WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

TEACHERS' ARTIFICIAL INTELLIGENCE COMPETENCE AND SELF-EFFICACY ON LEARNERS' ACADEMIC PERFORMANCE

SHIELA MARI C. LURIDO

Bulacan Agricultural State College, San Ildefonso, Bulacan, Philippines

A B S T R A C T :

This study aims to determine the relationship between teachers' artificial intelligence (AI) competence and AI self-efficacy and learners' academic performance in public elementary schools in the District of Angat, Schools Division of Bulacan, during School Year 2026–2027. Specifically, it seeks to assess teachers' levels of AI competence and self-efficacy, examine learners' academic performance, determine significant differences in teachers' responses when grouped according to selected demographic and professional characteristics, and establish the relationships among the study variables.

The study will adopt an explanatory sequential mixed-methods research design that calls for conducting a survey and a qualitative study. In this case, both quantitative and qualitative data will be collected, with the former being analyzed first, and the latter being used to explain the results. The total number of participants will be 258 public elementary school teachers selected through total enumeration. The data will be collected using valid and reliable research instruments to measure participants' AI competence and efficacy. The learners' achievement data will be extracted from their academic transcripts. The quantitative results will be analyzed using frequency, percentage, and mean, and standard deviation, tests of significant differences and correlation. The qualitative data will be analyzed thematically to expound on the quantitative results.

The results of the study will contribute to the understanding of how teachers' ability to use artificial intelligence and their confidence in utilizing related tools in the field are likely to be connected to learners' academic performance. The information will be useful in creating relevant professional development programs, enhancing responsible AI-informed education, and identifying approaches that can improve educational outcomes in public elementary schools.

Keywords: artificial intelligence competence, AI self-efficacy, academic performance, elementary education, explanatory sequential mixed-methods design

Introduction

In recent years, the globe has experienced unparalleled improvements in technology across multiple domains, with the education sector being a principal beneficiary of this progress. Artificial intelligence (AI) has emerged as a pivotal technical instrument that has profoundly influenced the educational process. AI can evaluate extensive datasets to tailor instructional materials according to the specific requirements of each learner, a principle referred to as personalized learning. Personalized learning is predicated on the notion that each student has distinct talents and capacities, necessitating an educational system tailored to address these requirements, hence yielding superior educational outcomes and an overall elevation in the quality of education.

The growing implementation of AI technologies in education accentuates the teacher's function as a crucial component in the learning process. Instead of supplanting the instructor, AI augments their function as a guide and mentor in the educational process. AI enhances educational outcomes by delivering accurate analytical data regarding each student's performance, enabling teachers to optimize the allocation of time and instructional materials. Furthermore, the teacher's human function is crucial in providing feedback and emotional support to students–an element that technology cannot entirely supplant. This illustrates a distinct connection between AI and the theory of multiple intelligences, enabling educators to utilize this interaction to tailor guidance for each student based on their specific forms of intelligence (Al Nabhani et al., 2025).

The incorporation of AI into education encounters numerous obstacles. A significant problem is the necessity of training educators to proficiently and competently utilize technology. Moreover, disparate access to technology can generate disparities between learners with access to these resources and those without.

One of the primary duties of a teacher is to establish a purposeful learning environment to enhance students' learning experiences and develop their abilities. However, teachers may lack the necessary digital skills and competence to effectively use AI-powered educational applications for instructional and learning goals (Seo et al., 2021). They may have insufficient technological expertise to perform data analysis or establish rules for automated assignments using AI-driven solutions (Akgun & Greenhow, 2022). Artificial intelligence is widely used by teachers to efficiently handle and analyze large amounts of data for remote learners. This technology has become highly used in educational environments (Aljarrah et al., 2021).

Recent studies have emphasized teachers' need to update their competencies to be able to integrate AI into pedagogical practices. It is recommended that this ongoing process of updating should extend beyond mere acquisition of knowledge of AI concepts and principles into understanding how to use AI-based tools to enhance students' competencies (Kong & Abelson, 2022; Su et al., 2022). As a result, it is critical to investigate and analyze the knowledge, abilities, and attitudes required by teachers for effective AI integration. For example, Kim and Kwon (2023) highlight the importance of identifying current gaps in teaching competencies within AI education. For them, analyzing the essential components of knowledge, skill, and attitude to enhance teaching can significantly improve teacher performance.

One of the major issues related to teachers' competencies in AI integration is the need to foster a balanced and thoughtful approach. Todorova (2023) states that the increasingly intensifying influence of digital technologies on human lives would oblige teachers to enhance their technological teaching capabilities and more importantly to establish boundaries that safeguard a distinctly human learning environment. Therefore, teachers should keep pace with technological advancements and introduce integration seamlessly within a “balanced approach". According to Markauskaite et al. (2022) seamless integration of new digital technologies into teaching practices involves engaging in professional learning to build competencies and to gain experience with AI-enabled tools. It entails teachers learning to utilize appropriate AI-driven technologies such as adaptive learning systems and intelligent agents.

In the Philippines, the use of AI in education has several applications including intelligent tutoring systems, automated exams, and data-driven instructional support. AI-powered technologies may help create interactive simulations, adaptive learning platforms, and automatic feedback systems to help students understand complicated concepts. These technologies provide tailored learning paths, allowing students to study at their own speed and get focused interventions. Despite these benefits, others have expressed concerns about the possible downsides of AI integration, such as teacher reliance on technology, ethical problems, and the need for digital literacy among teachers’ implementation in the classroom. Their amount of knowledge, competency, self-efficacy and desire to use AI tools influence the extent to which these technologies can improve student learning. Educators' perceived benefits and obstacles to AI adoption influence their teaching practices and student engagement. Additionally, institutional support, professional development opportunities, and access to AI resources all have a substantial impact on the self-efficacy of AI integration in teaching (Lucillo - Perdez, 2025).

Teachers’ competence and self-efficacy in AI are particularly important because they serve as facilitators of learning who directly influence how students interact with digital tools (Eze & Idowu, 2021). When teachers understand AI, they can integrate it strategically into lesson plans, assessments, and classroom activities, ensuring meaningful engagement with technology (Chukwu & Ibrahim, 2022). They can also guide students in using AI responsibly, helping them develop essential digital literacy, computational thinking, and problem-solving skills needed for the 21st century. Moreover, knowledgeable teachers can identify ethical concerns related to AI such as data privacy, academic integrity, and excessive dependence on automated tools and implement measures to mitigate these risks (Olatunji, 2023). In this way, teacher expertise becomes central to maintaining a balanced and effective learning environment.

Given these considerations, the importance of teachers' AI competence and self-efficacy cannot be overstated. Their competence determines whether AI becomes a tool for enhancing teaching and learning or a source of confusion and inequality in classrooms. Teachers who possess strong AI literacy are better positioned to harness emerging technologies for improved learning outcomes, while those with limited knowledge may unintentionally create digital divides among learners (Okeke & Bello, 2021). This study therefore examines the depth of teachers’ competence and self-efficacy in AI, the roles they play in learners’ learning outcomes.

Conceptual Framework

The conceptual framework of the study was informed by the notion of artificial intelligence (AI) competencies. Generally, AI competencies “refer to the knowledge, skills, attitudes, and abilities that enable one to use AI technology to operate, critically evaluate, and question effectively” (Ng et al., 2023, p. 106). Researchers highlight the role of AI literacy, which “encompasses the competencies and learning outcomes needed to understand and appropriately engage with AI technologies in a given context” (Ng et al., 2023, p. 106). Thus, in the modern world, AI competencies have become extremely important since they allow people to analyze and solve problems, communicate, and use existing technologies for work and learning.

The concept of teachers’ AI competencies includes their digital competence, which refers to “the confidence and capacity to engage with and realize the potential of digital technologies in education” (Rafael et al., 2023, p. 5). Particularly, in the framework of the policy of digital transformation, the European Commission has proposed a competence framework for digital educators, known as DigCompEdu (Khalil & Alsenaidi, 2024). It covers six competence areas, including professional attitude, digital resources, teaching and learning, assessment, empowerment of learners, and fostering learners’ digital competence (Khalil & Alsenaidi, 2024). These areas embrace the use of digital technologies in teaching, learning, assessing, and empowering learners, as well as fostering learners’ digital competencies and skills.

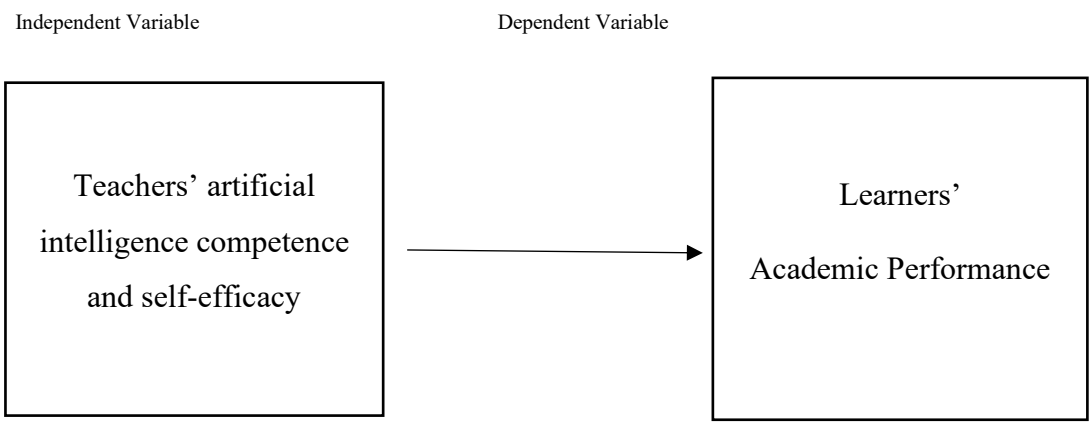
Moreover, according to Long and Magerko (2021), there are five core competencies required for teachers to develop AI literacy. These are understanding AI, understanding the technology’s limits, analyzing data and solutions, engaging with machine learning models, and comprehending AI’s impact on society. Indeed, understanding AI is critical for teachers, who should choose and implement appropriate AI technologies for effective teaching and learning. Furthermore, teachers should be aware of the capabilities and limitations of AI, analyze data, work with models, and evaluate how such technology impacts their learners. Finally, in the context of teaching, one should also consider the teachers’ competencies in using new technologies.

The researchers highlighted the need for teachers to acquire practical and technical competencies related to the use of AI technologies. For example, Oni and Ngongpah (2024) state that teachers should be able to operate AI applications; manage adaptive learning systems; utilize AI-powered

assessment tools; troubleshoot technical issues; and customize and adapt such tools for learners' needs, pedagogy, and contexts. Furthermore, in terms of pedagogical use, teachers should be able to assess the effectiveness of AI-assisted tasks in terms of learning, participation, engagement, and performance. The researchers have therefore identified four conceptual components of teachers' AI competencies: AI knowledge and literacy, digital competence, technical competencies, and pedagogical use of AI. Overall, the conceptual framework informed the current study aims at exploring these four components of teachers' AI competencies. The framework highlights the role of teachers' knowledge and literacy about AI, digital competence, technical skills, and the use of such technologies as a pedagogical tool. Thus, the study will explore how these factors are associated with the effective use of AI programs by teachers.

Figure 1:

Paradigm of the Study



Statement of the Problem

The study seeks to determine the relationship between teachers' artificial intelligence (AI) competence, teachers' self-efficacy, and learners' academic performance in public elementary schools in Angat, Schools Division of Bulacan, during School Year 2026-2027.

Specifically, it seeks to answer the following questions:

1. How may the demographic profile of the teachers be described in terms of:
   1.1 age;
   1.2 sex;
   1.3 civil status; and
   1.4 plantilla position and
   1.5 highest educational attainment and training related to AI
2. How may the teachers' artificial intelligence competence be described in terms of:
   2.1 AI knowledge;
   2.2 AI pedagogy;
   2.3 AI assessment;
   2.4 AI ethics;
   2.5 human-centered education and
   2.6 professional engagement?
3. How may the teachers' artificial intelligence self-efficacy be described in terms of:
   3.1 self-affirmation;
   3.2 passion for teaching;
   3.3 adherence to hard work;
   3.4 negative consciousness and
   3.5 positive belief?
4. What is the level of the learners' academic performance?
5. Is there a significant difference between the teachers' artificial intelligence competence and self-efficacy when they are grouped according to their demographic profile?

6. Is there a significant relationship between the teachers' artificial intelligence competence, self-efficacy and the learners' academic performance?
7. What are the views and insights of the respondents regarding artificial intelligence competence and self-efficacy?
8. What challenges do the respondents encounter in relation to this study?
9. Based on the results of the study, what program of activities may be proposed?

Hypotheses

The following hypotheses were tested in the study:

1. There is no significant difference between the teachers' artificial intelligence competence and self-efficacy when they are grouped according to their demographic profile.
2. There is no significant relationship between the teachers' artificial intelligence competence and self-efficacy and the learners' academic performance.

RESEARCH METHODS

Research Design

To investigate the research problem, the researcher adopted an explanatory sequential mixed-methods research design. According to Plano Clark (2019), this design entailed a two-step sequential process consisting of a "dominant quantitative phase followed by a qualitative phase." This meant that data collection procedures, such as survey questionnaires for the quantitative component and semi-structured interviews for the qualitative component, took place in two stages. The quantitative phase took precedence over the qualitative phase.

Prior to conducting the one-year study, the researcher gathered data using survey questionnaires administered to the selected teachers and obtained the learners' performance records from the participating teachers. The researcher analyzed the collected quantitative data using appropriate descriptive and inferential statistics to determine significant relationships among the variables of interest. The quantitative findings then informed the development of questions for the semi-structured interviews. During the second stage, selected participants were interviewed, and their responses were analyzed thematically to generate additional information needed to interpret the quantitative results. The researcher combined and integrated the findings from both phases to gain a comprehensive understanding of the research problem and address the research questions.

Sampling and Respondents

The study employed total enumeration or universal sampling to select the quantitative respondents. This sampling technique involved inviting all 258 public elementary school teachers from the 14 public elementary schools in Angat, Bulacan, to participate in the study. The inclusion criteria required that the respondents were (1) currently employed as public elementary school teachers in any of the 14 participating schools during School Year 2026–2027; (2) officially included in the teaching personnel roster of their respective schools during the data-gathering period; and (3) willing to participate in the study and provide informed consent. Teachers who were not assigned to the participating schools during the data-gathering period or who declined participation were not included. No prior experience or proficiency in using artificial intelligence was required, since the study aimed to assess teachers' existing levels of AI competence and self-efficacy.

Table 1:

Respondents of the Study

Number of Teachers and Grade 6 Learners in Angat District Schools

School	Name of School	Teachers	Grade 6 Learners
A	Matias A. Fernando Memorial School	63	253
B	Pablo C. Capistrano Elementary School	8	33
C	Baybay Elementary School	7	21
D	Col. Vicente L. Salvador Elementary School	7	33
E	Don Pablo Amisola Memorial School	16	64
F	Teodoso R. Manuel Elementary School	15	60

G	Dr. Antonio C. Villarama Memorial School	16	66
H	Francisco F. Illescas Elementary School	23	121
I	Marcelo L. Adriano Memorial School	18	90
J	Paltok Elementary School	9	26
K	Osias M. Esteban Elementary School	29	128
L	Benito C. Cruz Elementary School	12	32
M	Antonio C. Cruz-Sulucan Elementary School	20	94
N	Atilano S. De Guzman Elementary School	15	74
	Total	258	1095

For the qualitative component, 14 teachers, representing one teacher from each participating school, were selected through the lottery method. The selection was conducted by preparing a list of eligible teachers from each school and writing their names on separate slips of paper of the same size, shape, and color. The slips were folded, placed in a container, and thoroughly mixed before one name was drawn randomly from each school. The selected teachers were then invited to participate in the semi-structured interviews, subject to their willingness and informed consent. This procedure ensured that every participating school was represented in the qualitative phase and provided an opportunity for eligible teachers to be selected without personal bias.

The study also utilized the academic performance records of 1,095 Grade 6 learners from the participating schools as a source of quantitative data. These records were obtained from the respective class advisers, subject to the necessary permissions and confidentiality measures. The learners' academic records served as the basis for examining the relationship between teachers' AI competence, AI self-efficacy, and learners' academic performance.

Locale of the Study

This study was conducted in 14 public elementary schools in Angat, Bulacan.

Instruments

Both quantitative and qualitative data were gathered to answer the research questions formulated in the preceding chapter. For the quantitative component of the study, the researcher utilized a three-part survey questionnaire. Part I gathered information regarding the demographic profiles of the teacher-respondents. Part II was adapted from the instrument developed by Chiu et al. (2025) to measure teachers' competence in utilizing artificial intelligence (AI). Part III was adapted from the instrument developed by Chou et al. (2024) to assess teachers' self-efficacy in using AI. Relevant modifications were made to the adapted instruments to ensure their applicability to the context and conditions of public elementary schools. Meanwhile, data on learners' academic performance were obtained from their respective class advisers, subject to the necessary permissions and confidentiality measures.

For the qualitative component of the study the researcher developed a set of researcher's made open ended interview questions informed by the findings of the quantitative analysis. Participants for this phase were purposively selected from amongst the teachers who had participated in the quantitative phase. The selection was based on their relevance to the research objectives, their willingness to participate and their ability to provide a good explanation and insight into the quantitative findings. Participants at varying levels of AI competence and self-efficacy were selected to provide a range of perspectives and a deeper insight into the findings. Semi-structured interviews were then conducted with the selected participants to explore their experiences and perceptions of teachers' AI competence, self-efficacy and their relationship to learners' achievement. The qualitative findings were then analyzed, and the findings of the qualitative and quantitative phases were combined to provide a more complete picture of the results.

Data Gathering Procedure

The researcher accomplished the required documentary requirements from the Department of Education (DepEd), Schools Division of Bulacan, and the College of Education of Bulacan Agricultural State College (BASC) before conducting the study. After completing the necessary documents, the researcher requested permission from the Schools Division Office of Bulacan to conduct the study among public elementary school teachers in Angat, Bulacan. Upon receiving the necessary permit, the researcher coordinated with the heads of the participating schools to schedule the distribution and retrieval of survey questionnaires and the conduct of qualitative interviews.

The researcher personally administered the survey questionnaires and conducted the semi-structured interviews. The teacher-respondents were given sufficient time to answer the questionnaire honestly and accurately. The participants were also allowed to leave questions unanswered or decline to respond to questions they did not wish to answer during the interviews. The respondents' answers were kept confidential throughout the research process.

The researcher ensured that all data collection procedures complied with the policies outlined in DepEd Memorandum No. 9, s. 2021, regarding the ethical and legal aspects of data gathering. The documents containing the respondents' personal information were properly stored and preserved. All collected data were treated as confidential and kept safe and secure. Following the completion of the study and the required retention period, all collected records were scheduled for secure disposal.

Data Analysis

The quantitative data obtained from the study were analyzed using descriptive and inferential statistics. The learners' academic performance was described using measures such as the mean and standard deviation. Meanwhile, the weighted mean was used to determine teachers' artificial intelligence (AI) competence and self-efficacy based on their responses to the survey questionnaires.

To determine differences in teachers' AI competence and self-efficacy when grouped according to selected demographic and professional characteristics, appropriate statistical tests were employed. An independent-samples t-test was used for comparisons involving two independent groups, while analysis of variance (ANOVA) was applied to variables involving more than two independent groups, provided that the required statistical assumptions were met.

To examine the relationships among teachers' AI competence, teachers' self-efficacy, and learners' academic performance, correlation analysis was conducted. Pearson's product-moment correlation was applied when the data met the required statistical assumptions. Otherwise, Spearman's rank-order correlation was used.

On the other hand, the qualitative data were analyzed thematically. Initially, the interview transcripts underwent familiarization, during which the researcher reviewed the data to gain an overall understanding of the participants' responses. Coding was then conducted to facilitate the identification of patterns in the data. The researcher subsequently identified and developed themes interpreted the findings, and presented the results. The qualitative analysis complemented the quantitative findings by providing further insights into the relationships among the variables of the study.

Ethical Considerations

The researcher adhered to ethical standards and procedures in gathering both quantitative and qualitative data. The respondents were informed of the study's objectives, procedures, and their rights as participants before they agreed to participate. Participation was voluntary, and the respondents were free to decline participation or withdraw from the study at any time without adverse consequences.

For the quantitative component of the research, questionnaires were distributed anonymously, and no unnecessary sensitive information was collected. Measures were implemented to maintain the confidentiality of the participants. The information gathered was used solely for the purposes of the study and was not shared with unauthorized parties. The collected data were scheduled for deletion after the completion and successful defense of the thesis in October 2026. Accordingly, electronic data stored on the researcher's laptop were scheduled for deletion, while printed copies of the questionnaires were designated for secure disposal in accordance with the university's data retention policies.

Prior to conducting the interviews, the researcher secured the required permits from the relevant ethical review boards. The participants were informed beforehand of the general objectives and scope of the interviews to allow them to prepare their responses. They were also informed of their right to refuse to answer any question or discontinue the interview at any time if they felt uncomfortable, without any adverse consequences. In addition, informed consent was obtained from the participants before the interviews were recorded.

During the preparation and presentation of the research results, the researcher ensured the anonymity of the participants. In doing so, the rights, privacy, welfare, and dignity of the research participants were respected and protected in accordance with established ethical research practices.

Teachers' Views and Insights Regarding Artificial Intelligence Competence and Self-Efficacy

Table presents the teachers' views and insights regarding artificial intelligence competence and self-efficacy. Based on the data, six major themes emerged: AI as a Support for Teaching, Improved Teaching Efficiency, Need for Continuous Learning, Importance of Teacher Judgment, Increased Confidence Through Practice, and Responsible and Ethical Use.

Table

Teachers' Views and Insights Regarding Artificial Intelligence Competence and Self-Efficacy

These themes indicate that teachers generally viewed AI as a supportive educational technology rather than a replacement for teachers. The responses also emphasized the importance of continued learning, practical experience, professional judgment, and ethical considerations in developing teachers' AI competence and self-efficacy.

Themes	*Key Insights*
AI as a Support for Teaching	*Teachers viewed AI as a useful tool that can support lesson preparation, content development, and the delivery of learning activities.*
	AI was perceived to help teachers accomplish instructional tasks more efficiently and provide additional resources for classroom use.
	Teachers emphasized that AI should support, rather than replace, teachers' professional judgment and decision-making.
Strengthening AI Self-Efficacy Through Practice	*Regular exposure and actual use of AI tools were viewed as important in enhancing teachers' confidence and self-efficacy.*
Need for Continuous Learning	*Teachers recognized the need to continuously develop their knowledge and skills to use AI effectively in teaching.*

The findings suggest that teachers recognize both the practical benefits and responsibilities associated with AI use. Their perception of AI as a support for lesson preparation and content development indicates that teachers primarily see AI as a tool that can supplement their existing instructional practices. The emphasis on continuous learning and practice further suggests that teachers view AI competence as something that develops over time through exposure and application. At the same time, their emphasis on teacher judgment and responsible use indicates an awareness that AI-generated outputs require human evaluation and that sensitive learner information must be protected.

These qualitative findings correspond with Chiu et al. (2024), who identified AI knowledge, pedagogy, assessment, ethics, human-centered education, and professional engagement as interconnected dimensions of teacher AI competence. Mikeladze (2024) similarly emphasized that teacher AI competence frameworks need to account for the complexity of AI use in education rather than reducing competence to technical skills alone. The teachers' emphasis on responsible use and professional judgment also corresponds with the human-centered orientation of current AI competence frameworks. Their views therefore reinforce the quantitative findings showing competence in AI ethics and human-centered education.

Challenges Encountered by Teachers in the Use of Artificial Intelligence in Teaching

Table 27 presents the challenges encountered by teachers in using artificial intelligence in teaching. The identified challenges included limited knowledge and skills, limited training opportunities, internet and technology limitations, accuracy of AI-generated information, data privacy and security concerns, time constraints, and learners' responsible use of AI.

Table

Challenges Encountered by Teachers in the Use of Artificial Intelligence in Teaching

Challenges	*Description*
Limited Knowledge and Skills for Seasoned Teachers	*Some teachers had trouble understanding and maximizing the functions of different AI tools.*
Limited Training Opportunities	*Teachers identified the need for more relevant and continuous professional development activities related to AI.*
Internet and Technology Limitations	*Unstable internet connectivity and limited access to appropriate technological resources affected the use of AI in classroom activities.*

Accuracy of AI-Generated Information	*Teachers needed to verify AI-generated outputs because these may contain inaccurate, incomplete, or inappropriate information.*
Learners' Responsible Use of AI	*Teachers faced challenges in guiding learners to use AI appropriately without becoming overly dependent on AI-generated outputs.*

The results suggest that in addition to knowledge and skills, teachers need professional support, such as relevant training, available technology, time for exploration, and guidance on using AI in instruction, to ensure effective AI integration in teaching. Without such support, teachers may face challenges in building AI expertise and self-efficacy. Thus, it is needed to provide professional development and school resources to ensure that teachers can enhance their AI literacy and efficacy. By doing so, it would be possible to explain the observed results by linking them to the role of contextual factors in shaping teachers' experiences of using AI in schools.

The findings suggest that teachers require both individual and institutional support to use AI effectively. Limited knowledge and training opportunities may make it difficult for teachers to maximize the capabilities of available AI tools, while unstable internet connectivity and limited technological resources may restrict actual classroom implementation. Concerns about inaccurate AI-generated information and data privacy further indicate that teachers need skills for verifying AI outputs and protecting sensitive information. The challenge involving learners' responsible use also highlights the need for clear guidance so that AI becomes a learning support rather than a substitute for learners' independent thinking.

These findings are consistent with Celik et al. (2022), who identified both opportunities and challenges associated with AI for teachers and emphasized the need for teachers to develop appropriate competencies for effective AI integration. The findings are also consistent with Yue et al. (2024), whose study of 1,664 K–12 teachers identified gaps in AI-related content and technological knowledge and emphasized the need for effective professional development. Mah and Groß (2024) likewise examined faculty AI self-efficacy, perceived benefits, challenges, and professional development needs, demonstrating that educators' AI engagement occurs within a broader context of institutional and professional conditions. These studies support the present qualitative findings that improving AI use requires more than simply making AI tools available to teachers.

For the interview component, the teacher respondents were asked about the most difficult aspects of using artificial intelligence in teaching. The majority of the teacher respondents identified limited training, difficulty determining the accuracy of AI-generated information, unstable internet connectivity, data privacy concerns, and the additional time required to learn and integrate new AI tools as important challenges.

Proposed Program of Activities

The proposed program of activities was developed based on the findings of the present study and was guided by relevant local research on school-based interventions and resource management. The action-planning approach of San Gabriel and Manalastas (2025), which translated research findings into specific objectives, activities, timelines, responsible persons, and expected outcomes, served as a reference in structuring the proposed project. Moreover, the study of Dimacali et al. (2025) on resource generation strategies, partnerships, and resource sharing informed the inclusion of activities that address teachers' access to AI tools, technical assistance, and institutional support. These references were considered in developing Project AI-READY, with the activities specifically tailored to the identified needs and challenges of teachers in integrating artificial intelligence into instruction.

Table

Proposed AI-READY: Advancing Responsible and Effective AI Integration in Teaching

PROJECT COMPONENTS	DESCRIPTION
I. Rationale	More people are using Artificial Intelligence in education. This gives a chance to improve teaching methods, plan lessons, assess students and create learning materials. Teachers need to know enough to have the right skills, feel confident and understand the ethics of AI to get the best from it. This project wants to make teachers better at using AI. It will do this by giving training, helping them grow professionally and offering support.
II. General Objective	The goal is to help public elementary school teachers become better at using AI. This will be done by using AI tools in a ethical and effective way during teaching and learning.
III. Specific Objectives	1. Help teachers understand what AI is and how to use it in lessons. 2. Help teachers learn how to use AI for planning lessons and evaluating students. 3. Encourage teachers to use AI in a responsible way. 4. Help teachers work together, share resources and get help when using AI.
IV. Target Participants	Public elementary school teachers in the Schools Division of Bulacan.

V. Program Components and Proposed Activities	1. AI Knowledge and Instructional Integration – Host workshops about AI basics, how to choose the AI tools how to use AI for lesson planning how to create different learning activities and how to develop learning materials. 2. AI-Assisted. Critical Evaluation – Offer practical sessions where teachers can make quizzes, rubrics, worksheets and feedback using AI tools. Do exercises where teachers check facts, spot errors and bias and make sure AI content is correct. 3. Ethical and Responsible AI Use – Hold seminars and workshops about protecting data keeping honesty dealing with AI bias stopping false information using AI properly and guiding students on how to use AI tools. 4. Professional Development, Resource Sharing and Technical Support – Arrange LAC meetings have peer mentoring show how to teach with AI share ideas and work on ways to share resources. Also provide help with using AI tools. Find alternatives when internet is not available.
VI. Persons Responsible	Schools Division Office of Bulacan, Public Schools District Supervisors, school heads, master teachers, ICT coordinators, designated data protection personnel, and partner institutions.
VII. Time Frame	First and Second Terms: AI Knowledge and Instructional Integration. Second and Third Terms: AI-Assisted Assessment and Critical Evaluation. Third Term: Ethical and Responsible AI Use. Throughout the School Year: Professional Development, Resource Sharing, and Technical Support.
VIII. Expected Outcomes	1. Teachers show knowledge and skills in using AI. 2. Teachers create materials using AI for lessons and assessments. 3. Teachers use AI in a safe and responsible way. 4. Teachers feel more confident when using AI tools in lessons. 5. Teachers take part in learning opportunities and share resources.
IX. Monitoring and Evaluation	Track how many teachers attend by looking at attendance sheets training feedback, their work, classroom visits LAC records and a collection of AI-assisted teaching materials. Check how well the project works by using tests after training and asking for feedback from the teachers.
X. Budgetary Requirements	Costs for training materials, supplies, people who help with training, internet access and other things needed for training. These must follow the rules of the Department of Education.
XI. Source of Funds	Money from the School MOOE funds, from the Schools Division Office and other allowed sources of money and help according to the rules of the Department of Education.

The proposed Project AI-READY: Advancing Responsible and Effective AI Integration in Teaching was developed in response to the findings of the study, particularly the teachers' level of artificial intelligence competence, self-efficacy, and the challenges encountered in integrating AI into instruction. Although the results indicated that teachers generally demonstrated competent AI knowledge and high AI self-efficacy, opportunities for further development remained necessary to strengthen their practical skills, professional engagement, and responsible use of AI tools. The proposed program therefore consists of four major components.

The first component, AI Knowledge and Instructional Integration, aims to strengthen teachers' foundational understanding of artificial intelligence and their ability to apply AI tools in instructional planning and delivery. Through workshops on AI fundamentals, tool selection, lesson planning, and development of instructional materials, teachers may become more capable of identifying appropriate AI applications for their teaching needs. This component also addresses the need to further develop teachers' practical knowledge in selecting suitable AI tools for specific instructional tasks.

The second component, AI-Assisted Assessment and Critical Evaluation, focuses on developing teachers' ability to use AI in preparing assessment materials while ensuring the accuracy and appropriateness of generated outputs. Training activities include the preparation of quizzes, rubrics, worksheets, and feedback, as well as exercises on verifying information and identifying inaccurate or biased AI-generated content. This component responds to concerns regarding the reliability of AI-generated information and emphasizes that teachers remain responsible for reviewing and validating materials before using them in the classroom.

The third component, Ethical and Responsible AI Use, promotes the safe and appropriate application of artificial intelligence in educational settings. Through seminars and workshops on data privacy, academic integrity, misinformation, AI bias, and responsible prompting, teachers may strengthen their understanding of the ethical considerations involved in AI integration. The component also highlights their responsibility to guide learners in using AI appropriately while maintaining independent thinking and academic honesty.

The fourth component, Professional Development, Resource Sharing, and Technical Support, addresses the need for continuous learning, collaboration, and institutional assistance. Activities such as Learning Action Cell sessions, peer mentoring, demonstration teaching, and resource-sharing initiatives may provide teachers with opportunities to exchange experiences and improve their AI-related practices. Technical assistance and access to appropriate AI resources may also help address challenges involving limited training opportunities, internet connectivity, and access to digital tools. This component is consistent with the resource-sharing and partnership principles discussed by Dimacali et al. (2025).

Overall, Project AI-READY provides a structured approach to strengthening teachers' AI competence and self-efficacy through training, ethical awareness, professional collaboration, and institutional support. Its implementation may help teachers maximize the educational applications of artificial intelligence while maintaining professional judgment and responsibility in instructional decision-making. The program may also serve as a basis for sustained professional development and more effective AI integration in public elementary schools.

Findings :

The results of the study revealed that the teachers demonstrated an overall Competent level of artificial intelligence competence, with an overall mean of 4.02. Among the six dimensions, AI Ethics obtained the highest mean of 4.18, followed closely by Human-Centered Education with a mean of 4.17, while AI Knowledge obtained 4.09. AI Pedagogy and AI Assessment obtained means of 3.94 and 3.90, respectively, while Professional Engagement obtained the lowest mean of 3.84. Despite the differences among the dimensions, all were interpreted as Competent, indicating that the teachers possessed adequate competence across the different areas of AI use in education.

In terms of AI self-efficacy, the teachers demonstrated an overall High level, with an overall mean of 3.69. Passion for Teaching obtained the highest mean of 4.17, followed by Positive Belief with 4.12, Self-Affirmation with 4.09, and Adherence to Hard Work with 4.03, all interpreted as High. In contrast, Negative Consciousness obtained a mean of 2.03, interpreted as Low, indicating that negative perceptions toward AI teaching were relatively limited among the teacher respondents. These findings suggest that the teachers generally possessed positive beliefs, willingness, and motivation to engage in AI-supported teaching and to develop their AI-related knowledge and skills.

The results also showed that the learners generally demonstrated favorable academic performance. Out of 258 learners, 128 or 49.42% were classified as Outstanding, while 92 or 35.66% were classified as Very Satisfactory. Another 32 or 12.40% obtained a Satisfactory level of performance, while only 6 or 2.33% were classified as Fairly Satisfactory. No learner was classified under Did Not Meet Expectations, representing 0.00% of the respondents. Overall, the distribution indicates that most learners attained either Outstanding or Very Satisfactory academic performance, with 85.08% of the learners belonging to these two categories.

Conclusion :

Based on the findings, the teachers demonstrated a *Competent* level of artificial intelligence competence across all six dimensions, with AI Ethics and Human-Centered Education obtaining the highest means and Professional Engagement obtaining the lowest. They also demonstrated a *High* level of AI self-efficacy, particularly in Passion for Teaching, Positive Belief, Self-Affirmation, and Adherence to Hard Work. The Low level of Negative Consciousness further indicated that negative perceptions toward AI integration were relatively limited. These results suggest that teachers possess adequate AI-related competencies and positive beliefs that may support the continued integration of artificial intelligence into teaching and learning.

The learners generally demonstrated favorable academic performance, with most classified as Outstanding or Very Satisfactory and all attaining at least a Fairly Satisfactory level. However, the findings do not establish a causal relationship between teachers' AI competence, self-efficacy, and learners' academic performance. The study also identified challenges in AI integration, particularly limited training opportunities, concerns about the accuracy of AI-generated information, unstable internet connectivity, data privacy, time constraints, and learners' responsible use of AI. These findings highlight the need for continuous professional development and institutional support to strengthen teachers' effective and responsible use of artificial intelligence in education.

Recommendations

In accordance with the results and conclusions of the study, the following recommendations are formulated:

1. The Schools Division Office of Bulacan may provide continuing professional development programs on AI pedagogy, assessment, ethics, and professional engagement to strengthen teachers' AI competence and self-efficacy.
2. School heads may provide teachers with access to appropriate AI tools, technical assistance, internet resources, and opportunities for collaborative learning and training to support responsible AI integration.
3. Teachers may continuously enhance their AI knowledge and skills, verify AI-generated information, protect sensitive data, and guide learners in using AI responsibly while maintaining independent thinking and academic integrity.
4. Schools and curriculum developers may establish guidelines for the ethical and human-centered use of AI, particularly in protecting data privacy, promoting academic honesty, and ensuring that human judgment remains central to instructional decisions.
5. Future researchers may conduct similar studies in other educational settings and explore additional factors, such as AI-related training, digital proficiency, teaching experience, and institutional support, that may influence teachers' AI competence and self-efficacy.

REFERENCES

- Abar, C. A. A. P., dos Santos, J. M. D. S., & de Almeida, M. V. (2024). Contributions of the integration between computational thinking and artificial intelligence for mathematics education. In *International Conference on Information Technology & Systems* (pp. 290–299). Springer Nature Switzerland.
- Akgun, S., & Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K–12 settings. *AI and Ethics, 2*, 431–440. https://doi.org/10.1007/s43681-021-00096-7
- Al-Abdullatif, A. M. (2024). Modeling teachers' acceptance of generative artificial intelligence use in higher education: The role of AI literacy, intelligent TPACK, and perceived trust. *Education Sciences, 14*(11), Article 1209. https://doi.org/10.3390/educsci14111209

- Bautista, A., Estrada, C., Jaravata, A. M., Mangaser, L. M., Narag, F., Soquila, R., & Asuncion, R. J. (2024). Preservice teachers' readiness towards integrating AI-based tools in education: A TPACK approach. *Educational Process: International Journal, 13*(3), 40–68. https://doi.org/10.22521/edupij.2024.133.3
- Bryant, J., Heitz, C., Sanghvi, S., & Wagle, D. (2020, January 14). *How artificial intelligence will impact K–12 teachers*. McKinsey & Company. https://www.mckinsey.com/industries/education/our-insights/how-artificial-intelligence-will-impact-k-12-teachers
- Celik, I., Dindar, M., Muukkonen, H., & Järvelä, S. (2022). The promises and challenges of artificial intelligence for teachers: A systematic review of research. *TechTrends, 66*, 616–630. https://doi.org/10.1007/s11528-022-00715-y
- Chiu, T. K. F., Ahmad, Z., & Çoban, M. (2025). Development and validation of teacher artificial intelligence (AI) competence self-efficacy (TAICS) scale. *Education and Information Technologies, 30*, 6667–6685. https://doi.org/10.1007/s10639-024-13094-z (Springer)
- Chukwu, P. J., & Ibrahim, Y. K. (2022). AI-driven instructional innovations: Implications for teaching and learning in African schools. *African Journal of Digital Education, 5*(2), 33–47.
- Deshen, M., Harari, R., & Aharony, N. (2026). Teachers' artificial intelligence (AI) literacy: An exploratory study. *Smart Learning Environments, 13*, Article 7. https://doi.org/10.1186/s40561-026-00433-5 (Springer)
- Dimacali, V. N., Labao, N. M., Tayag, C. C., & Garcia, R. C. (2025). Exploring the external resource generation strategies of secondary public schools in San Luis, Pampanga. *World Journal of Advanced Research and Reviews, 25*(3), 1399–1410. https://doi.org/10.30574/wjarr.2025.25.3.0877
- Dinopol, M. C., Camilo, J. B. C., & Oyangoren, M. O. (2025). School leaders' strategies for teachers' instructional functions in using AI-powered Edtech tools. *Psychology and Education: A Multidisciplinary Journal, 41*(2).
- Eze, V. O., & Idowu, O. P. (2021). Teachers' digital competence and readiness for artificial intelligence integration in secondary schools. *International Review of Education Technology, 12*(4), 52–67.
- Galindo-Domínguez, H., Delgado, N., Campo, L., & Losada, D. (2024). Relationship between teachers' digital competence and attitudes towards artificial intelligence in education. *International Journal of Educational Research, 126*, 102381. https://doi.org/10.1016/j.ijer.2024.102381
- Langreo, L. (2026, January 12). More teachers are using AI in their classrooms. Here's why. *Education Week*. https://www.edweek.org/technology/more-teachers-are-using-ai-in-their-classrooms-heres-why/2026/01
- Lu, J., Zheng, R., Gong, Z., & Xu, H. (2024). Supporting teachers' professional development with generative AI: The effects on higher order thinking and self-efficacy. *IEEE Transactions on Learning Technologies, 17*, 1267–1277. https://doi.org/10.1109/TLT.2024.3369690
- Mah, D.-K., & Groß, N. (2024). Artificial intelligence in higher education: Exploring faculty use, self-efficacy, distinct profiles, and professional development needs. *International Journal of Educational Technology in Higher Education, 21*, Article 58. https://doi.org/10.1186/s41239-024-00490-1
- Manaig, K. A., Yazon, A. D., Buama, C. A. C., & Bonganciso, R. T. (2025). Teachers' awareness in artificial intelligence and digital competence in the workplace. *Advanced Journal of STEM Education, 3*(1), 27–44. https://doi.org/10.31098/ajosed.v3i1.3302
- Merrill, S. (2020). In schools, are we measuring what matters? *Edutopia*. https://www.edutopia.org/article/schools-are-we-measuring-what-matters
- Mikeladze, T. (2024). A comprehensive exploration of artificial intelligence competence frameworks for educators: A critical review. *European Journal of Education, 59*(3), e12663. https://doi.org/10.1111/ejed.12663
- Molenaar, I. (2022). Towards hybrid human-AI learning technologies. *European Journal of Education, 57*, 632–645. https://doi.org/10.1111/ejed.12527
- Mousavinasab, E., Zarifsanaiey, N., Niakan Kalhori, S. R., Rakhshan, M., Keikha, L., & Ghazi Saeedi, M. (2021). Intelligent tutoring systems: A systematic review of characteristics, applications, and evaluation methods. *Interactive Learning Environments, 29*(1), 142–163. https://doi.org/10.1080/10494820.2018.1558257
- Nwankwoala, H. C. O., Omonigho-Moses, E. J., & Hobobo-Moni, M. P. (2025). Teachers' knowledge of artificial intelligence and its importance in enhancing teaching and learning in schools. *International Journal of Scientific Research in Education, 18*(4), 708–715.
- Ogunleye, A. A. (2020). Enhancing pedagogy through artificial intelligence: The role of teacher competence. *Journal of Modern Pedagogical Research, 6*(3), 78–89.
- Raguindin, C. (2025). Artificial intelligence in the teaching process in public elementary schools: Inputs to curriculum enhancement. *The International Journal of Science, Technology and Engineering, 2*(1).
- San Gabriel, J. D., & Manalastas, A. S. (2025). Experimental skills of senior high school students on academic performance in chemistry. *International Journal of Research Publication and Reviews, 6*(1), 2390-2406 https://doi.org/10.13140/RG.2.2.14229.64486
- Silagan, B. L., & Tumapon, T. T. (2025). Technological competence, training and support, attitude towards AI, and teachers' acceptance. *Psychology and Education: A Multidisciplinary Journal, 36*(8).
- South African Broadband Education Networks. (2024, May 30). *The role of AI in education: Transformative trends and future implications*. SABEN. https://saben.ac.za/the-role-of-ai-in-education-transformative-trends-and-future-implications/
- Subosa, M. (2026). Teachers' knowledge, attitude, and practices on artificial intelligence (AI). *International Journal of Research and Innovation in Social Science, 10*(7), 4364–4400. https://doi.org/10.47772/ijriss.2026.100700296
- Taşkın, T. (2026). Artificial intelligence in teacher education: Exploring the role of AI literacy on attitudes. *Journal of Research in Innovative Teaching & Learning*. Advance online publication. https://doi.org/10.1108/JRIT-03-2026-0082
- U.S. Department of Education, Office of Educational Technology. (2023). *Artificial intelligence and the future of teaching and learning: Insights and recommendations*. U.S. Department of Education.
- Walton Family Foundation. (2023, March 1). *Teachers and students embrace ChatGPT for education*. https://www.waltonfamilyfoundation.org/learning/teachers-and-students-embrace-chatgpt-for-education
- Winne, P. H. (2021). Open learner models working in symbiosis with self-regulating learners: A research agenda. *International Journal of Artificial Intelligence in Education, 31*(3), 446–459. https://doi.org/10.1007/s40593-020-00212-4
- Yang, Y.-F., Tseng, C. C., & Lai, S.-C. (2024). Enhancing teachers' self-efficacy beliefs in AI-based technology integration into English speaking teaching through a professional development program. *Teaching and Teacher Education, 144*, 104582. https://doi.org/10.1016/j.tate.2024.104582 (ScienceDirect)
- Yue, M., Jong, M. S.-Y., & Ng, D. T. K. (2024). Understanding K–12 teachers' technological pedagogical content knowledge readiness and attitudes toward artificial intelligence education. *Education and Information Technologies, 29*(15), 19505–19536. https://doi.org/10.1007/s10639-024-12621-2 (The Chinese University of Hong Kong)
- Zacamy, J., & Roschelle, J. (2022). *Navigating the tensions: How could equity-relevant research also be agile, open, and scalable?* Digital Promise. http://hdl.handle.net/20.500.12265/159