

Influence of Teachers' Artificial Intelligence Competence on Students' Academic Performance in Science

Jayson C. Ecleo^{*1}, Prof. Jared Harem Q. Celis² ^{1,2}Eastern Samar State University, Guiuan Campus, Eastern Samar, Philippines Corresponding Author e-mail: *jaysone71@gmail.com*

Received: 19 March 2025

Revised: 20 April 2025

Accepted: 22 April 2025

Available Online: 24 April 2025

Volume IV (2025), Issue 2, P-ISSN - 2984-7567; E-ISSN - 2945-3577

https://doi.org/10.63498/etcor286

Abstract

Aim: This study aimed to explore the relationship between the Artificial Intelligence (AI) competence of Grade 6 Science teachers and the academic performance of their students in selected central elementary schools in the southern municipalities of the Eastern Samar Division. Specifically, it sought to determine the teachers' level of AI competence, determine the level of academic performance of their students, and establish whether a significant relationship exists between these two variables.

Methodology: The study employed a descriptive-correlational research design with a quantitative approach. A total of 13 Grade 6 Science teachers from selected central elementary schools participated. A structured questionnaire assessed the teachers' AI competence, while the students' academic performance in Science was determined by averaging the grades of 30 students per teacher. Descriptive statistics such as mean, frequency, and percentage were used to summarize the data. Pearson's Product-Moment Correlation was utilized to examine the relationship between teacher competence and student academic performance.

Results: With a correlation coefficient (r) of 0.989, there is a very strong positive correlation between teachers' AI competence and students' academic performance in Science. Furthermore, the correlation was found to be statistically significant with a p-value of 0.000. This confirms that higher levels of AI competence among teachers are strongly associated with better academic outcomes in Science.

Conclusion: There is a very strong positive correlation between teachers' AI competence and students' academic performance in Science.

Keywords: AI competence, educational technology, academic performance, elementary science education

INTRODUCTION

Over time, technologies are getting more complicated and more connected to each other (Wolff, 2021). Says Giannelis (2024), technology shapes the dynamics of communication, education, and cognition, influencing societal functions and everyday interactions. Its significance in contemporary society, they added, cannot be overstated. Technology, according to Watts (2023), has been instrumental in shaping the modern world, starting from the invention of the wheel to the latest breakthroughs in artificial intelligence. In fact, according to Roser et al. (2023), "in many ways, technology has transformed our lives for the better."

One of the most intriguing advancements in contemporary technology, states Watts (2023), is artificial intelligence (AI). Most popularly termed as AI, artificial intelligence as defined by Copeland (2024) is "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings" and is "...frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience." In layman's terms, it refers to computers or robots doing smart things like humans, such as thinking, understanding, and learning from experience. And with this, the sphere of education is likewise subject to its influence (Nomerovska, 2023).

In a LinkedIn post by Scott (2023), she stated that education is rapidly evolving, and AI is emerging as a potent force, significantly influencing its future. As per her assertion, AI in education enables administrators and teachers to dedicate more attention to tasks such as curriculum development, exam creation, and teaching. With AI,

426

ETCOR's Website : Facebook Page : Twitter Account : YouTube Channel : E-mail Address : Mobile Number :

Thank you for embracing the culture of research with us!



the processes like grading exams are made faster, making them more efficient. Correspondingly, Burton (2023) said that AI can revolutionize learning and teaching, improving student engagement and aiding diverse learners in understanding course materials. In a similar vein, Knight-Hay (2023) enumerated three future roles of AI in education, namely: 1) individual learning and assessments in real time, 2) easier lesson planning, and 3) deep virtual experiences.

In an article published by Language Magazine (2023), it emphasized the need for AI to be integrated into the field of education: As AI tools like ChatGPT, Canva, and the like become widespread, they're reshaping how individuals work, learn, and communicate. Integrating AI education into the curriculum is then vital for preparing students for the future job market, it added. The Office of Educational Technology (n.d.) in the US reports five key advantages that learning institutions can harness with AI: 1) It enables new forms of interaction, 2) can help educators address variability in student learning, 3) supports powerful forms of adaptivity, 4) can enhance feedback loops, and 5) can support educators. With all these benefits, integrating technology, particularly artificial intelligence (AI), has been increasingly emphasized as a means to enhance teaching and learning experiences. And this has almost become imperative for educators, even in the Philippines.

In the Philippine educational system, the utilization of Artificial Intelligence (AI) education has significantly sparked academic discussions in this field (Estrellado & Miranda, 2023). Ibrahim (2023), vice president of the Analytics and AI Association of the Philippines, even said that "...AI is rapidly transforming the education sector today including here in the Philippines and is poised to revolutionize the way both learning and teaching are done." However, he added, education administrators need to find a balance between using AI's benefits and managing its risks. To strike a balance between these two, Data Ethics PH Executive Director Dominic Ligot (2023), said that "with careful planning and responsible implementation, AI can have a positive and lasting impact on education in the Philippines, offering a brighter future for students and educators alike." Meanwhile, in a seminar hosted by the Technological Institute of the Philippines (T.I.P.), Dr. Elmer-Rico Mojica, an associate professor at Pace University in New York, expressed his viewpoint during his presentation on the advantages and disadvantages of generative AI tools in education and research. According to him, students should not miss out the chance to use AI to improve their learning, but teachers need to set clear ethical boundaries to ensure that quality education is still provided.

Despite the growing body of literature on the integration of Artificial Intelligence (AI) in education, there is a limited understanding of how teachers' AI competence specifically influences students' academic performance in Science, especially at the elementary level. Existing studies often focus on higher education institutions, such as the University of the Philippines and Batangas State University, where AI is increasingly embedded in curricula (Toral, 2023). However, there is a lack of research examining how teachers' competence in using AI tools translates into effective Science instruction and student outcomes in basic education, particularly in resource-constrained areas like Eastern Samar. This gap underscores the need to explore the practical implications of AI competence among elementary Science teachers and its impact on learners' academic achievement in marginalized contexts.

The rationale for this study is grounded in the growing recognition of AI's potential to transform education and the urgent need to promote equitable access and effective use of such technologies among teachers, particularly in underserved areas like Eastern Samar. By investigating how elementary Science teachers in Eastern Samar apply AI tools in their classroom practices, this research seeks to inform the development of targeted programs and support systems that enhance teachers' digital literacy and instructional competence. Ultimately, the study aims to bridge the gap between existing knowledge about AI in education and its practical application with the end goal of contributing to a more inclusive and responsive integration of AI that supports improved student performance in Science.

Objectives

The primary objective of this research was to examine the influence of teachers' competence in artificial intelligence on their students' academic performance in Science.

- The research sought to answer the following research questions:
- 1. What is the teachers' artificial intelligence (AI) level of competence?
- 2. What is the level of students' academic performance?
- 3. Is there a significant relationship between teachers' level of AI competence and level of students' academic performance?
- 4. What recommendation may be offered based on the results of the study?

427

: https://etcor.org : https://www.facebook.com/EmbracingTheCultureOfResearch : https://twitter.com/ETCOR_research : https://tinyurl.com/YouTubeETCOR : embracingthecultureofresearch@etcor.org : 0939-202-9035

Thank you for embracing the culture of research with us!



Hypothesis

Given the stated research problems, the following hypotheses were tested at 0.05 level of significance:

 H_0 : There is no significant relationship between the teachers' AI competence and students' academic performance in Science.

 $H_{a:}$ There is a significant relationship between the teachers' AI competence and students' academic performance in Science.

METHODS

Research Design

The research design used in this study was descriptive-correlational to examine and describe the relationship between teachers' AI competence and students' academic performance in selected central elementary schools in Eastern Samar Division.

Population and Sampling

This study was carried out in three central elementary schools located in the southern area of the Eastern Samar Division, involving a total of 13 participants. The respondents were selected through purposive sampling based on the specific criterion that they are Grade 6 teachers handling the Science subject.

Instrument

This study utilized a structured questionnaire to assess teachers' AI competence, specifically the 24-item Teacher Artificial Intelligence (AI) Competence Self-efficacy (TAICS) scale adapted from Chiu, Ahmad, and Çoban (2024), with no modifications. Participants rated their agreement using a 5-point Likert scale. Meanwhile, student academic performance data were based on the actual Science grades of 30 students per teacher, averaged to represent overall performance per respondent for correlation analysis.

Data Collection

The data-gathering process began with a formal request to the participating schools for permission to conduct the study. Upon approval, the researchers explained the study's purpose and procedures to the participants and obtained their informed consent. The survey questionnaire was then distributed in paper-and-pencil format, with assistance from a school contact person. Ample time was given for completion to ensure full retrieval. Collected data were reviewed for accuracy and completeness, with follow-up communication as needed. The entire process upheld ethical standards, ensuring validity, reliability, and respect for participants' rights.

Treatment of Data

The gathered data were subjected to quantitative analysis employing appropriate statistical techniques. Descriptive statistics, including mean scores and frequency distributions, were utilized to offer a general profile of the data and the characteristics of the study participants. To examine the relationship between teachers' AI competence and students' academic performance in Science, Pearson's correlation coefficient (r) was employed, providing a measure of the strength and direction of the association. The resulting data were systematically presented through tables, charts, and graphs to enhance clarity and emphasize the significance of the findings.

Ethical Considerations

The researchers ensured that all ethical guidelines were followed, including obtaining informed consent from participants and ensuring the confidentiality and privacy of their responses throughout the study.



RESULTS and DISCUSSION

This section provides an overview of the respondents' profiles concerning their Artificial Intelligence (AI) competence. Here, the respondents' understanding, familiarity, and exposure to AI concepts and applications are highlighted.

Profile of the Respondents on Artificial Intelligence (AI) Competence

The table below presents the perceptions of Grade 6 Science teachers regarding their awareness and competence in using Artificial Intelligence (AI) tools in education, especially in Science classes.

Table 1. Perception of the Respondents on Artificial Intelligence (AI) Competence

	Artificial Intelligence (AI) Competence	Mean	Description	Interpretation
1.	I can distinguish whether a tool is AI-based or not.	4.23	Strongly Agree	Highly Competent
2.	I can create content with AI.	4.31	Strongly Agree	Highly Competent
З.	I can explain what AI is.	4.23	Strongly Agree	Highly Competent
4.	I know how to choose the right AI tools to effectively complete a task.	4.00	Agree	Competent
5.	I can choose an AI tool to use in my classroom that enhances what I teach, how I teach, and what students learn.	4.00	Agree	Competent
6.	<i>I can choose an AI tool that enhances my teaching subject content for a lesson.</i>	3.62	Agree	Competent
7.	I can teach lessons that appropriately combine my teaching subject, AI tools, and teaching approaches.	3.62	Agree	Competent
8.	<i>I can help others coordinate the use of subject content, AI tools, and teaching approaches.</i>	3.54	Agree	Competent
9.	I can use AI tool to foster assessment for learning.	3.38	Neutral	Moderately Competent
10.	I can design an assessment approach to improve student learning in an AI-based environment (e.g., learning with ChatGPT).	3.62	Agree	Competent
11.	I can assess student learning in an AI-based environment.	3.38	Neutral	Moderately Competent
12.	I can choose an AI tool to foster student self-assessment.	3.46	Agree	Competent
13.	I can teach students ethics.	3.62	Agree	Competent
14.	I can protect sensitive content from AI tools (e.g., exams, students' grades and personal data).	3.38	Neutral	Moderately Competent
15.	I can ensure my health and well-being while using AI tools.	3.62	Agree	Competent
16.	I teach students how to behave safely and responsibly when learning with AI tools.	2.92	Neutral	Moderately Competent
17.	I can assess the benefits of an AI tool.	4.08	Agree	Competent
18.	I can assess the risks of an AI tool.	4.08	Agree	Competent
19.	I recognise human is responsible for AI bias.	4.15	Agree	Competent
20.	I can explain how AI impact our society.	4.00	Agree	Competent
21.	<i>I can use different websites and search strategies to find and select a range of different AI tools.</i>	4.08	Agree	Competent
22.	I actively look for continuous professional development activities outside my educational organization.	3.77	Agree	Competent
23.	I actively share my AI teaching experience with other colleagues within and outside my educational organization.	4.00	Agree	Competent



Interval	Interpretation	Level of AI Competence
4.20-5.00	Strongly Agree	Highly Competent
3.40-4.19	Agree	Competent
2.60-3.39	Neutral	Moderately Competent
1.80-2.59	Disagree	Minimally Competent
1.00-1.79	Strongly Disagree	Not Yet Competent
	Interval 4.20-5.00 3.40-4.19 2.60-3.39 1.80-2.59 1.00-1.79	Interval Interpretation 4.20-5.00 Strongly Agree 3.40-4.19 Agree 2.60-3.39 Neutral 1.80-2.59 Disagree 1.00-1.79 Strongly Disagree

The overall mean score of 3.79 indicates a competent level of AI integration among the respondents. This suggests that teachers generally possess a sound understanding of AI applications and are capable of utilizing these tools effectively in classroom settings.

The highest-rated item, "I can create content with AI," obtained a mean score of 4.31, reflecting a very high level of competence. This finding aligns with recent studies emphasizing the growing ability of educators to leverage AI for instructional material development, particularly with the rise of generative technologies. On the other hand, the lowest-rated item, "I can teach students how to behave safely and responsibly when learning with AI tools," with a mean of 2.92, highlights a moderate level of competence. This suggests a gap in teachers' preparedness to guide students on the ethical and responsible use of AI, echoing similar findings in earlier research that call attention to the need for digital citizenship training in teacher development programs.

Overall, these results underscore the importance of continuing professional development focused not only on the technical use of AI but also on promoting responsible and ethical AI practices in the classroom.

Profile of the Respondents on Academic Performance

This section shows the students' academic performance in the Science subject.

Table 2. Frequency Distribution of Students according to the Level of Academic Performance in the Science Subject

Level of Academic Performance	Frequency	Percentage
90 and above (Outstanding)	3	23%
85 to 89 (Very Satisfactory)	10	77%
80 to 84 (Satisfactory)	0	0%
75 to 79 (Fairly Satisfactory)	0	0%
Below 75 (Did not meet expectations)	0	0%
TOTAL	13	100

Interpretation
Outstanding
Very Satisfactory
Satisfactory
Fairly Satisfactory
Did not meet expectations

Below 75

Range 90 and above 85 to 89 80 to 84 75 to 79

As shown in the data, the study involved a total of 13 respondents, each representing one Grade 6 Science teacher from the selected central elementary schools. For each teacher, the researcher gathered the Science grades of 30 students, but rather than analyzing each student's grade individually, these were averaged to form a single representative score per teacher. This approach allowed the researcher to correlate the teachers' level of AI competence with the mean academic performance of their respective students in Science. By treating the group of 30 students as one data set per teacher, the study ensured a focused and manageable analysis of the relationship between teacher competence and student achievement.

430

: https://etcor.org : https://www.facebook.com/EmbracingTheCultureOfResearch : https://twitter.com/ETCOR_research : https://tinyurl.com/YouTubeETCOR : embracingthecultureofresearch@etcor.org : 0939-202-9035

Thank you for embracing the culture of research with us!



As indicated in the table, the majority of the students, 10 out of 13 (77%), fall under the "Very Satisfactory" range (85 to 89), indicating a strong overall performance. Meanwhile, 3 students (23%) achieved an "Outstanding" performance (90 and above), reflecting exceptional academic achievement.

Notably, there are no students who scored below 85, which means 100% of the students performed at very satisfactory or higher levels. This highly positive outcome suggests that the group is academically strong, with no one falling into the "Satisfactory," "Fairly Satisfactory," or "Did not meet expectations" categories.

This finding suggests that teachers' competence in using artificial intelligence is helping students stay engaged and well-supported in their Science classes. Since none of the students scored low, it shows that the teaching strategies—enhanced by AI tools—are meeting their needs and helping them perform well. This also means the positive impact of teachers effectively using AI to improve Science learning and boost academic performance.

Relationship between Artificial Intelligence (AI) Competence and Academic Performance

This final section of the chapter presents the correlation between teachers' competence in Artificial Intelligence (AI) and their students' academic performance in Science. The analysis highlights the extent to which teachers' proficiency in using AI tools and strategies contributes to enhancing students' academic achievement in the Science subject.

Variable 1	Variable 2	Correlation Coefficient	Interpretation	P-value	Interpretation
AI Awareness	Academic Performance	.989	Very High Correlation	.000	Highly Significant

Table 3. Correlation between Artificial Intelligence (AI) Competence and Academic Performance

Table 3 illustrates the relationship between the teachers' Artificial Intelligence (AI) competence and students' academic performance in Science. The data reveals a correlation coefficient of 0.989 between teachers' Artificial Intelligence (AI) competence and students' academic performance in Science. This indicates a very high positive correlation, which means that as teachers demonstrate higher levels of AI competence, students tend to perform better in Science subjects. The near-perfect correlation suggests a strong linear relationship, implying that improvements in teachers' ability to integrate and utilize AI tools and strategies are closely associated with increased student achievement. This high correlation emphasizes the transformative potential of AI in enhancing science instruction and learning outcomes.

Additionally, the p-value of 0.000 signifies that the correlation is highly significant, statistically validating the relationship between the two variables. With a p-value well below the standard significance level of 0.05, the researcher confidently rejects the null hypothesis that there is no relationship between teachers' AI competence and students' academic performance. This reinforces the idea that AI competence is not merely an incidental factor, but a critical element influencing academic success in Science. The findings highlight the importance of equipping teachers with sufficient training in AI to positively impact student learning outcomes.

This result finds parallel support in the study of Mallillin and Mallillin (2024), which revealed that "...AI effectively targets the specific learning needs of students, facilitating comprehensive and improved learning experiences." This alignment of results reinforces the idea that teachers' competence in AI significantly contributes to more effective teaching strategies, ultimately leading to better academic performance among students. Similarly, the study by Sugiarso et al. (2024) further affirms this finding, stating that "with the help of this Artificial Intelligence Technology, it helps teachers in achieving student competence in the teaching and learning process and students can also improve achievement in the learning process."

Banking on these findings, one can infer that when teachers are equipped with the necessary skills and knowledge, AI can serve as a powerful tool in advancing both teaching effectiveness and student achievement.

Conclusions

This study concludes that the participating Grade 6 Science teachers generally exhibited competent to high levels of Artificial Intelligence (AI) awareness and application, particularly in content creation using AI tools. While

431

ETCOR's Website : Facebook Page : Twitter Account : YouTube Channel : E-mail Address : Mobile Number :



the respondents demonstrated substantial familiarity with AI in education, there remains a critical gap in equipping students with knowledge on the responsible and ethical use of such technologies. Notably, the study found a very strong and statistically significant positive correlation (r = 0.989, p = 0.000) between teachers' AI competence and their students' academic performance in Science, stressing the substantial impact of AI-literate teachers on learning outcomes. All student respondents attained either "Very Satisfactory" or "Outstanding" marks, further reinforcing the pedagogical value of AI integration in Science instruction.

Recommendations

In light of the key findings and conclusions discussed above, the study recommends the institutionalization of targeted and continuous professional development programs focused on AI integration in elementary Science education. These should include both technical skill-building and ethical dimensions of AI use. In addition, schools are encouraged to establish AI-focused Learning Action Cells (LACs) to facilitate collaborative learning among teachers. Furthermore, the inclusion of AI literacy in pre-service and in-service teacher education curricula, through strategic partnerships between State Universities and Colleges (SUCs) and the Department of Education (DepEd), is strongly endorsed. Such efforts will ensure that both current and future educators are adequately equipped to harness the potential of AI to enhance instructional delivery and elevate academic performance in Science at the basic education level.

REFERENCES

- Burton, C. (2023, August 29). *The role of AI in education*. Thinkific. https://www.thinkific.com/blog/ai-in-education/#threeways-benefitsteachers
- Chiu, T., Ahmad, Z., & Coban, M. (2024). Development and validation of teacher artificial intelligence (AI) competence self-efficacy (TAICS) scale. *Education and Information Technologies*. https://doi.org/10.1007/s10639-024-13094-z
- Copeland, B. J. (2024, March 28). *Artificial intelligence*. Encyclopedia Britannica. https://www.britannica.com/technology/artificial-intelligence
- Estrellado, C., & Miranda, J. (2023, May 23). *Artificial intelligence in the Philippine educational context: Circumspection and future inquiries.* Scispace. https://typeset.io/papers/artificial-intelligence-in-the-philippine-educational-21vl4ist
- Giannelis, M. (2024, January 23). *The impact of technology*. Tech Business News. https://www.techbusinessnews.com.au/the-impact-oftechnology/#:~:text=Technology%20affects%20the%20way%20people,and%20it%20impacts%20everyda y%20life.
- Ibrahim, M. (2023, November 7). *AI in education: The next big thing*. Manila Bulletin. https://mb.com.ph/2023/11/6/ai-in-education-the-next-big-thing
- Knight-Hay, S. (2023, August 8). *The role of artificial intelligence in education*. Grand Canyon University. https://www.gcu.edu/blog/teaching-school-administration/role-artificial-intelligence-education
- Ligot, D. (2023, November 27). *How educators in the Philippines react to AI in education*. LinkedIn. https://www.linkedin.com/pulse/how-educators-philippines-react-ai-education-dominic-ligot-9ya5f/
- Malillin, L. L., & Mallillin, D. (2024). Artificial intelligence (AI) towards students' academic performance. *Innovare Journal of Education, 12*(4), 1–14. https://doi.org/10.22159/ijoe.2024v12i4.51665
- Nomerovska, I. (2023, September 12). *How is AI impacting the education system?* Keymakr. https://keymakr.com/blog/how-ai-is-impacting-on-the-education-system/



Office of Educational Technology. (n.d.). Artificial intelligence. U.S. Department of Education. https://tech.ed.gov/ai/

- Roser, M., Ritchie, H., & Mathieu, E. (2023). *Technological change*. Our World in Data. https://ourworldindata.org/technological-change
- Scott, A. (2023, December 13). *The artificial intelligence (AI) impact on education* [Post]. LinkedIn. https://www.linkedin.com/pulse/artificial-intelligence-ai-impact-education-aileen-scott-t2shf/
- Sugiarso, B., Nurjamin, A., Judijanto, L., Firdausiyah, L., & Hidayat, A. (2024). The effect of artificial intelligence in improving student learning achievement in high school. *World Psychology*, *3*(1), 1–14. https://doi.org/10.55849/wp.v3i1.569
- Technological Institute of the Philippines. (n.d.). *The risks and rewards of AI integration in education*. https://www.tip.edu.ph/home/risks-rewards-ai-in-education/
- The Language Magazine. (2023, May 31). *The importance of artificial intelligence in education for all students*. https://www.languagemagazine.com/2023/05/31/the-importance-of-artificial-intelligence-in-education-forall-students/
- Toral, J. (2023, December 23). *From vision to reality: The Philippines' roadmap for AI and metaverse adoption*. LinkedIn. https://www.linkedin.com/pulse/from-vision-reality-philippines-roadmap-ai-metaverse-adoption-toral-vbwvc/
- Watts, T. (2023, April 14). *The role of technology in the future and its impact on society*. The Times of India. https://timesofindia.indiatimes.com/readersblog/amitosh/the-role-of-technology-in-the-future-and-its-impact-on-society-52565/
- Wolff, J. (2021, August 24). *How is technology changing the world, and how should the world change technology?* University of California Press. https://online.ucpress.edu/gp/article/2/1/27353/118411/How-Is-Technology-Changing-the-World-and-How