.95	0.71	High Readiness	7
I can use AI to improve students' engagement during science lessons.	4.11	0.64	High Readiness	3
I can troubleshoot basic problems encountered when using AI tools.	3.84	0.74	High Readiness	9
I continuously improve my AI-related instructional skills.	3.93	0.70	High Readiness	7
Overall Mean	**3.97**	**0.58**	**High Readiness**	

Interpretation: 4.21–5.00 = Very High Readiness; 3.41–4.20 = High Readiness; 2.61–3.40 = Moderate Readiness; 1.81–2.60 = Low Readiness; 1.00–1.80 = Very Low Readiness.

The second-highest indicator, using AI to prepare lesson plans (M = 4.16), further suggests that respondents recognize AI as an effective instructional planning tool. AI-assisted lesson planning enables teachers to organize learning objectives, generate learning activities, recommend instructional strategies, and align assessments with curriculum standards. According to Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework, effective technology integration occurs when teachers successfully combine technological competence with pedagogical knowledge and subject matter expertise. The high rating obtained in this indicator suggests that respondents are beginning to integrate these domains effectively during lesson preparation.

Respondents likewise reported high competence in using AI to enhance student engagement (M = 4.11) and modifying AI-generated outputs to suit learners' needs (M = 4.09). These findings indicate that teachers do not merely reproduce AI-

generated content but exercise professional judgment by adapting instructional materials to the learning characteristics of their students. This practice aligns with UNESCO's (2023) recommendation that AI should function as a tool to augment teachers' instructional expertise rather than replace their professional decision-making. The ability to contextualize AI-generated materials is particularly important in science education, where inquiry-based learning and authentic scientific investigation require carefully designed instructional experiences.

Despite the generally favorable results, relatively lower mean scores were observed for developing effective prompts (M = 3.91) and troubleshooting AI-related technical problems (M = 3.84). Although these indicators remained within the high readiness category, they suggest areas where teachers require additional professional support. Prompt engineering has emerged as an essential competency in the era of generative AI because the quality of AI-generated outputs largely depends on the clarity, specificity, and structure of user prompts (Kasneci et al. 2023). Likewise, limited troubleshooting skills may discourage teachers from experimenting with more advanced AI applications, particularly when technical challenges arise during classroom implementation.

The findings therefore highlight the importance of designing professional development programs that extend beyond basic AI orientation and emphasize authentic, hands-on learning experiences. Workshops focusing on prompt engineering, evaluation of AI-generated content, instructional design, and classroom implementation may further strengthen teachers' practical AI competencies. Bandura (1997) argued that mastery experiences significantly enhance self-efficacy, suggesting that opportunities for repeated practice and collaborative experimentation are likely to increase teachers' confidence and competence in integrating AI into science instruction.

Overall, the results indicate that the findings indicate that General Science teachers in public secondary schools of Agusan del Sur possess a strong practical foundation for AI integration. Nevertheless, sustained professional learning remains necessary to strengthen advanced AI competencies, particularly those involving prompt engineering, troubleshooting, and the effective implementation of AI within inquiry-based science education. Enhancing these competencies will enable teachers to maximize the instructional benefits of AI while maintaining pedagogical quality, ethical responsibility, and learner-centered practice.

E. Artificial Intelligence Confidence

Artificial Intelligence (AI) confidence refers to teachers' belief in their capability to utilize AI technologies effectively for instructional planning, classroom implementation, assessment, and learner support. Rooted in Bandura's (1997) Social Cognitive Theory, confidence or self-efficacy influences an individual's motivation, persistence, and willingness to adopt innovative practices. Teachers who possess greater confidence in their AI competencies are more likely to explore emerging technologies, overcome implementation challenges, and sustain AI integration within their instructional practice (Bandura, 1997; Tlili et al. (2023). Consequently, AI confidence serves as a critical affective component of teacher readiness because it bridges knowledge acquisition and actual classroom application.

Table 5
Level of artificial intelligence confidence among general science teachers (N = 100)

Artificial Intelligence Confidence	Mean	SD	Interpretation	Rank
I am confident in using AI tools for lesson preparation.	4.18	0.61	High Readiness	2
I am confident in integrating AI into my classroom instruction.	4.15	0.63	High Readiness	3
I am confident in evaluating AI-generated instructional materials.	4.09	0.67	High Readiness	6
I am confident in guiding students on the responsible use of AI.	4.22	0.59	Very High Readiness	1
I am confident in learning new AI applications independently.	4.07	0.66	High Readiness	7
I am confident in solving instructional problems using AI.	4.10	0.65	High Readiness	5
I am willing to experiment with new AI technologies in teaching.	4.14	0.62	High Readiness	4
I can adapt to changes in AI technologies used in education.	4.05	0.68	High Readiness	8
I believe I can effectively integrate AI into science education.	4.03	0.69	High Readiness	9
I am confident in continuously improving my AI competencies.	4.11	0.64	High Readiness	5
Overall Mean	**4.11**	**0.55**	**High Readiness**	

Interpretation: 4.21–5.00 = Very High Readiness; 3.41–4.20 = High Readiness; 2.61–3.40 = Moderate Readiness; 1.81–2.60 = Low Readiness; 1.00–1.80 = Very Low Readiness.

Table 5 presents the level of Artificial Intelligence confidence among General Science teachers. The findings yielded an overall mean of 4.11 (SD = 0.55), indicating a high level of confidence in utilizing AI for instructional purposes. The results suggest that respondents generally believe in their capability to integrate AI into classroom instruction, evaluate AI-generated outputs, and continuously improve their AI-related competencies. Such confidence is essential because teachers who perceive themselves as capable are more likely to adopt emerging technologies and persist when confronted with implementation challenges.

The highest-rated indicator, **"**I am confident in guiding students on the responsible use of AI**"** (M = 4.22), achieved a very high readiness rating. This finding demonstrates that respondents recognize their professional responsibility in promoting ethical AI use among learners. Beyond teaching subject content, science teachers are increasingly expected to develop students' digital citizenship, critical thinking, and responsible technology practices. UNESCO (2023) emphasized that teachers play a pivotal role in ensuring that AI is used ethically, transparently, and responsibly within educational

settings. Similarly, (Long & Magerko 2020) argued that AI literacy extends beyond technical competence and includes the ability to cultivate ethical awareness and informed decision-making among learners.

The second-highest indicator, confidence in using AI tools for lesson preparation (M = 4.18), reflects respondents' belief in their ability to employ AI during instructional planning. AI applications have become valuable tools for designing lesson plans, preparing instructional materials, developing assessments, and organizing learning activities. Teachers who feel confident using these technologies are more likely to integrate AI consistently into their daily instructional routines. Consistent with the Technology Acceptance Model (Davis, 1989), greater confidence contributes to stronger perceptions of AI's usefulness and ease of use, ultimately encouraging technology adoption.

Respondents likewise reported high confidence in integrating AI into classroom instruction (M = 4.15) and experimenting with emerging AI technologies (M = 4.14). These findings suggest a positive disposition toward instructional innovation, indicating that respondents are willing to explore new technologies that may enhance science teaching and learning. Crompton & Burke (2024) similarly found that teachers with higher confidence are significantly more likely to adopt AI-supported instructional strategies than those who lack confidence in their technological capabilities.

Although all indicators were rated within the high readiness category, comparatively lower mean scores were observed for confidence in effectively integrating AI into science education (M = 4.03) and confidence in adapting to rapidly changing AI technologies (M = 4.05). These findings suggest that while teachers generally feel capable of using AI, they may still require additional support in applying AI within authentic inquiry-based science instruction and keeping pace with the rapid evolution of AI technologies. Given the continuous emergence of new AI platforms and applications, professional development should focus on developing adaptive expertise rather than mastery of a single AI tool. (Kasneci et al. 2023) emphasized that sustainable AI integration depends on teachers' capacity for continuous learning and their willingness to update instructional practices in response to technological advancements.

The findings strongly support Bandura's (1997) concept of self-efficacy, which posits that confidence influences behavioral intentions, persistence, and performance. Teachers who possess high levels of AI confidence are more likely to engage in experimentation, overcome implementation barriers, and integrate AI consistently into classroom instruction. Consequently, professional development initiatives should incorporate authentic learning experiences, peer mentoring, collaborative lesson design, and reflective practice to strengthen teachers' confidence through mastery experiences and social learning.

Overall, the results indicate that the findings indicate that General Science teachers in public secondary schools of Agusan del Sur possess a favorable level of confidence for AI integration. However, maintaining this confidence requires continuous institutional support, ongoing professional development, and opportunities for authentic classroom application. Strengthening teachers' confidence will not only facilitate greater AI adoption but also promote innovative, ethical, and learner-centered science instruction that responds to the evolving demands of twenty-first-century education.

F. Artificial Intelligence Usage

Artificial Intelligence (AI) usage represents the behavioral dimension of teachers' readiness and reflects the extent to which AI technologies are incorporated into everyday instructional practice. While AI knowledge, skills, and confidence indicate teachers' preparedness, actual classroom implementation demonstrates whether these competencies are translated into meaningful educational practice. According to the Technology Acceptance Model (Davis, 1989), users who perceive technology as useful and easy to use are more likely to adopt and utilize it consistently. Similarly, Rogers' (2003) Diffusion of Innovations Theory suggests that successful innovation occurs only when individuals move beyond awareness and develop sustained implementation within their professional contexts. Thus, examining teachers' AI usage provides valuable insights into the practical integration of AI in science education.

Table 6
Level of artificial intelligence usage among general science teachers (N = 100)

Artificial Intelligence Usage	Mean	SD	Interpretation	Rank
I use AI to prepare lesson plans.	4.08	0.64	High Readiness	2
I use AI to develop instructional materials.	4.12	0.61	High Readiness	1
I use AI to prepare quizzes, tests, and assessments.	3.95	0.68	High Readiness	4
I use AI to generate classroom activities.	3.89	0.70	High Readiness	6
I use AI to provide learning resources for students.	3.93	0.67	High Readiness	5
I use AI to simplify complex science concepts.	4.01	0.65	High Readiness	3
I encourage students to use AI responsibly during learning activities.	3.86	0.71	High Readiness	7
I use AI to analyze students' learning needs and progress.	3.72	0.76	High Readiness	9
I integrate AI into inquiry-based science activities.	3.69	0.78	High Readiness	10
I regularly explore new AI applications for teaching.	3.87	0.72	High Readiness	8
Overall Mean	**3.91**	**0.62**	**High Readiness**	

Interpretation: 4.21–5.00 = Very High Readiness; 3.41–4.20 = High Readiness; 2.61–3.40 = Moderate Readiness; 1.81–2.60 = Low Readiness; 1.00–1.80 = Very Low Readiness.

Table 6 presents the level of Artificial Intelligence usage among General Science teachers. The findings revealed an overall mean of 3.91 (SD = 0.62), indicating a high level of AI usage. Although this dimension obtained the lowest overall mean among the four components of AI readiness, the results demonstrate that respondents regularly utilize AI technologies to support various instructional tasks. The findings suggest that AI has become an emerging component of classroom practice

rather than merely an experimental educational technology.

The highest-rated indicator, "I use AI to develop instructional materials" (M = 4.12), indicates that teachers most frequently employ AI for creating teaching resources. This finding reflects the widespread adoption of generative AI applications capable of producing presentations, worksheets, laboratory activities, learning modules, and multimedia resources with increased efficiency. Similar findings were reported by (Kasneci et al. 2023), who observed that instructional material development is among the most common educational applications of generative AI because it significantly reduces teachers' preparation time while enhancing instructional quality.

The second-highest indicator, using AI to prepare lesson plans (M = 4.08), further demonstrates that AI has become an important instructional planning tool. AI-assisted lesson planning enables teachers to generate learning objectives, identify appropriate teaching strategies, recommend formative assessments, and organize classroom activities that align with curriculum standards. These findings support those of Garzón et al. (2025), who concluded that AI enhances instructional efficiency by automating routine planning tasks and allowing teachers to devote greater attention to learner engagement and instructional innovation.

Respondents also reported frequent use of AI to simplify complex science concepts (M = 4.01) and develop assessments (M = 3.95). These findings are particularly significant within science education, where abstract concepts often require multiple representations, visualizations, simulations, and contextualized explanations. AI applications enable teachers to generate age-appropriate explanations, visual learning resources, and differentiated instructional materials that facilitate students' conceptual understanding. According to (Zawacki-Richter et al. 2019). AI-supported instructional resources can improve students' engagement and conceptual learning when integrated appropriately within inquiry-based science instruction.

Despite the generally favorable findings, relatively lower mean scores were observed for integrating AI into inquiry-based science activities (M = 3.69) and using AI to analyze students' learning needs and progress (M = 3.72). Although both indicators remained within the high readiness category, these results suggest that teachers utilize AI more frequently for instructional preparation than for sophisticated pedagogical applications involving personalized learning, learning analytics, and inquiry-based instruction. Previous research similarly indicates that teachers often begin AI adoption by using AI for administrative and instructional preparation tasks before progressing toward more advanced classroom integration (Kasneci et al. 2023); Crompton & Burke (2024).

The findings further imply that AI implementation among General Science teachers remains concentrated on teacher-centered instructional support rather than learner-centered AI applications. While AI effectively enhances lesson preparation and content generation, its potential to facilitate scientific inquiry, adaptive instruction, formative assessment, and personalized feedback has not yet been fully realized. UNESCO (2023) emphasized that meaningful AI integration should move beyond improving teacher productivity and instead support authentic learning experiences that promote critical thinking, collaboration, creativity, and responsible technology use.

The comparatively lower utilization of AI for inquiry-based learning also highlights the need for specialized professional development programs focusing on authentic classroom implementation. Teachers require opportunities to experience AI within actual science teaching contexts, including virtual laboratories, scientific simulations, intelligent tutoring systems, automated formative assessment, and data visualization. Such experiences would strengthen teachers' ability to incorporate AI into higher-order learning activities rather than limiting its use to instructional preparation alone.

Overall, the findings indicate that General Science teachers demonstrate a favorable level of AI usage and have begun integrating AI into routine instructional practice. However, expanding AI utilization beyond lesson preparation toward learner-centered and inquiry-driven instructional applications remains an important area for professional growth. Increasing authentic classroom implementation will enable teachers to maximize AI's potential for improving scientific literacy, problem-solving, and evidence-based learning while ensuring ethical and responsible technology integration.

G. Differences in Artificial Intelligence Readiness According to Respondents' Profile

To determine whether General Science teachers differed significantly in their level of Artificial Intelligence (AI) readiness according to selected demographic variables, independent-samples *t*-test and one-way analysis of variance (ANOVA) were performed. The variables examined included sex, attendance in AI-related training, highest educational attainment, teaching experience, and frequency of AI tool usage. Understanding these differences is important because teacher characteristics may influence the acquisition of AI competencies and the successful implementation of AI-supported instructional practices (Kasneci et al. 2023); Tlili et al. (2023).

Table 7
Independent samples *t*-Test on artificial intelligence readiness according to sex and attendance in AI-related training

Variable	Group	Mean	SD	t	p-value	Decision
Sex	Male	4.02	0.47	-0.61	.543	Not Significant
	Female	4.07	0.50			
AI-related Training	Attended	4.23	0.39	5.18	<.001***	Significant
	Not Attended	3.76	0.48			

$p < .001$

Table 7 presents the results of the independent-samples *t*-test comparing respondents' AI readiness according to sex and attendance in AI-related training. The findings revealed no statistically significant difference according to sex (***t*** = -0.61, *p* = .543), indicating that male and female General Science teachers demonstrated comparable levels of AI readiness. This suggests that readiness for AI integration is not influenced by

gender but is instead associated with teachers' professional experiences and exposure to AI technologies.

The absence of sex differences is consistent with recent studies reporting that AI readiness is more strongly influenced by access to professional learning opportunities than by demographic characteristics (Kasneci et al. 2023); Crompton & Burke (2024). As AI technologies become increasingly accessible, both male and female teachers have comparable opportunities to develop AI-related competencies, resulting in similar levels of instructional preparedness.

In contrast, a highly significant difference was observed according to attendance in AI-related training (t = 5.18, p < .001). Teachers who had previously participated in AI-related seminars, workshops, or professional development activities demonstrated significantly higher AI readiness than those without such training. This finding underscores the critical role of structured professional development in strengthening teachers' AI competencies.

The results support previous systematic reviews emphasizing that continuous professional learning is one of the strongest predictors of successful AI integration in education (Kasneci et al. 2023). Likewise, (Dilek et al. 2025) concluded that teachers who receive AI-specific training demonstrate greater AI literacy, stronger instructional confidence, and more frequent classroom utilization of AI technologies.

Table 8
One-way analysis of variance (ANOVA) on artificial intelligence readiness according to educational attainment, teaching experience, and frequency of AI tool usage

Variable	F	p-value	Decision
Highest Educational Attainment	4.87	.003**	Significant
Teaching Experience	3.52	.017*	Significant
Frequency of AI Tool Usage	18.46	< .001***	Significant

p < .05, *p < .01, **p < .001

The ANOVA results presented in Table 8 indicate that respondents' AI readiness differed significantly according to highest educational attainment**,** teaching experience**,** and frequency of AI tool usage**.**

The significant difference according to educational attainment **(**F = 4.87, p = .003) suggests that teachers with higher academic qualifications generally exhibited greater AI readiness. Graduate education often provides educators with broader exposure to educational technologies, research-based instructional practices, and continuous professional learning, thereby strengthening their capacity to integrate AI effectively into classroom instruction. Similar findings were reported by (Kasneci et al. 2023) who observed that teachers possessing advanced academic qualifications generally demonstrate higher levels of technological competence and instructional innovation.

Likewise, teaching experience significantly influenced AI readiness (F = 3.52, p = .017). However, this finding should not be interpreted as indicating that more experienced teachers are inherently more AI-ready. Rather, teaching experience may contribute to greater instructional maturity, professional reflection, and pedagogical adaptability, enabling educators to integrate emerging technologies more effectively when supported by appropriate professional development. Previous studies have similarly concluded that teaching experience alone does not guarantee AI competence; instead, continuous learning remains essential regardless of years of service (Kasneci et al. 2023).

The strongest difference was observed according to frequency of AI tool usage (F = 18.46, p < .001). Teachers who reported using AI applications more frequently demonstrated substantially higher levels of AI readiness than those who used AI only occasionally. This finding reinforces the principle that competence develops through authentic practice and repeated application rather than through theoretical knowledge alone.

The result is consistent with Rogers' (2003) Diffusion of Innovations Theory, which explains that individuals become increasingly competent and confident as innovations progress from initial awareness to routine implementation. Similarly, Bandura (1997) emphasized that repeated mastery experiences strengthen self-efficacy, thereby encouraging greater adoption of innovative instructional practices.

Collectively, these findings indicate that professional learning experiences and authentic AI utilization contribute more substantially to AI readiness than demographic characteristics such as sex**.** Consequently, educational institutions should prioritize sustained AI-related professional development, encourage regular classroom implementation, and provide continuous instructional support to strengthen teachers' AI competencies.

H. Relationships Among the Dimensions of Artificial Intelligence Readiness

While demographic variables provide insights into factors influencing AI readiness, understanding the relationships among AI knowledge, AI skills, AI confidence, and AI usage offers a more comprehensive explanation of how these dimensions interact. Previous research conceptualizes AI readiness as a multidimensional construct in which cognitive, behavioral, and affective competencies reinforce one another (Long & Magerko 2020; Tlili et al. 2023). Accordingly, Pearson product-moment correlation analysis was conducted to determine the relationships among the four dimensions of AI readiness.

Table 9
Pearson correlation matrix of the dimensions of artificial intelligence readiness

Variables	AI Knowledge	AI Skills	AI Confidence	AI Usage
AI Knowledge	—	.78***	.74***	.69***
AI Skills	.78***	—	.83***	.81***
AI Confidence	.74***	.83***	—	.79***
AI Usage	.69***	.81***	.79***	—

p < .001

Table 9 reveals strong positive and statistically significant relationships among all four dimensions of Artificial Intelligence readiness (p < .001). The strongest correlation was observed between AI Skills and AI Confidence (r = .83), followed closely by the relationship between AI Skills and AI

Usage (r = .81). These findings suggest that teachers who possess stronger practical AI competencies also demonstrate greater confidence and more frequent classroom utilization of AI technologies.

AI Knowledge likewise exhibited significant positive relationships with AI Skills (r = .78), AI Confidence (r = .74), and AI Usage (r = .69). These findings indicate that conceptual understanding provides the foundation upon which teachers develop practical competencies and confidence for AI integration. However, knowledge alone does not guarantee implementation; rather, it must be complemented by opportunities for authentic practice and continuous professional learning.

The observed relationships support the Technology Acceptance Model (Davis, 1989), which posits that knowledge and perceived competence influence technology adoption through increased perceptions of usefulness and ease of use. Similarly, the TPACK Framework (Mishra & Koehler, 2006) emphasizes that effective technology integration requires the interaction of technological knowledge, pedagogical competence, and content expertise. The findings further align with Bandura's (1997) Social Cognitive Theory, which explains that confidence develops through successful mastery experiences and subsequently promotes sustained behavioral change.

Overall, the correlation analysis demonstrates that AI readiness should be viewed as an interconnected system of competencies rather than as independent dimensions. Strengthening one component—particularly AI knowledge or AI skills—is likely to produce corresponding improvements in teachers' confidence and classroom utilization of AI technologies. These findings provide a strong empirical foundation for the proposed AI-READY Professional Development Framework, which is presented in the succeeding section.

I. Evidence for Developing the AI-READY Professional Development Framework

The empirical findings of the study provided the basis for developing the Artificial Intelligence Readiness Enhancement and Development for Educators (AI-READY) Professional Development Framework. Although respondents demonstrated a high level of AI readiness, several findings indicated the need for sustained professional development. First, AI Usage obtained the lowest mean among the four readiness dimensions, suggesting that teachers' conceptual understanding and confidence have not yet been fully translated into authentic classroom implementation. Second, significant differences were observed according to attendance in AI-related training, educational attainment, teaching experience, and frequency of AI tool usage, highlighting the influence of continuous professional learning on AI readiness. Finally, the strong positive relationships among AI knowledge, AI skills, AI confidence, and AI usage suggest that strengthening one competency is likely to enhance the others.

These findings collectively indicate that professional development initiatives should extend beyond introductory AI orientation and emphasize practical classroom implementation, ethical AI integration, prompt engineering, collaborative learning, and continuous instructional improvement. Accordingly, the AI-READY Professional Development Framework was generated as a competency-based guide for strengthening teachers' readiness for AI-enhanced science instruction.

Figure 1. AI-READY Framework

Artificial Intelligence Readiness Enhancement and Development for Educators

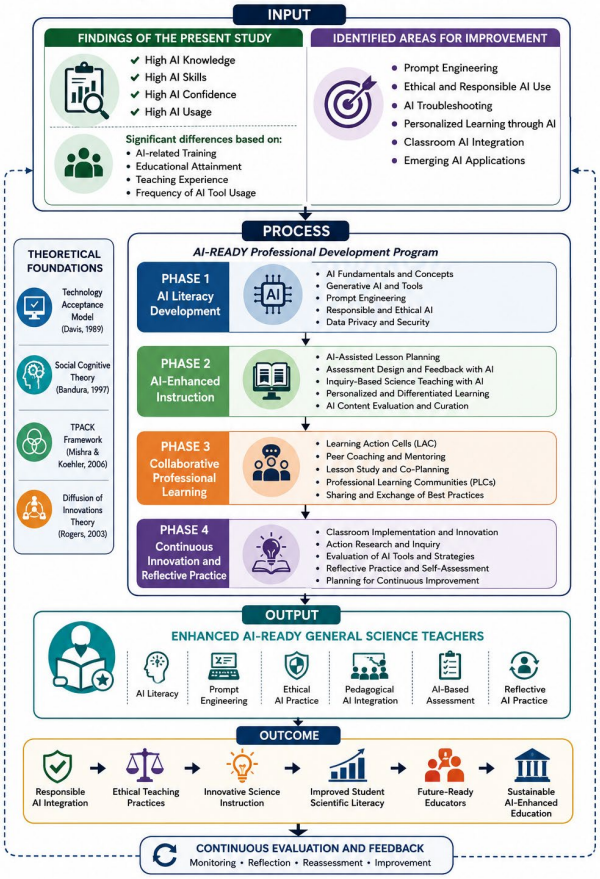

Fig. 1. AI-READY professional development framework

The framework is organized into four competency-development phases: AI Literacy Development, Instructional AI Integration, Collaborative Professional Learning, and Continuous Innovation and Reflective Practice. Together, these phases are intended to strengthen teachers' AI knowledge, practical competencies, instructional confidence, and classroom implementation while promoting responsible, ethical, and sustainable AI integration. The framework provides educational leaders and teacher education institutions with an evidence-based guide for planning future professional development initiatives.

4. Conclusion

This study assessed the Artificial Intelligence (AI) readiness of General Science teachers by examining four interrelated dimensions: AI knowledge, AI skills, AI confidence, and AI usage. The findings revealed that respondents demonstrated an overall high level of AI readiness, indicating that the findings

indicate that General Science teachers in public secondary schools of Agusan del Sur possess the foundational competencies necessary to integrate AI into science instruction. Among the four dimensions, AI knowledge obtained the highest level of readiness, followed by AI confidence, AI skills, and AI usage. These findings suggest that while teachers possess adequate conceptual understanding and confidence regarding AI, opportunities remain to strengthen the consistent and meaningful application of AI within authentic classroom instruction.

The inferential analyses further demonstrated that teachers' AI readiness was significantly influenced by attendance in AI-related professional development, educational attainment, teaching experience, and frequency of AI tool usage. Conversely, no significant difference was observed according to sex, indicating that AI readiness is primarily associated with professional learning experiences and practical engagement rather than demographic characteristics. The strong positive relationships observed among AI knowledge, AI skills, AI confidence, and AI usage further confirm that these dimensions operate as an interconnected system of competencies. Strengthening one aspect of AI readiness is therefore likely to enhance the others, reinforcing the need for comprehensive and integrated professional development initiatives.

The findings generated empirical evidence that informed the development of the AI-READY Professional Development Framework. Although the framework is introduced in the present study, future investigations should validate its components through expert evaluation and determine its effectiveness through experimental or longitudinal research. Such investigations may further establish the framework's contribution to teacher professional development and AI-enhanced science education.

5. Practical Implications

The findings of this study provide several practical implications for educational policy, school leadership, teacher education, and classroom practice.

For the Department of Education (DepEd)**,** the results underscore the importance of institutionalizing competency-based professional development programs that extend beyond basic digital literacy and specifically address Artificial Intelligence literacy, prompt engineering, ethical AI use, assessment design, and classroom implementation. Integrating AI competency standards into national teacher development initiatives may strengthen teachers' preparedness for technology-enhanced instruction and support the digital transformation goals articulated in the Basic Education Development Plan 2030.

For *school administrators and instructional leaders*, the findings highlight the importance of providing continuous opportunities for teachers to engage in AI-focused professional learning. School-based Learning Action Cells (LAC), instructional coaching, peer mentoring, and professional learning communities may serve as effective mechanisms for promoting collaborative AI integration, sharing best practices, and supporting teachers during classroom implementation.

For *teacher education institutions*, the study suggests the need to integrate Artificial Intelligence literacy into preservice and graduate teacher education curricula. Future science teachers should develop competencies not only in operating AI technologies but also in evaluating AI-generated content critically, applying AI ethically, designing AI-supported instructional activities, and facilitating responsible student use of AI within inquiry-based science education.

For *General Science teachers,* the findings encourage continuous professional learning and reflective instructional practice. Teachers should actively explore emerging AI applications, participate in professional development activities, and engage in collaborative learning experiences that strengthen both technical competence and pedagogical expertise. Rather than replacing professional judgment, AI should be utilized as a tool that enhances instructional quality, supports scientific inquiry, and promotes learner-centered education.

The findings provide empirical evidence that may assist the Schools Division Office of Agusan del Sur in designing competency-based Artificial Intelligence professional development programs for General Science teachers. The AI-READY Professional Development Framework may serve as a guide in planning division-wide capacity-building initiatives that strengthen teachers' AI literacy, instructional competencies, and ethical AI integration.

Finally, for *future researchers,* the study provides a validated framework for investigating Artificial Intelligence readiness among educators. Future investigations may replicate the study across different subject areas, educational levels, and geographical contexts to determine the generalizability of the findings. Researchers may also employ longitudinal, mixed-methods, or experimental designs to evaluate the effectiveness of the AI-READY Professional Development Framework in improving teachers' AI competencies and classroom implementation over time.

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Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this study.

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