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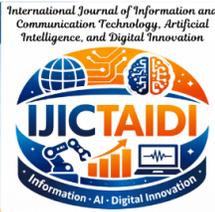
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International Journal of Information and Communication Technology, Artificial Intelligence, and Digital Innovation (IJCTAIDI)

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International Journal of Information and Communication Technology, Artificial Intelligence, and Digital Innovation (IJCTAIDI)

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About the Journal

The **International Journal of Information and Communication Technology, Artificial Intelligence, and Digital Innovation (IJCTAIDI)** is a quarterly, peer-reviewed, international print and online research journal dedicated to the advancement of knowledge in **information and communication technology (ICT), artificial intelligence (AI), data science, intelligent systems, and digital innovation.**

Published by ETCOR Educational Research Center Research Consultancy Services, the journal recognizes that digital technologies and AI are transforming governance, education, industry, healthcare, business, security, and society at large. IJCTAIDI provides a scholarly venue for examining both the **technical foundations** and **applied implications** of ICT- and AI-driven transformation.

IJCTAIDI serves as a global platform for computer scientists, ICT professionals, AI researchers, data scientists, engineers, technologists, educators, policymakers, and interdisciplinary scholars to disseminate high-quality **theoretical, experimental, computational, and applied research** that advances digital innovation, ethical AI, and intelligent technological systems.

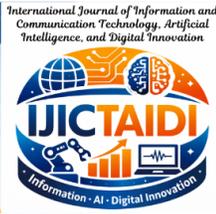
The journal is committed to maintaining **rigorous scholarly and ethical standards**, responsible technology research, and global visibility through international indexing, Crossref DOI registration, and print and electronic ISSN accreditation.

Aims and Scope

Aims

IJCTAIDI aims to:

1. Promote high-quality research in ICT, artificial intelligence, and digital innovation
2. Advance theoretical and applied understanding of intelligent systems and digital technologies



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3. Encourage interdisciplinary integration of computing, engineering, education, governance, and industry
4. Provide a venue for global, comparative, and application-driven ICT and AI research
5. Support ethical, inclusive, and sustainable digital transformation

Scope

The journal welcomes original research articles, systematic reviews, meta-analyses, design studies, technical reports, and conceptual papers in, but not limited to, the following areas:

- Information and communication technology (ICT) systems
- Artificial intelligence and machine learning
- Data science, big data analytics, and data mining
- Intelligent systems and decision-support technologies
- Computer science and software engineering
- Internet of Things (IoT) and cyber-physical systems
- Digital transformation and smart technologies
- Human-computer interaction and user-centered design
- Cybersecurity, privacy, and ethical AI
- Educational technologies and AI in learning systems
- ICT applications in governance, health, industry, and society
- Interdisciplinary and applied digital innovation research

Publication Frequency and Format

- **Frequency:** Quarterly (4 issues per year)
- **Formats:** Print and Online
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Additionally, kindly comply with the following:

1. **Academic Significance, Contribution to Discipline or Community, Technical Novelty**
The paper should demonstrate importance to the academic community or to research in general. It must offer a material contribution to its discipline and present novel or unique ideas that may be useful to the community. Clearly show the research gap, why there was a need to investigate the present study, and how it is different from previous works.
2. **English Usage (or Filipino, as may be applicable)**
The manuscript must adhere to the rules of grammar and language usage, whether in English or Filipino.
 - Use **past tense** consistently since the study is already completed.
 - Avoid first-person point of view (“I,” “we”); instead, maintain a **third-person scientific tone**.
 - Avoid contractions; spell out complete words to retain formality.
 - Provide **English translations** for words, terms, or items not understandable to international readers.
3. **Abstract**
The abstract should follow the journal’s prescribed format and accurately reflect the study’s major components. Ensure that it correctly presents the **aim, methodology, key findings or results, and conclusion** in a concise and logical manner.
4. **Introduction / Background of the Study**
The introduction must:
 - Present a clear rationale or background from the **global to Philippine/local contexts**.
 - Show the **trends and issues** related to the study, supported with recent and relevant citations (2021–2026 preferred).
 - Identify and explain the **research gap/s**, highlighting why the present study is necessary and how it differs from prior works.

5. Statement of the Problem, Research Objectives and Research Questions

The Statement of the Problem, Research Objectives and Research Questions must be clearly, explicitly, and logically stated.

- The **statement of the problem** is a detailed explanation of the issue, gap, or challenge that the study seeks to address. It frames the context and justifies why the study is necessary, usually written in declarative form as a narrative or paragraph. Its purpose is to highlight the significance, scope, and urgency of the study, providing a broad and contextual background of the issue at hand. For example, a study may state: *“Despite government programs, many senior citizens in rural areas experience delays in receiving social pensions, raising concerns about accessibility and efficiency.”*
- The **research objectives** represent the specific aims or intentions of the study, focusing on what the researcher seeks to accomplish. These are written in infinitive form such as “To determine...” or “To examine...,” ensuring that the targets are clear, measurable, and achievable. Unlike the broad statement of the problem, objectives are narrower and centered on actionable outcomes. For instance, a general objective could be *“To assess the implementation of the Social Pension Program in Balbalan, Kalinga.”* This may be broken down into specific objectives, such as: (1) To determine the accessibility of the program, (2) To examine its impact on beneficiaries, and (3) To identify challenges faced in its implementation.
- The **research questions** are the interrogative form of the objectives, expressed as direct questions the study seeks to answer. They are usually written in formats such as “What is...?” or “How does...?” and serve the purpose of guiding data collection and analysis by pointing to specific inquiries. Research questions are even more specific than objectives, as they operationalize the study’s goals into answerable items. Using the same example, the research questions could include: *RQ1: How accessible is the Social Pension Program to senior citizens in Balbalan? RQ2: What impact does the program have on the beneficiaries’ quality of life? RQ3: What challenges hinder the effective implementation of the program?*

6. Review of Related Literature and Studies

This section must include sufficient, relevant, and **up-to-date references** to support the rationale and conduct of the research.

- Avoid outdated sources (1–2 decades old) for dynamic or evolving concepts.
- Do not use sources with “no date (n.d).”
- Ensure citations are aligned with the arguments and logically linked to the study.
- There must be a clear synthesis at the end of the RRLS that captures key insights, connects the reviewed works, and justifies the need for the present study.

7. Theoretical and/or Conceptual Framework

An appropriate theoretical and/or conceptual framework must be presented to anchor the study.

8. Research Methodology (Research Design, Population and Sampling, Instrument, Data Collection, Treatment of Data, Ethics in Research)

The methodology section should be well-structured, detailed, and properly organized. Each subsection should only contain content appropriate to it:

- **Research Design:** Describe what design was used, how it was applied, and why it was the most suited.
- **Population and Sampling and Other Source/s of Data:** Provide the exact number of participants/respondents, how and why they were selected. If you used other source/s of data (documents, policies, other contents), describe each document, how each was accessed, and why each is needed in the study.
- **Instrument/s:** State whether the instrument was adopted or researcher-made. Describe its validation process, including the qualifications of validators.
- **Data Collection:** Focus on *how*, *when*, and *where* the data was collected. Do not include ethics approval here.
- **Treatment of Data:** Clearly describe the methods of data analysis or statistical treatment. For qualitative analysis, avoid generic discussions (e.g., what thematic analysis is according to authors). Instead, show how the method was applied in your study.
- **Ethical Considerations:** Include ethical approval, informed consent, and permissions here, not in other subsections.

Important Reminders:

- Avoid “chop-suey” writing (mixing unrelated topics).
- If the study used a **mixed-method approach**, discuss both parts separately (quantitative and qualitative)—design, participants, instruments, data collection, treatment of data, ethical considerations—and explain how the two sets of data were integrated.
- Use plural (“researchers”) consistently if the paper has co-authors.

9. Results and Discussion

- Present results clearly, logically, and aligned with the research questions.
- Support findings with **relevant and recent literature**.
- Integrate discussion immediately after each result to enhance coherence.

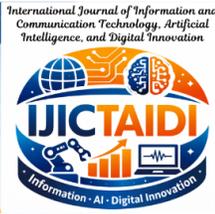
10. Conclusions and Recommendations

- Conclusions must be logically drawn from the study’s findings.
- Recommendations should be **specific, actionable, and relevant** to the results. Avoid generic statements.

11. References (APA 7th Edition)

References must strictly adhere to APA 7th edition. Authors must review their entire manuscript carefully:

- Ensure proper formatting (e.g., italicizing journal names, use of “&” vs. “and,” correct application of *et al.*, punctuation, spacing, quotation marks).
- All in-text citations must appear in the References list and vice versa. **No mismatches allowed.**
- Avoid old references; prioritize recent ones.
- If a citation was included but missing in the References, update it properly (do not erase it without explanation). Similarly, remove unused entries from the References list.



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- The paper will not be published if even one citation/reference entry is non-compliant.

APA 7th requires:

- All sources listed in the References Section must match 100% with the actual sources used in the entire manuscript, and all sources cited in the entire manuscript are reflected in the list of sources in the References section.
- Author/s should provide a link to every research article or literature/document, where we can find the journal or document, or best, where we can find the specific research article/document. Must provide the DOI for it, or URL if the journal is not yet DOI accredited, or link to the document.
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- Retrieval statements are used sparingly (only when content is likely to change).
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12. Acronyms and Abbreviations

Always define acronyms upon first mention in the manuscript. Do not assume that readers will automatically know them.

Authors are also required to submit a **duly signed Authorship and Contribution Declaration Form**, which can be accessed through <https://tinyurl.com/TemplatesIJICTAIDI>

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Compliant manuscripts undergo:

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2. Plagiarism check
3. Double-blind peer review by two subject-expert reviewers

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- Publish unaltered
- Accept after minor revisions
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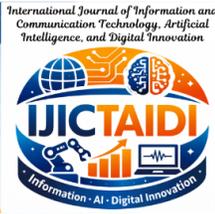
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Editor's Note (Maiden Issue) International Journal of Information and Communication Technology, Artificial Intelligence, and Digital Innovation (IJCTAIDI)

It is with great pride and enthusiasm that we present the maiden issue of the **International Journal of Information and Communication Technology, Artificial Intelligence, and Digital Innovation (IJCTAIDI)**. This inaugural publication reflects ETCOR's commitment to advancing rigorous, ethical, and future-oriented research in ICT and artificial intelligence.

Digital technologies and AI are reshaping how societies communicate, learn, govern, and innovate. From intelligent systems to data-driven decision-making, ICT and AI now occupy a central role in global development.

IJCTAIDI provides a scholarly platform for research that advances both the technical foundations and applied dimensions of digital innovation. The journal values work that integrates theory, computation, design, and real-world application.

As a peer-reviewed international journal, IJCTAIDI upholds the highest standards of academic integrity through a double-blind review process and strict adherence to ethical research and publication practices.

The journal seeks to bridge research and practice. ICT and AI research achieves its greatest impact when it informs system design, policy development, education, and responsible technological deployment.

This maiden issue is the result of collaborative efforts among authors, reviewers, editors, and technology scholars committed to scholarly excellence and responsible digital transformation.

IJCTAIDI is positioned as a global journal that values interdisciplinary, cross-sectoral, and international perspectives in ICT and AI research.

The journal is also committed to supporting early-career researchers, innovators, and practitioner-scholars in computing and digital technologies.

As we launch this first issue, we reaffirm our commitment to ethical publishing, transparency, and continuous improvement in a rapidly evolving digital landscape.

On behalf of the Editorial Board, we invite ICT professionals, AI researchers, and interdisciplinary scholars worldwide to join us in shaping future issues of **IJCTAIDI**.

Dr. Richard D. Sanchez — Editor-in-Chief

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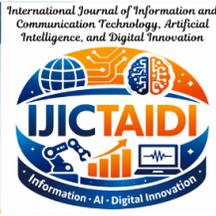


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Integration of Artificial Intelligence (AI) in School Management: MATATAG Implementation in Elementary Education

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^{1, 2} Sultan Kudarat State University, Philippines

Abstract

Aim: This study examined the relationship between AI integration in school management and the enhancement of the MATATAG Curriculum implementation in East and West Tacurong City.

Methodology: This quantitative study utilized a descriptive-correlational design to examine the relationship between AI integration in school management and the enhancement of the MATATAG Curriculum implementation in East and West Tacurong City. The study involved selected school heads and teachers from elementary schools in these districts during the school year 2024-2025. The study employed statistical tools such as Mean to assess the extent of AI utilization in school management and curriculum implementation and Pearson r correlation to determine their relationship.

Results: The results of the study reveal a strong and statistically significant relationship between the extent of integration of Artificial Intelligence (AI) in school management and the enhancement level of the MATATAG Curriculum implementation, with a correlation coefficient of $r = 0.875$, which is significantly higher than the p-value of 0.016 at the 0.05 level of significance.

Conclusion: AI is widely utilized in administrative tasks, decision-making, and personalized learning, enhancing efficiency in grading, attendance tracking, and performance monitoring. However, it improves curriculum implementation by streamlining lesson planning, assessment, and decision-making while optimizing resources and enhancing instructional quality. Indeed, a strong correlation confirms AI's crucial role in improving educational practices, resource allocation, and data-driven decision-making in schools.

Keywords: *Administrative Efficiency, AI-Driven Decision-Making, Automation of Routine Tasks, Decision-making efficacy, Integration of AI in Administrative Processes, MATATAG Curriculum Implementation*

INTRODUCTION

The rapid evolution of technology has reshaped various industries, and education is no exception. Artificial Intelligence (AI) is increasingly seen as a game-changer in school administration, promising to enhance efficiency, automate routine tasks, and provide data-driven insights. However, while AI's potential is immense, its successful integration requires careful examination to address challenges, ethical concerns, and institutional readiness.

On a global scale, AI has been progressively incorporated into educational systems to streamline administrative processes, improve decision-making, and optimize resource allocation. Many institutions leverage AI for attendance tracking, predictive analytics, and personalized learning support (Buckingham, 2019; UNESCO, 2020). However, the degree of implementation varies across countries due to differences in technological infrastructure, policy frameworks, and institutional capacity. As AI continues to revolutionize school administration worldwide, localized studies are necessary to explore its specific implications in different educational contexts.

In the Philippines, the interest in AI adoption for school administration is growing, yet research on its actual implementation and impact remains limited. While international studies provide valuable insights, they do not fully capture the unique socio-cultural, economic, and educational landscape of the country. Challenges such as limited digital infrastructure, budget constraints, and varying levels of technological proficiency among educators highlight the need for a focused analysis of AI's role in school management within the Philippine setting.

Zooming into the local context, Tacurong City faces similar challenges in integrating AI into school administration. While AI has the potential to support the MATATAG education agenda by improving efficiency and decision-making, many school districts lack concrete policies and sufficient training for educators to effectively utilize AI tools. Urban districts, including those in Region XII, struggle with resource constraints and inconsistent digital readiness, further hindering AI adoption in school (World Economic Forum, 2024).

Despite the growing discourse on AI in education, there remains a significant research gap concerning its practical application in Philippine schools, particularly in Tacurong City. Existing studies often emphasize AI's benefits while overlooking critical aspects such as institutional preparedness, ethical considerations, and potential drawbacks.

Without comprehensive research on these areas, policymakers and educators risk adopting AI solutions that may not align with local needs or effectively address existing challenges.

This study, therefore, sought to examine the integration of AI in school administration within Region XII, focusing on its current applications, challenges, and potential impact. By bridging this research gap, the study aims to provide evidence-based insights that can inform policies, strategies, and best practices for AI-driven school management, ultimately contributing to the advancement of the MATATAG education agenda.

Objectives

This study examined the relationship between the integration of artificial intelligence in school management and the enhancement of MATATAG Curriculum implementation in East and West Tacurong Districts, Division of Tacurong City during the school year 2024-2025.

Specifically, it sought to answer the following questions:

1. To what extent is the Integration of Artificial Intelligence (AI) in School Management, in terms of:
 - 1.1. Integration of AI in Administrative Processes;
 - 1.2. Automation of Routine Tasks;
 - 1.3. AI-driven Decision-Making;
 - 1.4. Personalized Learning Experiences;
 - 1.5. Types of AI Tools;
 - 1.6. Data Utilization; and
 - 1.7. Training and Support Provided to Staff?
2. What is the level of the enhancement of MATATAG Curriculum implementation, in terms of:
 - 2.1. Time Element;
 - 2.2. Work Quality;
 - 2.3. Work Quantity; and
 - 2.4. Resource Optimization
3. Is there a significant relationship between the extent in the Integration of Artificial Intelligence (AI) in School Management, and the enhancement of MATATAG Curriculum implementation?

Hypothesis

This null hypotheses are tested using the 0.5 level of significance.

1. There is no significant relationship between the extents in the Integration of Artificial Intelligence (AI) in School Management, and the enhancement of MATATAG Curriculum implementation.

METHODS

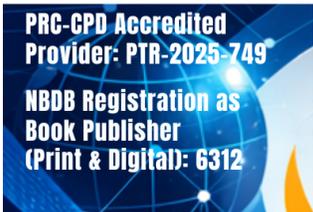
Research Design

This study employed a quantitative research design, specifically a descriptive-correlational approach, to examine the relationship between the integration of artificial intelligence (AI) in school management and the enhancement of MATATAG Curriculum implementation. The research focused on public elementary schools in East and West Tacurong Districts, Division of Tacurong City, during the school year 2024-2025.

A descriptive-correlational research design was appropriate for this study, as it allowed the researcher to analyze the extent to which AI-driven tools and systems influenced various aspects of school management, such as administrative efficiency, decision-making, and curriculum monitoring. According to Bhandari (2021), a correlational research design investigates relationships between variables without direct manipulation. This design was particularly relevant in the context of AI utilization in schools, as it enabled an objective assessment of how AI-driven decision-making, data utilization, and digital tools contributed to curriculum implementation.

Population and Sampling

The respondents of this study were selected using various sampling techniques. First, the Total Enumeration Sampling Technique was used for the selection of all elementary schools in East and West Tacurong Districts, Division of Tacurong City, during the school year 2024-2025. Total Enumeration Sampling, or a census approach, involved including all elementary schools within these districts, ensuring comprehensive coverage of the population. This method was essential for obtaining a complete understanding of the context in which the MATATAG Curriculum



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was implemented. Furthermore, the Simple Random Sampling technique was used to select teachers from the chosen elementary schools in East and West Tacurong Districts.

Instrument

This study employed a researcher-made survey questionnaire, which was validated and evaluated by a panel of expert validators to ensure its content validity and reliability.

Data Collection

To ensure reliable and authentic findings, the researcher adhered to a methodology that aligned with the objectives of the inquiry. Initially, the study's implementation required the endorsement of the DepEd-Division Superintendent of Tacurong City Division and the CGS Dean through the affixation of their respective signatures on a formal document. Additionally, a letter of authorization was dispatched to the school district supervisors.

Treatment of Data

Upon the culmination of the study, the collected data were systematically arranged, presented in tabular form, subjected to rigorous analysis, and subsequently interpreted. Mean was employed to calculate the extent of the integration of Artificial Intelligence (AI) in school management and the level of enhancement in the implementation of the MATATAG Curriculum.

To assess the extent of the integration of Artificial Intelligence (AI) in school management, the scale below, adopted from Mendoza (2022), was used:

Table 1.

Scale for the extent of the integration of Artificial Intelligence (AI) in school management

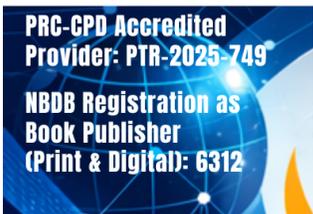
RATING	RANGE OF MEANS	DESCRIPTION	INTERPRETATION
5	4.20-5.00	Highly Agree	Very High Extent
4	3.40-4.19	Agree	High Extent
3	2.60-3.39	Moderately Agree	Moderate Extent
2	1.80-2.59	Disagree	Low Extent
1	1.00-1.79	Highly Disagree	Very Low Extent

Another rating scale, adopted from De Guzman and Valdez (2022), was used to evaluate the level of enhancement in the implementation of the MATATAG Curriculum:

Table 2.

Scale for the level of enhancement in the implementation of the MATATAG Curriculum

RATING	RANGE OF MEANS	DESCRIPTION	INTERPRETATION
5	4.20-5.00	Agree	Very Highly Implemented



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4	3.40-4.19	Fairly Agree	Highly Implemented
3	2.60-3.39	Neutral	Satisfactorily Implemented
2	1.80-2.59	Fairly Disagree	Fairly Implemented
1	1.00-1.79	Disagree	Poorly Implemented

On the other hand, Pearson *r* Correlation was also employed to determine the significant relationship between the extent of AI utilization and the level of school management in the MATATAG Curriculum implementation.

Ethical Considerations

The researcher ensured that all research protocols involving ethics in research such as informed consent, privacy and confidentiality, data security, bias and fairness and transparency and accountability were complied with for the protection of all people and institutions involved in the conduct of the study.

RESULTS and DISCUSSION

Table 3.

The extent in the Integration of Artificial Intelligence (AI) in School Management

Indicator	Mean	SD	Description	Interpretation
1.1. Integration of AI in Administrative Processes;	3.70	0.91	Agree	High Extent
1.2. Automation of Routine Tasks;	3.70	1.2	Agree	High Extent
1.3. AI – driven Decision-Making;	3.74	1	Agree	High Extent
1.4. Personalized Learning Experiences;	4.06	0.8	Agree	High Extent
1.5. Types of AI Tools;	3.48	0.9	Agree	High Extent
1.6. Data Utilization;	3.34	1.1	Moderately agree	Moderate Extent
1.7. Training and Support Provided to Staff.	3.61	1	Agree	High Extent
Grand Mean	3.74	0.99	Agree	High Extent

The study's findings indicate that respondents generally "agree" that AI integration in school management—particularly in administrative processes, automation of routine tasks, AI-driven decision-making, personalized learning experiences, types of AI tools, and training/support provided to staff—has a positive impact. These aspects of AI contribute to increased efficiency, improved decision-making, and enhanced learning experiences in the MATATAG implementation for elementary education. However, the moderate agreement regarding data utilization suggests that while AI plays a role in handling data, challenges such as accessibility, proper analysis, and application of insights may limit its full effectiveness.

The results suggest that AI is successfully integrated into school management and learning processes, though some areas still need improvement. The “agree” rating on various AI functions indicates that educators and administrators agree that AI brings advantages – especially if it can automate administrative tasks, improve decision making, and improve student learning with personalized solutions. The “moderately agree” rating on data utilization shows that schools may have difficulty using AI-based insights fully as it may impede the ability to capture insights due to issues such as not receiving enough training, concerns over data privacy, or technology limitations for data analytics.

To further optimize AI integration in school management under the MATATAG curriculum, the following actions are recommended:

The DepEd (Department of Education) will help the administrators and educators in Enhancing Data Utilization with Implement more advanced AI-driven analytics tools to improve data collection, interpretation, and application in decision-making. Conduct workshops and training sessions for educators and administrators on how to effectively utilize AI-generated data insights, and strengthen data security and privacy policies to ensure ethical and responsible use of AI in managing school data.

Secondly, improving AI training and support Increase professional development opportunities focused on AI literacy for school staff and provide technical assistance and help desks for troubleshooting AI-related concerns.

Lastly, optimizing AI Tools for Administrative Processes and Learning to continuously update AI systems to align with school-specific needs and improve automation efficiency. Integrate AI more effectively into learning platforms to provide better personalized learning experiences for students.

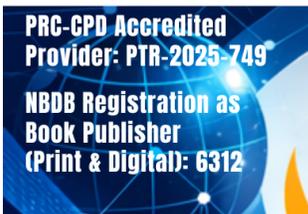
By addressing these recommendations, AI’s role in school management can be maximized, ensuring a more effective and sustainable implementation of the MATATAG curriculum in elementary education.

Table 4.
Summary of the MATATAG Curriculum Implementation

Indicator	Mean	SD	Description	Interpretation
2.1. Time Element	3.92	0.74	Fairly Agree	Highly Implemented
2.2. Work Quality	3.86	0.82	Fairly Agree	Highly Implemented
2.3. Work Quantity	3.87	0.85	Fairly Agree	Highly Implemented
3.4. Resource Optimization	3.89	0.87	Fairly Agree	Highly Implemented
Grand Mean	3.87	0.82	Fairly Agree	Highly Implemented

The integration of artificial intelligence (AI) in school management, particularly within the MATATAG implementation in elementary education, has a significant impact on time efficiency, work quality, work quantity, and resource optimization. The findings, which indicate a “fairly agree” response, suggest that while AI contributes positively to these aspects, its full potential has yet to be realized due to certain limitations. AI helps streamline administrative tasks, enhances decision-making through data-driven insights, and improves efficiency in resource allocation. However, challenges such as technical limitations, lack of proper training, and infrastructure constraints may hinder its optimal implementation.

The study’s results imply that AI integration in school management is beneficial but still requires improvements to maximize its effectiveness. The “fairly agree” rating suggests that while AI enhances work efficiency and quality, some gaps exist in its actual application. For time element, AI reduces administrative workload but may not be fully utilized due to system inefficiencies. Work quality improves with automation, but human oversight is still needed. Work quantity increases as AI assists in multitasking; however, dependence on AI tools varies among schools. In terms of resource optimization, AI can help allocate resources effectively, but schools may struggle with financial and technical constraints. Addressing these factors will enhance AI’s role in school management.



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To improve AI integration in school management under the MATATAG implementation, the following recommendations are suggested:

Time Element: Schools should invest in training programs to help educators and administrators effectively utilize AI tools, minimizing inefficiencies and maximizing time savings.

Work Quality: AI systems should be continuously updated and improved to enhance decision-making and minimize errors. Regular monitoring and assessment should be conducted to ensure AI applications align with educational goals.

Work Quantity: AI tools should be expanded to cover more administrative tasks, allowing educators to focus on teaching. Providing technical support and ensuring system reliability will further improve productivity.

Resource Optimization: Schools should seek partnerships with technology providers and government agencies to secure funding and infrastructure necessary for AI implementation. Ensuring accessibility and maintenance of AI tools will lead to better resource management.

By addressing these aspects, AI can be more effectively integrated into school management, leading to improved efficiency and productivity in elementary education under the MATATAG curriculum.

Table 5.

Relationship between the extent in the Integration of Artificial Intelligence (AI) in School Management and the enhancement of MATATAG Curriculum implementation

	N	Mean	SD	r	p-value	Interpretation
Integration of Artificial Intelligence (AI) in School Management	75	3.69	.047	.875	.016	High Significant Correlation
Effectiveness of the Community	75	3.95	.059			

.05 level of Significance (2 tailed)

The data presented in Table 5 reveal a strong and statistically significant relationship between the extent of integration of Artificial Intelligence (AI) in school management and the enhancement of the MATATAG Curriculum implementation, with a correlation coefficient of $r = 0.875$, which is significantly higher than the p-value of 0.016 at the 0.05 level of significance. This indicates that the use of AI in school management has a substantial impact on improving the implementation of the MATATAG Curriculum, suggesting that AI plays a critical role in facilitating more effective educational practices, resource allocation, and decision-making in schools.

The integration of AI in educational settings has been widely recognized as a powerful tool for enhancing curriculum delivery. According to Shroff (2024), AI in school management helps in automating administrative processes, providing real-time data analysis, and personalizing learning experiences, which directly contributes to more efficient curriculum implementation. By optimizing administrative tasks and providing data-driven insights, AI empowers educators to focus on more impactful instructional strategies, thus enhancing the overall quality of education (Analytikus, 2023). In this context, the results corroborate the notion that AI's involvement in school management is pivotal in enhancing the effectiveness of educational reforms, such as the MATATAG Curriculum, which aims for a more holistic and inclusive approach to learning.

Moreover, AI's role in improving curriculum implementation is not only about administrative efficiency but also about creating a more tailored educational experience for students. As noted by Yu (2024), AI technologies allow for adaptive learning systems that cater to individual student needs, making it easier for schools to implement curricular changes effectively. This individualized approach helps in addressing diverse student needs, which is crucial for the success of the MATATAG Curriculum, designed to be more inclusive and contextually relevant to Filipino learners. Therefore, the strong correlation observed in this study highlights the critical role of AI in modernizing educational systems and enhancing curriculum delivery.

Conclusion

The following conclusions were made in light of the study's findings:

AI is widely utilized in administrative tasks, decision-making, and personalized learning, enhancing efficiency in grading, attendance tracking, and performance monitoring.

AI improves curriculum implementation by streamlining lesson planning, assessment, and decision-making while optimizing resources and enhancing instructional quality.

A strong correlation confirms AI's crucial role in improving educational practices, resource allocation, and data-driven decision-making in schools.

Indeed, integration of AI in school management to the MATATAG Curriculum has a significant impact and helps streamline to contribute positively aspects in decision making and administrative tasks.

Recommendations

In the light of the findings, the following were recommended

Department of Education (DepEd) may develop comprehensive policies and guidelines for integrating AI in school management, ensuring alignment with the MATATAG Curriculum. This includes establishing clear protocols on AI-driven decision-making, data utilization, and staff training to enhance administrative efficiency and personalized learning experiences.

Curriculum developers can design AI-supported instructional materials tailored to the MATATAG Curriculum's objectives. They can ensure that AI tools align with curriculum standards, enhance work efficiency, and promote resource optimization while maintaining a balance between technology integration and traditional pedagogical approaches.

School administrators may invest in AI tools that optimize administrative processes and support data-driven decision-making. They can also ensure that teachers and staff receive continuous professional development and technical support to effectively use AI in enhancing curriculum implementation, resource allocation, and instructional strategies. Educators can actively engage in AI training programs to develop competencies in utilizing AI for personalized learning experiences. By integrating AI-assisted tools in lesson planning, assessment, and student progress tracking, teachers can improve work quality, optimize instructional time, and enhance student learning outcomes under the Matatag Curriculum.

Future Researchers may explore the long-term impact of AI integration on school management and curriculum implementation. Studies may examine how AI-driven innovations influence teaching methodologies, student engagement, and overall educational effectiveness to provide data-driven recommendations for policy improvements.

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

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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, 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 (Torral, 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?

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



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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

<i>Artificial Intelligence (AI) Competence</i>	<i>Mean</i>	<i>Description</i>	<i>Interpretation</i>
1. <i>I can distinguish whether a tool is AI-based or not.</i>	4.23	Strongly Agree	Highly Competent
2. <i>I can create content with AI.</i>	4.31	Strongly Agree	Highly Competent
3. <i>I can explain what AI is.</i>	4.23	Strongly Agree	Highly Competent
4. <i>I know how to choose the right AI tools to effectively</i>	4.00	Agree	Competent



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<i>complete a task.</i>			
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 can choose an AI tool that enhances my teaching subject content for a lesson.	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 can help others coordinate the use of subject content, AI tools, and teaching approaches.	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 can use different websites and search strategies to find and select a range of different AI tools.	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
24. I love to help my colleagues design learning activities with AI.	4.00	Agree	Competent
Overall Mean	3.79	Agree	Competent

	Interval	Interpretation	Level of AI Competence
5	4.20-5.00	Strongly Agree	Highly Competent
4	3.40-4.19	Agree	Competent
3	2.60-3.39	Neutral	Moderately Competent
2	1.80-2.59	Disagree	Minimally Competent
1	1.00-1.79	Strongly Disagree	Not Yet Competent

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,



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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
<i>90 and above (Outstanding)</i>	<i>3</i>	<i>23%</i>
<i>85 to 89 (Very Satisfactory)</i>	<i>10</i>	<i>77%</i>
<i>80 to 84 (Satisfactory)</i>	<i>0</i>	<i>0%</i>
<i>75 to 79 (Fairly Satisfactory)</i>	<i>0</i>	<i>0%</i>
<i>Below 75 (Did not meet expectations)</i>	<i>0</i>	<i>0%</i>
TOTAL	13	100

Range	Interpretation
<i>90 and above</i>	<i>Outstanding</i>
<i>85 to 89</i>	<i>Very Satisfactory</i>
<i>80 to 84</i>	<i>Satisfactory</i>
<i>75 to 79</i>	<i>Fairly Satisfactory</i>
<i>Below 75</i>	<i>Did not meet expectations</i>

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.

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.

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

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

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 Sugiarto 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 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.

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Embracing Technological Shift: Teachers' Experiences and Perceptions in Utilizing Artificial Intelligence as a Teaching Tool

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Abstract

Aim: In light of the growing integration of Artificial Intelligence (AI) into education, this study explored how secondary school teachers experience and perceive AI as a teaching tool. The research aimed to uncover how AI shapes teaching practices, student learning, and professional development amid technological shifts in Philippine public education.

Methodology: Employing a qualitative design, the study used Husserl's transcendental phenomenology to examine the lived experiences of 13 secondary school teachers from three districts in Glan, Sarangani Province. Participants were selected through purposive sampling, and data were collected via semi-structured interviews and thematically analyzed using Braun and Clarke's approach.

Results: The findings revealed five core themes: (1) AI enhances teaching efficiency and convenience; (2) AI supports lesson planning and instructional design; (3) AI fosters student engagement and performance; (4) Teachers face challenges related to accessibility, ethical use, and overreliance; and (5) There is a strong need for AI-focused training and policy support. Participants acknowledged the benefits of AI in improving instruction, saving time, and increasing student confidence, yet emphasized the importance of moderation, ethical use, and teacher judgment.

Conclusion: Teachers view AI as a transformative yet complementary tool that should enhance—not replace—the human element in education. Responsible integration of AI requires institutional support, continuous training, and ethical safeguards. Ultimately, teachers' discernment, empathy, and adaptability remain central to meaningful learning in the age of AI.

Keywords: Artificial Intelligence, Teaching Practices, Teacher Perceptions, Student Engagement, Education Technology

INTRODUCTION

The advancement of Artificial Intelligence (AI) has significantly redefined many sectors, particularly education, by transforming traditional teaching methodologies and introducing new opportunities for innovation and efficiency. Chaurasia (2023) described AI as the ability of machines to mimic cognitive functions such as learning, reasoning, and problem-solving, positioning it as a driving force in modern education. AI applications like ChatGPT, DALL-E, and AI-driven Learning Management Systems (LMS) are now reshaping instructional design, lesson delivery, and student engagement (Dwivedi et al., 2023; Zawacki-Richter et al., 2019).

However, the integration of AI in education is not without challenges. According to Schiavo (2022), while educators acknowledge AI's potential benefits, many feel underprepared due to insufficient technical skills and limited training. Similarly, Kim (2022) reported that while AI-enhanced scaffolding was valued among STEM educators, concerns around transparency, data privacy, and classroom dynamics persisted. These findings echo Panigrahi's (2020) study, which highlighted skepticism and ethical concerns as barriers to widespread adoption.

Furthermore, several researchers noted the unevenness of AI integration depending on teacher beliefs, institutional support, and infrastructure quality. Celik et al. (2022) emphasized that while AI can offer adaptive learning paths for students, its effectiveness heavily depends on the instructor's attitude, pedagogical innovation, and technological competence. Meanwhile, Garg and Agrawal (2020) warned that over-reliance on AI tools may lead to reduced student critical thinking and superficial engagement if not properly mediated by educators.

Historically, teacher adaptability to technological changes has been influenced by broader educational theories. Vygotsky's (1978) social constructivist theory suggested that learning is socially mediated, a view reinforced by the growing trend of AI tools designed to foster collaborative learning environments. Siemens' (2005) theory of Connectivism, developed specifically for the digital age, further posits that learning occurs across networks, emphasizing the role of technology in shaping knowledge construction. In addition, the Technology Acceptance Model (TAM) by Davis (1989) provides a framework for understanding how teachers' perceived usefulness and ease of use affect their willingness to adopt AI technologies.

Despite the promising landscape, gaps remain. Most existing literature focuses on theoretical frameworks, technical aspects, or policy recommendations. Very few studies delve into the lived experiences and personal perceptions of teachers who navigate the day-to-day realities of AI integration in the classroom (Boonmoh et. al. 2020; Sun, 2023). Understanding these experiences is vital as teachers are not merely implementers of technology but active agents who mediate how AI impacts students' learning experiences.

Thus, this study aims to bridge this gap by exploring the experiences and perceptions of secondary school teachers in Glan, Sarangani Province, Philippines, in utilizing AI as a teaching tool. Their narratives are expected to offer practical insights into how technology adoption occurs in real classrooms, influenced by socio-cultural, infrastructural, and pedagogical factors.

The findings of this research are expected to contribute meaningfully to the body of knowledge on AI integration in education, offer practical recommendations for teacher training and policy development, and provide a grounded understanding of how AI can be meaningfully harnessed to enhance educational delivery.

Objectives

This study aimed to explore the experiences and perceptions of secondary school teachers in Glan, Sarangani Province, in utilizing artificial intelligence (AI) as a teaching tool.

Specifically, it sought to answer the following questions:

1. What were the experiences of teachers in utilizing AI as a teaching tool?
2. What were the perceptions of teachers toward integrating AI into their teaching practices?
3. How did teachers' experiences and perceptions shape their teaching practices in the context of AI integration?

METHODS

Research Design

This study employed a qualitative phenomenological design to explore the lived experiences and perceptions of secondary school teachers in Glan, Sarangani Province regarding the integration of Artificial Intelligence (AI) into their teaching practices. The phenomenological approach was appropriate as it enabled the researchers to understand and describe the participants' firsthand experiences, focusing on the essence and meaning of AI use in educational settings (Adeniran & Tayo-Ladega, 2024; Alhazmi & Kaufmann, 2022).

Phenomenology allowed the researchers to set aside their biases and interpret the participants' narratives authentically, aiming to uncover deep insights into how AI tools are perceived, adopted, and adapted within the classroom context. Through this method, the study captured the complexity of integrating emerging technologies into traditional pedagogical practices, providing a rich, detailed understanding of the challenges and benefits encountered by teachers.

Population and Sampling

The participants of this study were thirteen (13) secondary school teachers from Glan Districts I, II, and IV in Glan, Sarangani Province, Philippines. Selection criteria included having practical experience with Artificial Intelligence (AI) tools and online platforms in teaching. The participants represented various subject areas and grade levels, allowing for a broad understanding of AI integration across disciplines.

A purposive sampling technique was employed to deliberately select participants who had relevant exposure to AI technologies in education. This non-probability method enabled the researchers to ensure that participants possessed the necessary experiences and insights to address the research objectives effectively (Creswell, 2022; Alhazmi & Kaufmann, 2022). Each participant was anonymized using pseudonyms to uphold confidentiality throughout the study.

Instrument

For triangulation purposes, Focus Group Discussion (FGD) and semi-structured interviews were conducted. To aid in the data collection process, a thorough conversation, sharing of personal experiences through a Focus Group Discussion (FGD), and conversational interviews were done with the purposely selected participants via a virtual platform. This aimed to develop a deep understanding of the phenomenon and to create a dialogue between the participants and the researcher.

Triangulation was employed in the analysis to provide a multidimensional perspective of the data. Triangulation is a method employed during the analysis to ensure the credibility and validity of research findings (Sanchez & Sarmiento, 2020). Triangulation is done by combining theories, methods, or observers in a research study that can help ensure that the biases arising are overcome from the use of a single method. Also, triangulation offers a more balanced and fair explanation of the gathered data to the readers. In this undertaking, triangulation is done by reviewing the transcribed notes and themes that were listed during the series of interviews, the transcript of the FGD, and the coding of the different words and themes from the transcripts (Carter et al., 2014; Nowell et al., 2017).

Data Collection

The data for this study were gathered through semi-structured interviews and a focus group discussion (FGD) involving purposively selected public secondary school teachers from Glan Districts I, II, and IV. Approval was first obtained from the Schools Division Office of Sarangani Province, and informed consent was secured from all participants prior to their involvement.

Data collection took place in quiet and familiar school environments to ensure participant comfort and encourage open sharing. The semi-structured interviews facilitated in-depth exploration of each teacher's individual experiences with the use of artificial intelligence (AI) in teaching. Meanwhile, the FGD served to elicit broader insights, stimulate discussion, and capture shared perceptions, offering a richer understanding of collective experiences.

Both data collection methods were guided by a semi-structured interview protocol, allowing for flexibility to ask follow-up or clarifying questions as needed (DeJonckheere & Vaughn, 2019). All sessions were audio-recorded with the participants' permission and supported by handwritten field notes. Verbatim transcription was completed shortly after each session to ensure the accuracy and integrity of the data.

Data Analysis

Thematic analysis was used to interpret the transcribed interview data following Braun and Clarke's (2006) six-phase approach: familiarization with data, generation of initial codes, searching for themes, reviewing themes, defining themes, and producing the final report. Data were clustered around emerging themes related to teachers' experiences and perceptions of Artificial Intelligence (AI) integration. To ensure credibility and trustworthiness, findings were validated against the participants' actual narratives and cross-referenced with relevant theories and literature.

Ethical Considerations

The researchers followed ethical research protocols to ensure participant protection and study credibility. Approval was obtained from institutional authorities, and informed consent was secured from all participants, who were assured of their voluntary participation and rights. In compliance with Republic Act No. 10173 (Data Privacy Act of 2012), confidentiality was maintained through the use of pseudonyms, and data access was limited to the principal researchers.

Interviews and the focus group discussion were audio-recorded with consent. All data were securely stored and responsibly disposed of after analysis. The study upheld participants' dignity, privacy, and autonomy throughout the research process.

Confidentiality was strictly observed throughout the research process, and no individual other than the researchers had access to the participants' responses.

RESULTS and DISCUSSION

This section presents the analyses and interpretation of data obtained from the participants of the study. The information is presented in themes with interpretation and implication. The presentation is organized based on the order of the problems in the statement of the problem.

1. EXPERIENCES OF TEACHERS IN UTILIZING AI AS A TEACHING TOOL.

Themes

**Enhanced Instructional Efficiency and Time Management
Shift in Teaching Roles and Pedagogical Approach
Opportunities and Ethical Challenges in AI Use
Impact on Student Performance**

Theme 1: Enhanced Instructional Efficiency and Time Management

Participants emphasized that AI made their teaching easier, efficient, and data-driven.

Person 1 stated, "***It makes the work easier and convenient, especially when you use AI. What's good about using AI is that it is data-driven.***"

Person 7 added, "***I think I've been more efficient in my teaching because of the AI tools.***"

Person 8 affirmed, "***AI tools provide direct and quick access to relevant information... easier for discussion, grading, and lesson plans.***"

Person 12 shared, "***AI helped me automate grading, saving time for student interactions.***"

These reflections reveal that AI helped reduce repetitive tasks, enhance instructional efficiency, and allowed more focus on student engagement. AI served as a tool for automating grading and sourcing content, enabling teachers to prioritize learner interaction and informed instructional planning (Domínguez, 2024; Chounta et al., 2022).

Theme 2: Shift in Teaching Roles and Pedagogical Approach

Teachers shared that AI facilitated lesson planning and content development. Person 1 remarked, "AI makes it easier for me to look for reading selections with guide questions."

Person 6 noted, "***Naging mas madali ang paghahanda ng mga aralin... sa paggawa ng mga materyales at pagsasuri ng datos ng mag-aaral.***"

Person 13 stated, "***AI helps with lesson construction, but only as a suggestion.***"

These insights indicate that AI enhanced efficiency in preparing lesson materials and analyzing student data, yet teachers still valued their role in evaluating and refining AI outputs (Schiavo, 2022).

Theme 3: Opportunities and Ethical Challenges in AI Use

Teachers cited difficulties such as unreliability, access issues, and student misuse.

Person 1 explained, "***You have to determine what works for your students and what does not.***"

Person 2 mentioned, "***Sometimes I use AI, but I am not sure if it gives the right answer.***"

Person 3 raised the issue of unequal access, and Person 13 noted academic dishonesty: "***Students copy AI-generated research.***"

These challenges reflect concerns raised in recent studies about overreliance, digital divide, and ethical use (Panigrahi, 2020; Sun, 2023). Teachers stressed the need for responsible AI use and policy support.

Participants observed that AI increased participation.

Person 1 shared, "***Students participate more, especially when AI tools are activity-driven.***"

Person 7 noted, "***Mas lalo silang naging engaged... Something kakaiba. Nakaka-boost ng interest.***"

Person 12 added, "***Students enjoy AI-powered quizzes and interactive tools.***"

However, Person 4 warned about answer uniformity, and Person 13 discussed the need to check authenticity of AI-generated responses. While AI promotes interaction and output quality, it also raises issues of originality and misuse (Celik et al., 2022).

Theme 4: Impact on Student Performance

Teachers confirmed AI enhanced comprehension and confidence.

Person 1 stated, "***Students are more participative, and they think more critically.***"

Person 5 shared, "***Students have this confidence in sharing their answers because grammatically, it gives them good output.***"

Person 7 remarked, "***Students who frequently use AI tools are ahead.***"

AI provided accessible feedback and improved grammar and design skills via tools like Grammarly and Canva. Yet, as highlighted in studies, these benefits must be made accessible to all to bridge the digital divide (Kim, 2022).

2. Teacher's Perceptions of AI in Education

Themes

Convenience and Efficiency of AI AI in Lesson Plan Preparation Challenges in AI Integration Impact on Student Engagement

Theme 1: Convenience and Efficiency of AI

Participants unanimously viewed AI as a helpful tool in streamlining instructional tasks and enhancing teaching quality. One teacher described AI as "very beneficial" in improving efficiency

Person 1 while another noted that "**AI gives me confidence in how I present my lessons**"

Person 2, indicating "**increased self-assurance in teaching delivery**".

The ability of AI to support personalized instruction was highlighted by P6, who explained that it allowed them to tailor content to students' unique needs.

Additionally, Person appreciated the time-saving advantages, stating, "**It provides the tools I need for teaching... it saves time.**" These reflections illustrate how AI facilitates convenience, improves lesson quality, and strengthens instructional adaptability. However, a sense of cautious optimism was shared by P10, who expressed both enthusiasm and reservations—echoing the need for balanced use. This dual perspective is consistent with Domínguez (2024) and Chounta et al. (2022), who assert that AI offers notable benefits but must be contextually integrated.

Theme 2: AI in Lesson Plan Preparation

Participants acknowledged that AI significantly aided their lesson planning process.

Person 1 shared that "**AI makes it easier for me to look for reading selections with guide questions for reading comprehension,**" emphasizing AI's role in curating instructional content that aligns with learning objectives.

Similarly, Person 6 described how AI streamlined lesson preparation, stating, "**Preparing lessons has become easier, particularly in creating instructional materials and analyzing student data,**" highlighting how AI facilitated both content creation and student data analysis.

Meanwhile, Person 13 emphasized a more cautious approach to AI use, remarking that "**AI helps with lesson construction, but only as a suggestion.**" This underscores the importance of teacher discretion in evaluating AI-generated materials, ensuring alignment with curricular goals and learners' needs.

These insights illustrate that while AI enhances instructional efficiency, the teacher's judgment remains central in crafting meaningful and context-appropriate lessons. Literature supports this balanced approach—teachers can leverage AI for creative input and administrative support while maintaining academic rigor and pedagogical relevance (Chounta et al., 2022; Domínguez, 2024).

Theme 3: Challenges in AI Integration

Participants expressed various concerns about the limitations and obstacles of integrating AI into classroom settings.

Person 1 remarked, "**There are challenges... One size does not fit all. You have to determine what works for your students and what does not,**" pointing to the necessity of personalized strategies rather than blanket AI applications.

Person 2 admitted uncertainty in AI's reliability, stating, "**Sometimes I use Google, sometimes I use AI, but I am not sure if it gives the right answer,**" which reflected concerns about the accuracy of AI-generated information.

Access to technology emerged as a major barrier.

Person 3 noted, "**Some challenges include students' lack of access to technology,**" highlighting the digital divide. This issue was compounded by Person 4's observation: "**Most of them become reluctant in**

internalizing the lesson because they can generate the answer through AI easily," suggesting that AI might hinder deep learning and critical thinking.

Teachers also faced adaptation hurdles.

Person 8 shared, *"If teachers do not stay updated, they might feel unprepared,"* underscoring the importance of continuous professional development.

Person 11 acknowledged resistance, saying, *"One of the challenges has been making both the students and me as a teacher feel at ease with the AI tools since initially there was resistance."* Furthermore, Person 13 highlighted academic integrity concerns: *"Students copy AI-generated research, so I use AI checkers to verify authenticity."*

These statements collectively underscore the multifaceted nature of challenges in AI integration—ranging from access and reliability issues to ethical concerns and pedagogical resistance. Supporting literature echoes these findings, emphasizing the need for teacher training, digital infrastructure, and regulatory frameworks to ensure effective and responsible AI use (Panigrahi, 2020; Sun, 2023).

Theme 4: Impact on Student Engagement

Participants highlighted that the integration of AI tools significantly influenced student engagement by making classroom activities more interactive and participatory.

Person 1 observed, *"Students participate more, especially when AI tools are activity-driven. It increases their class participation and makes them more active,"* pointing to the motivational appeal of technology-infused instruction.

Similarly, Person 7 stated, *"They became even more engaged... Something different. It boosts interest,"* reflecting how the novelty and interactivity of AI foster enthusiasm for learning.

AI-powered platforms and tools also enhanced students' involvement in academic outputs.

Person 5 explained, *"Students use AI in making presentations, researching, and producing good outputs,"* an insight mirrored by Person 6, who noted similar usage patterns. These statements suggest that AI contributes to skill development in research and presentation, key indicators of academic engagement.

Person 12 reinforced this perspective by adding, *"Students enjoy AI-powered quizzes and interactive tools,"* indicating that gamified and automated assessments improve participation and enjoyment.

Despite these positives, the participants acknowledged challenges.

Person 4 cautioned, *"They can participate since they have the source, but the students have common ideas because most of the questions we have are the same, and they also derive the same answer as the others,"* highlighting concerns about uniformity and lack of originality in student outputs.

Person 13 addressed this risk as well, sharing, *"Students copy AI-generated research, so I use AI checkers to verify authenticity,"* which points to the importance of maintaining academic integrity in AI-assisted learning environments.

These responses illustrate a dual reality: while AI enhances engagement through interactivity and accessibility, it also raises important concerns regarding originality and ethical use. Studies by Schiavo (2022) and Kim (2022) echo these reflections, emphasizing that educators must strike a balance between leveraging AI's engaging features and fostering critical, independent thinking.

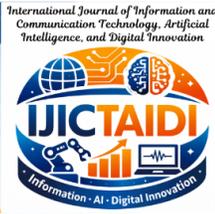
3. INFLUENCE OF AI ON TEACHING PRACTICES AND PROFESSIONAL GROWTH

Themes

AI in Teaching Strategies Changes in Student Learning Outcomes AI's Influence on Educator Roles

Theme 1: AI in Teaching Strategies

Participants reported significant shifts in their instructional methods due to AI integration.



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Person 1 shared, **"I use AI for grammar correction. Grammarly and Quill Bot are helpful, especially since I'm not an English major but I teach English,"** reflecting how AI supports technical refinement in content delivery.

Person 3 explained, **"I now use AI-powered tools to generate individualized learning paths,"** pointing to how AI enables customized instruction based on learner needs.

Person 4 remarked that **"AI gives me more examples, more avenues to explore in different styles,"** emphasizing the expansion of teaching materials and strategies.

Person 9 stated, **"Using AI tools has helped me save time on tasks like grading and lesson planning,"** underlining how AI reduces workload and boosts instructional focus.

Meanwhile, Person 7 highlighted the transition from traditional tools to modern technologies: **"Before, we used cartolinas and Manila papers. Now, we use Smart TV, projectors... so, nagiging techie ako (I'm becoming tech-savvy)."**

These responses collectively show that AI enhances lesson planning, promotes personalization, and fosters technological adaptability among teachers (Chounta et al., 2022; Kim, 2022).

Theme 2: Changes in Student Learning Outcomes

Teachers observed notable improvements in student learning behaviors and engagement due to AI integration.

Person 1 noted, **"Since I spend less time searching for materials, I have more time to answer students' questions... Their performance has improved,"** pointing to increased instructional focus.

Person 3 added, **"AI automates administrative tasks, allowing me to spend more time on student engagement and critical thinking activities,"** which reveals AI's role in supporting active learning.

Person 2 commented, **"Students feel more confident because they have a basis for their output,"** while Person 7 explained, **"AI will help you bridge the gaps... lessons can be adjusted for slow and fast learners,"** reinforcing AI's support for differentiated instruction.

These insights affirm that AI allows educators to shift attention from clerical duties to facilitating deeper student learning and interaction (Domínguez, 2024; Sun, 2023).

Theme 3: AI's Influence on Educator Roles

AI has reshaped teachers' roles and professional development.

Person 10 observed, **"My experiences with AI have significantly influenced my teaching practices, shifting my role from being a sole provider of information to a facilitator of learning experiences."** This role transition echoes contemporary pedagogical frameworks emphasizing learner-centered teaching.

Person 5 noted, **"Using AI makes me more familiar with all the AI tools so I can share them with students and colleagues,"** highlighting peer collaboration and digital fluency.

Person 12 emphasized that AI **"introduced teachers to new ideas and resources,"** demonstrating its impact on continuous learning and instructional creativity.

These statements reflect how AI empowers educators to evolve into adaptive, innovative facilitators who guide learners in dynamic classroom environments (Panigrahi, 2020; Schiavo, 2022; Ho & Limpaecher, 2022).

4. AI Considerations and Recommendations

- Themes
- Perceived Benefits of AI
- Balanced AI Integration in Teaching
- Ethical AI Usage
- Need for AI Training
- Support for AI adoption in Teaching

Theme 1: Perceived Benefits of AI

Participants consistently acknowledged AI as helpful in enhancing teaching practices.

Person 1 emphasized its usefulness, calling it **"very beneficial."**

Person 2 mentioned that **"AI gives me confidence in how I present my lessons,"**

while Person 5 shared that it **"makes my work easier, and in terms of quality, it has high quality."**

Person 6 highlighted AI's contribution to personalized teaching, and Person 7 noted time-saving benefits:

"It provides the tools that I need for teaching... it saves time."

These reflections affirm that AI improves teaching confidence, speeds up instructional tasks, and supports differentiated instruction. However, participants like Person 10 expressed a mixture of excitement and caution, signaling the dual nature of AI's impact. Studies by Domínguez (2024) and Chounta et al. (2022) support the view that AI offers both opportunities and challenges, depending on context and implementation.

Theme 2: Balanced AI Integration in Teaching

Most participants agreed that AI should be used responsibly and not replace human interaction.

Person 1 noted, **"It's more about responsible use,"**

while Person 3 raised concerns on **"over-reliance on AI."**

Person 4 emphasized that students may become **"dependent and shallow,"**

and Person 7 warned that **"they will never replace our personal touch and emotions."**

These narratives reflect the need for ethical boundaries in AI usage. Panigrahi (2020) highlighted similar concerns about AI diminishing learner autonomy, while Sun (2023) advocated for balanced integration to preserve teacher roles and emotional engagement in learning.

Theme 3: Ethical AI Usage

Participants advocated for moderation in AI use and supported the development of ethical guidelines.

Person 2 described AI as a **"supporting tool,"** not a replacement.

Person 4 asserted its limitation: **"just part of the process."**

Person 5 and 13 called for government and institutional policies to regulate AI use. Person 6 emphasized the need for **"comprehensive training"** on ethical usage.

These views align with literature advocating the formulation of ethical frameworks in education (Schiavo, 2022). Teachers must critically evaluate AI-generated content and guide students to avoid misuse and misinformation.

Theme 4: Need for AI Training

Training was a recurring recommendation among participants.

Person 1 called for **"more training for teachers on responsible AI use,"**

while Person 3 added, **"The school should provide training... on how to use AI effectively."**

Others like Person 6 and 11 stressed training on ethical use and data interpretation.

Participants also mentioned the lack of Information, Education, and Communication (IEC) sessions related to AI (P4, P13), highlighting the need for ongoing professional development. According to Kim (2022), effective AI integration depends on teacher competence and access to continuous learning opportunities.

Theme 5: Support for AI Adoption in Teaching

Participants shared views reflecting strong support for the responsible and ethical integration of AI into classroom practices, resonating with the principles of Digital Citizenship Theory and Community of Practice (CoP) Theory. These frameworks emphasize mindful technology use, ethical awareness, and collaborative learning within professional communities.

Several teachers acknowledged that while AI is a transformative tool, it must be used with discernment.

Person 1 remarked, **"Teachers should know the do's and don'ts of AI integration in education,"** underscoring the importance of digital literacy and ethical engagement.

Person 3 further stated, **"AI is a game-changer in education, but it must be used wisely, balancing AI with human interaction,"** reinforcing the idea that technological innovation should not come at the expense of human connection.

Similarly, Person 8 noted, **"Teachers should first learn netiquette... They should know how to use AI correctly,"** reflecting the core of digital citizenship, which advocates responsible and informed use of digital tools.

Beyond ethical awareness, the responses also revealed a call for collaborative and continuous professional

learning—a key component of the Community of Practice Theory.

Person 5 commented, "**We should learn and adapt, but we should also remember that humans are more intellectual than AI,**" a reminder of the irreplaceable value of human judgment in the teaching profession.

Person 12 added, "**Teachers should share AI best practices,**" directly advocating for a culture of shared learning, where educators improve collectively through experience and dialogue.

These insights align with recent literature. Studies by Prahani et al. (2022), Wang et al. (2024), and Talan (2021) confirm that AI's role in education continues to grow—ranging from adaptive learning platforms to intelligent tutoring systems—but highlight that successful implementation depends on teacher readiness and structured guidance. The participants echoed this by advocating for teacher training, peer sharing, and a balanced view of AI as a complement, not a replacement, to human teaching.

Thus, teachers viewed AI adoption not just as a technological update, but as an evolving professional responsibility—one that calls for digital competence, ethical practice, and shared community learning to ensure meaningful and mindful use in the classroom.

Conclusion

This study illuminated the transformative impact of Artificial Intelligence (AI) on teaching practices, student outcomes, and educators' professional roles. Teachers described AI as a helpful companion that supports instruction, enhances lesson planning, saves time, and boosts both student and teacher confidence. As AI became more integrated into the classroom, it gradually shifted the traditional role of educators from sole information providers to facilitators of learning. However, the findings also pointed to the growing need for ethical and responsible AI use. While AI helps improve teaching efficiency, participants voiced concerns about student overdependence, reduced critical thinking, and the loss of human interaction. These insights emphasize that AI cannot—and should not—replace the heart of teaching: the human connection.

AI's successful integration requires thoughtful planning, continuous teacher training, clear usage policies, and inclusive access to tools and connectivity. As technology continues to evolve, teachers must be equipped not just with skills, but with the discernment to use AI in ways that complement their professional judgment and uphold academic integrity. Ultimately, this study reminds us that while AI can enhance how we teach and learn, it is the teacher's wisdom, empathy, and adaptability that will ensure these tools serve their highest purpose in education.

Recommendations

In light of the findings, several key recommendations are offered to guide the thoughtful and effective use of AI in education. First, institutions should foster responsible AI integration by equipping teachers with adequate training that emphasizes ethical, practical, and pedagogical aspects of AI use. This includes sessions on verifying AI-generated content, protecting student data, and reinforcing critical thinking. Second, schools must develop and enforce clear AI usage policies to provide structure, accountability, and consistency in classroom applications. Third, equitable access to AI tools and internet connectivity should be prioritized to prevent digital inequality among learners. Fourth, curriculum developers and administrators are encouraged to blend AI-powered instruction with traditional methods to create more inclusive and personalized learning experiences. Fifth, ongoing research and feedback mechanisms should be established to assess AI's long-term impact on teaching effectiveness and student outcomes. Finally, a culture of digital responsibility must be cultivated—where both teachers and students are guided not just in using AI tools, but in using them wisely, ethically, and for the collective growth of the learning community.

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Artificial Intelligence in Academic Research: Assessing Ethical Use and Benchmarking Practices Across Local and Global Institutions*

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Abstract

Aim: This study aims to assess the ethical use of artificial intelligence (AI) in academic research by analyzing and benchmarking institutional AI policies and practices across selected Philippine Higher Education Institutions (HEIs) and leading global universities.

Methodology: The research employed a qualitative, document-based comparative analysis. Institutional policy documents—such as academic integrity statements, artificial intelligence (AI) use advisories, research ethics codes, and university guidelines—were collected from three local and three global universities. These were analyzed using an ethics matrix guided by frameworks from the Committee on Publication Ethics (COPE), the International Committee of Medical Journal Editors (ICMJE), and the United Nations Educational, Scientific and Cultural Organization (UNESCO), focusing on five key ethical themes: authorship, transparency, academic integrity, acceptable AI use, and ethical safeguards.

Results: Findings revealed that while all institutions recognize the growing role of AI in research, significant divergence exists in the maturity and enforcement of ethical guidelines. Global universities demonstrated more comprehensive, enforceable, and integrated policy frameworks, including AI-specific authorship disclosure, acceptable-use classifications, and training programs. In contrast, Philippine HEIs have begun to develop policies but often lack consistency, operational guidelines, and training infrastructure. The gap is further widened by contextual challenges such as resource disparities and digital literacy limitations.

Conclusion: To promote responsible AI integration, Philippine HEIs must develop coherent, enforceable policies that align with global ethical standards while addressing local academic and cultural contexts. Institutional efforts should also include faculty and student training, AI ethics education, and inter-university collaboration to build a robust and inclusive governance framework.

Keywords: Artificial intelligence, academic integrity, authorship ethics, institutional policy, AI transparency

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INTRODUCTION AND BACKGROUND OF THE STUDY

The global academic landscape is undergoing a profound transformation with the rapid integration of AI into research workflows. AI technologies such as machine learning algorithms, generative text tools, and data mining platforms now assist in literature reviews, data analysis, predictive modeling, and even manuscript drafting. As these tools become embedded in academic practice, their implications for research quality, authorship, and integrity are increasingly scrutinized. Institutions such as UNESCO and COPE have issued preliminary guidance on the responsible use of AI in academia (Ashrafuzzaman & Parveen, 2025; Villarino, 2025). A study by Naqvi et al. (2025) emphasized the transformative but ethically complex role AI plays in health sciences education, calling for curricular and policy-based interventions to maintain research integrity. Similarly, international reviews underscore that while AI enhances efficiency, its use demands ethical governance frameworks that ensure fairness, transparency, and accountability (He & Liu, 2025; Saura, Barbosa, & Rana, 2025).

Despite these global advances, there is limited empirical understanding of how ethical AI practices are embedded within institutional frameworks, particularly in developing countries like the Philippines. Research by Villarino (2025) and Pek et al. (2025) indicates that while many institutions acknowledge the relevance of AI in research and

education, formal policies remain underdeveloped or inconsistently enforced. The Philippines, although showing increasing interest in AI, lacks cohesive national or institutional policy frameworks specifically regulating AI's use in scholarly research. Studies in Philippine HEIs suggest inconsistent access to AI literacy, fragmented policy approaches, and a gap in culturally grounded ethics frameworks (Villarino, 2025). In contrast, leading global institutions have started aligning their academic integrity codes with international guidelines such as those from ICMJE and COPE, which explicitly address AI-aided authorship and review processes (Jambol et al., 2025; LaFrance, 2025). This divergence in policy maturity reveals a critical space for comparative policy analysis.

This study addresses these gaps by critically examining the ethical integration of AI tools into academic research through a comparative analysis of institutional policies from selected Philippine HEIs and globally leading universities. It aims to assess how ethical concerns—such as authorship transparency, academic misconduct prevention, and responsible tool usage—are governed through official documents, ethics guidelines, and internal memoranda. Drawing on a qualitative, document analysis approach, the research benchmarks local practices against international standards set by COPE, ICMJE, and UNESCO. In doing so, it aims to illuminate areas of convergence and divergence, identify best practices, and propose culturally responsive strategies for policy development. The findings will inform both national policy direction and institutional ethics education, contributing to a robust framework for safeguarding research integrity in an AI-enhanced academic environment.

Objectives of the Study

The main objective of this study is to assess the ethical use of AI in academic research by analyzing and benchmarking institutional policies across selected Philippine HEIs and leading global universities.

Specifically, the study aims to:

1. Examine how AI tools are ethically integrated into the academic research process
2. Identify and analyze existing institutional policies and guidelines governing AI use in research within selected Philippine HEIs and international universities.
3. Compare and contrast local and global policy approaches to identify areas of convergence, divergence, and best practices.
4. Highlight regulatory gaps and contextual challenges in the Philippine academic landscape.
5. Recommend an internationally aligned ethical framework for responsible AI usage in Philippine academic research.

METHODOLOGY

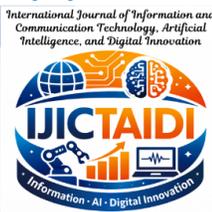
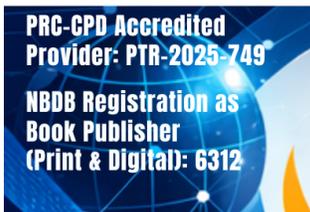
Research Design

This study employs a qualitative, document analysis design to examine how AI is ethically integrated into academic research through institutional policies. It is primarily descriptive and comparative, enabling an in-depth exploration of policy content and thematic trends across institutions.

Participants/Sample

The sample for this study consists of institutional documents—such as academic integrity policies, AI usage guidelines, research ethics manuals, and official institutional statements—from six higher education institutions. These include three Philippine Higher Education Institutions (HEIs): University of the Philippines Open University (UPOU), Mapúa University, and De La Salle University (DLSU). These were selected for their publicly available documents indicating initial efforts toward AI governance in academic contexts.

In addition, three globally recognized universities were included for comparative analysis due to their advanced and accessible AI-related academic policies: the University of Melbourne (Australia), Stanford University (United States), and ETH Zurich (Switzerland). These institutions were selected based on the presence of formal and detailed AI



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ethics provisions embedded within their research or academic conduct frameworks. Collectively, these documents provide a cross-institutional lens into how AI is ethically integrated and governed within academic research settings, both locally and globally.

Data Collection Instruments

The primary instrument is a document analysis matrix that categorizes policy content based on themes such as authorship, transparency, acceptable AI use, academic integrity, and ethical safeguards. The matrix is guided by internationally recognized frameworks including COPE, ICMJE, and UNESCO AI ethics guidelines. All institutional data was drawn from publicly accessible sources and analyzed for scholarly purposes.

Procedure of Data Collection

Relevant documents were identified through institutional websites, online repositories, and official academic portals. Publicly accessible and authenticated documents were downloaded, catalogued, and organized for coding. Where needed, institutional offices were contacted to verify document authenticity.

Data Analysis

Data were analyzed using qualitative thematic analysis, employing both deductive coding (based on global ethical standards) and inductive coding (to surface context-specific themes). Thematic categories were compared across institutions to identify convergence, divergence, policy gaps, and exemplary practices. Findings were synthesized to develop informed policy recommendations.

AI Declaration

AI tools were employed during select stages of this study to support the literature review, thematic organization, and policy comparison processes. During the literature review phase, ChatGPT was used to identify relevant keywords and map conceptual relationships. All cited literature was manually retrieved, read, and verified from primary academic sources. No AI-generated summaries or interpretations were included in the final manuscript.

Grammarly was used solely to improve grammar, clarity, and consistency in writing without altering intellectual content. All critical arguments, interpretations, and conclusions were generated by the researchers and validated against original sources. No AI tools were used to generate data, test hypotheses, or construct research findings. All content was reviewed, verified, and critically synthesized by the researchers in adherence to academic integrity standards.

FINDINGS/RESULTS

Table 1
Qualitative Thematic Matrix Analysis

Institution	Policy Type & Year	Sample Provision or Quoted Text	Ethical Themes (COPE, ICMJE, UNESCO)	Web/Document Source
UP Open University (Philippines) or Local University 1	University Statement (2023)	"Learners are expected to declare the use of AI tools... AI-generated outputs submitted without acknowledgment shall be considered a form of plagiarism."	Authorship, transparency, academic honesty	https://web.archive.org/web/20230921121139/https://www.upou.edu.ph/announcement/upou-statement-on-the-use-of-generative-artificial-intelligence-tools-in-academic-requirements/

Mapúa University (Philippines) <i>or</i> Local University 2	Memo / Dept. Guidelines (2023)	"Students must cite any generative AI tools used... AI is permitted for ideation and reference but must not replace critical reasoning."	Citation policy, tool usage scope, originality	https://www.mapua.edu.ph
De La Salle University (Philippines) <i>or</i> Local University 3	CET Guidelines (2023)	"AI tools may be used as assistive technologies; academic dishonesty includes submitting AI- generated content without attribution."	Training, misconduct, tool classification	https://www.dlsu.edu.ph/etoolkit/
University of Melbourne (Australia) <i>or</i> Global University 1	Research Integrity Policy (2023)	"The use of generative AI... must be fully disclosed and must not replace critical academic contribution."	Disclosure, originality, fairness	https://policy.unimelb.edu.au/
Stanford University (USA) <i>or</i> Global University 2	Teaching and Learning Policy (2023)	"Students must declare all AI assistance. Undisclosed use is a breach of the Honor Code."	Informed consent, authorship, autonomy	https://teachingcommons.stanford.edu/resources/teaching-guides/guidelines-ai-use
ETH Zurich (Switzerland) <i>or</i> Global University 3	Digital Research Guidelines (2022)	"AI tools used... must be referenced like any other source. The academic merit lies in interpretation, not automation."	Data transparency, research responsibility	https://ethz.ch/en.html

1. Ethical Integration of AI in Academic Research

All six institutions acknowledged the presence of AI in research processes but varied in how they integrated ethical controls. Local University 1's statement requires students to disclose AI tool usage and identifies non-disclosure as plagiarism, aligning with COPE's authorship transparency guidelines. Similarly, Local University 2 emphasizes citation of AI tools in research outputs, while Local University 3 classifies unacknowledged AI-generated content as academic dishonesty. Among global institutions, Global University 1, Global University 2, and Global University 3 all require explicit AI disclosures in research outputs, with Global University 1 noting that generative AI must not replace academic contribution. This reflects broader adherence to ICMJE's position on authorship accountability and UNESCO's emphasis on responsible innovation.

2. Institutional Guidelines on AI Use

Institutional responses varied in formality and scope. Local University 1 issued a full university-wide statement, while Local University 2 and Local University 3 issued department-level or internal advisories. By contrast, all three global universities reviewed have published comprehensive, system-wide AI policy frameworks available through official policy portals. These frameworks include specific clauses addressing AI use in data analysis, writing, and authorship, coupled with guidance on ethical citation and disclosure. Only Local University 3 among the Philippine HEIs indicated AI-related training or capacity-building initiatives, while Global University 2 and Global University 1 include AI ethics in teaching guides and faculty policies.

3. Comparative Patterns: Convergence and Divergence

A convergence exists across all institutions in recognizing the necessity for transparency and integrity when AI is used. Common provisions include requiring AI disclosures and discouraging reliance on AI for original scholarly contributions. However, divergence is significant in the level of policy maturity. Global universities implement policies supported by teaching resources, ethics training, and monitoring mechanisms. Philippine institutions remain at the early stages of policy development, often relying on high-level statements with limited operational guidance or enforcement mechanisms.

4. Policy Gaps and Contextual Challenges in Philippine HEIs

The analysis revealed several policy gaps among local institutions. These include (1) a lack of centralized, enforceable university-wide AI policies beyond isolated statements or memos, (2) the absence of standardized templates or forms for AI use declaration, and (3) limited or no institutional training in ethical AI use. In addition, infrastructure disparity and varying levels of faculty AI literacy present contextual barriers to effective policy implementation. These challenges mirror concerns highlighted in Villarino's (2025) study on rural HEI readiness for AI integration.

5. Toward Responsive and Globally Aligned Frameworks

The findings suggest that Philippine HEIs can enhance policy effectiveness by developing comprehensive, multi-tiered frameworks. These should include clear definitions of permissible AI use, mandatory disclosure protocols, and integration of AI ethics into student and faculty training. Benchmarking best practices from Global University 2, Global University 3, and Global University 1, local institutions can create policies that reflect both international standards (COPE, ICMJE, UNESCO) and cultural and infrastructural realities of the Philippine academic context. Local University 1's example can serve as a leading model for cascading policy adoption to other HEIs.

RECOMMENDATIONS

There is an urgent need for Philippine HEIs to transition from fragmented, advisory-level AI usage guidelines to unified, enforceable institutional policies. These policies should clearly define what constitutes ethical and unethical AI use in research, drawing on standards from COPE, ICMJE, and UNESCO. Specific provisions must cover authorship attribution, AI disclosure protocols, acceptable AI functions, and misconduct consequences. These guidelines should be integrated into existing academic integrity codes and research ethics manuals to ensure institutional coherence.

Equally important is the development of capacity-building initiatives to support these policy frameworks. Universities should implement training modules on AI ethics for both students and faculty as part of their research orientation, curriculum development, or professional development programs. These modules should not only introduce technical AI literacy but also address ethical reasoning, responsible tool usage, and case-based simulations on AI-related dilemmas in research.

Institutions must also invest in localized benchmarking and collaborative policy development. Philippine HEIs, particularly those with limited resources, can benefit from consortia or inter-university working groups that collectively study best practices and adapt them to the local cultural and technological context. Models like Local University 1's formal statement can serve as foundational references, but there remains a need for scalable, inclusive frameworks that reach smaller, rural, or under-resourced institutions.

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Exploring College Students' Acceptance of Artificial Intelligence Tools: A Bibliometric Analysis (2014–2024)

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Abstract

Aim: This bibliometric analysis investigates the acceptance of artificial intelligence (AI) tools among college students, highlighting the evolving research landscape from 2014 to 2024. Despite AI's transformative potential in enhancing educational experiences and supporting personalized learning, gaps persist in understanding its application in physical classroom settings. This study systematically reviews literature on AI tool adoption, focusing on research productivity, collaboration patterns, citation impact, and thematic evolution

Methodology: Utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), AI-related research post-2020 were analyzed.

Results: Findings indicate robust international and interdisciplinary collaboration among researchers and underscore the shift from theoretical exploration to practical applications of AI in education. As discussions around ethical considerations grow, this analysis provides critical insights into the factors influencing college students' acceptance of AI tools, ultimately contributing to the ongoing dialogue on AI's role in modern educational practices.

Conclusion: Based on the findings, it is concluded that the acceptance of AI tools among college students in education has been significantly shaped by diverse methodological approaches and theoretical frameworks such as Unified Theory of Acceptance and Use of Technology (UTAUT) and the Diffusion of Innovation Theory. The increase in research productivity, particularly after 2020, reflects the growing integration of AI in educational settings, especially in language learning, academic writing, and Science, Technology, Engineering, and Mathematics (STEM). The study highlights the influential role of systematic reviews and bibliometric analyses in identifying research trends and gaps. It is recommended that future research continue to embrace interdisciplinary collaboration to enhance the quality and impact of AI-related studies. Moreover, emphasis should be placed on addressing ethical considerations, data privacy, and the personalization of learning to ensure responsible and effective AI integration in higher education. This review underscores the dynamic and evolving nature of AI research in education and its critical implications for pedagogy and policy-making.

Keywords: Artificial intelligence (AI), Artificial Intelligence Tools, AI tools acceptance, student acceptance of AI, AI in higher education, college students and AI, perception of AI tools, AI usage in education

INTRODUCTION

Artificial Intelligence (AI) is rapidly transforming the educational landscape by providing innovative solutions that enhance both teaching and learning experiences. The integration of AI tools in education has the potential to significantly improve teacher effectiveness, boost student engagement, and optimize overall educational outcomes (Dwivedi et al., 2021). Beyond supporting traditional educational practices, AI is poised to revolutionize educational services, particularly for international students, by providing adaptive and personalized learning environments (Wang et al., 2023).

Aligned with the United Nations' Sustainable Development Goal (SDG) 4, which focuses on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all, AI offers promising solutions to many of the challenges currently faced in education. By leveraging AI, educational institutions can improve teaching methodologies, accelerate the learning process, and ultimately enhance the development of modern educational systems. (Borsatto, et.al, 2024)

However, despite its transformative potential, gaps remain in the existing body of research. The exploration of AI's application in physical classroom settings, for instance, is still underdeveloped, indicating the need for more comprehensive studies in this area (Chen, et al. 2020). Additionally, while systematic reviews have been conducted on AI's integration into educational practices, they tend to focus on general AI applications rather than specifically addressing pedagogical outcomes or student acceptance of AI tools (Prahani, 2022) This bibliometric review aims to fill these gaps by systematically analyzing research trends, collaboration patterns, and the impact of AI tools on college students' learning experiences over the past decade.

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Objectives

The purpose of the study is to investigate the acceptance of artificial intelligence (AI) tools among college students, highlighting the evolving research landscape from 2014 to 2024

This bibliometric review sought to address several key research questions:

1. What are the distinctive characteristics of literature on college students' acceptance of AI tools in terms of methodology, theoretical framework, and learning context?
2. How has research productivity on AI tool adoption in educational settings evolved over the past decade?
3. What patterns of collaboration emerge among authors studying AI in education, specifically in relation to college students' acceptance?
4. What is the level of citation impact of studies focusing on the acceptance of AI tools by college students?
5. How have the topics of research on AI acceptance in education evolved over time?

Conceptual Framework

The conceptual framework for this study is grounded in Hallinger and Kovacevic's (2019) approach to bibliometric analysis. This framework provides a structured method for examining the characteristics of the academic literature, focusing on research productivity, citation impact, patterns of collaboration, and thematic evolution. By applying this framework, the study will provide a comprehensive overview of the research landscape related to AI tools in college education, identifying key trends and gaps in the existing body of knowledge

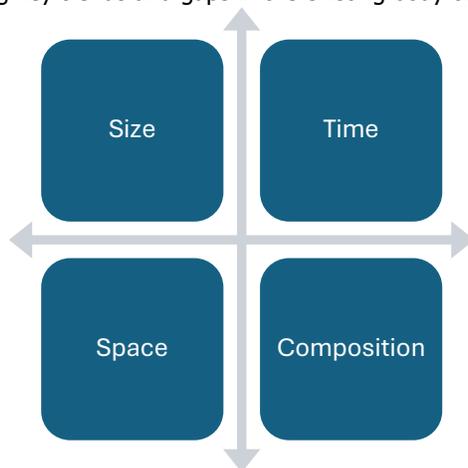


Figure 1. Hallinger and Kovacevics, 2019

METHODS

Research Design

In this study, the researchers adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol to guide the systematic literature review focused on the acceptance of Artificial Intelligence (AI) tools among college students. PRISMA is a well-established framework utilized for reporting systematic reviews and meta-analyses across various research fields, including education and technology (Moher et al., 2009; Liberati et al., 2009). Developed by an international consortium of researchers, PRISMA offers a comprehensive approach to ensure methodological rigor and quality in systematic reviews. Given the study's focus on AI tools in educational settings, the researchers found PRISMA's structured approach particularly beneficial for this review process.

The PRISMA protocol comprises four stages: identification, screening, eligibility, and inclusion. In the identification stage, the researchers initiated a thorough search for potential articles across key academic databases, including Scopus, Google Scholar, ERIC, ProQuest, and EBSCOhost. This extensive search aimed to collect a wide range of literature on the acceptance of AI tools among college students.

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During the screening stage, the researchers applied initial inclusion and exclusion criteria to the search results, focusing primarily on the titles and abstracts of the articles. Articles that appeared potentially relevant were saved to an EndNote library, where duplicates were systematically removed to ensure a clean dataset for further analysis.

The eligibility stage involved a meticulous review of the full texts of selected articles to confirm they met the outlined criteria for inclusion. The researchers assessed whether the articles provided insights into the acceptance of AI tools specifically among college students. Irrelevant articles or those not aligned with the study's focus were excluded at this stage.

In the final inclusion stage, the researchers compiled a comprehensive list of articles that satisfied all inclusion criteria for the systematic review. An Excel spreadsheet was created to document essential details from each article, including titles, authors, methodologies, and significant findings related to AI acceptance among college students. To ensure rigor and minimize bias, three authors independently reviewed the selected articles, comparing their notes and findings. Any discrepancies were resolved through virtual meetings, fostering collaboration and consensus among the researchers. This collaborative approach facilitated the development of a summary table of the included articles, ensuring a robust and accurate analysis of the literature on college students' acceptance of AI tools.

Search Plan and Techniques

To identify relevant studies on the acceptance of Artificial Intelligence (AI) tools among college students, a comprehensive search was conducted across several academic databases, including Scopus, Google Scholar, ERIC, ProQuest, and EBSCOhost. This systematic search aimed to gather a wide range of literature and ensure a thorough review of existing research from 2013 to 2023.

Table 1.

Concept	Keywords
Concept 1: Acceptance of AI Tools	"AI tools acceptance," "student acceptance of AI," "AI in higher education," "college students and AI," "perception of AI tools," "AI usage in education"
Concept 2: College Students	"college students," "university students," "higher education," "student experiences with AI," "student perspectives on AI," "AI tools in academic settings"

The search for relevant studies on the acceptance of AI tools among college students was meticulously structured to ensure a comprehensive review of the existing literature. The search strategy focused on two primary concepts: the acceptance of AI tools and the specific demographic of college students.

Concept 1 involved utilizing a carefully selected set of keywords related to the acceptance of AI tools. Terms such as "AI tools acceptance," "student acceptance of AI," "AI in higher education," "college students and AI," "perception of AI tools," and "AI usage in education" were employed to capture various dimensions of how students perceive and interact with AI technologies. This broad range of keywords aimed to include studies that explore both the positive and negative sentiments students hold toward AI in their academic environments.

Concept 2 concentrated on the demographic aspect, using keywords associated with college students. This included terms like "college students," "university students," "higher education," "student experiences with AI," "student perspectives on AI," and "AI tools in academic settings." The purpose was to refine the search to studies specifically involving college students, highlighting their unique experiences and challenges in relation to AI tools within the context of higher education.

The search strategy combined these keywords to ensure comprehensive retrieval of relevant articles. Specific keyword combinations used in the search included "AI tools acceptance AND college students," "student perceptions of AI AND higher education," "AI in education AND student experiences," and "AI usage AND university students." These combinations were designed to capture a wide range of studies that address both the acceptance of AI tools and the specific context of college students.

To enhance the quality and relevance of the search results, several filters were applied. The search was limited to articles published within the last decade to ensure the research is current and applicable. Additionally, the search focused on peer-reviewed articles, conference papers, and theses to maintain a high standard of academic credibility.

Search techniques included the use of quotation marks to encapsulate phrases like "AI tools acceptance" and "student perceptions of AI," which facilitated accurate retrieval of articles discussing these specific concepts.

Boolean operators (AND, OR, NOT) were also utilized to combine or exclude keywords, further refining search results and enhancing precision.

Overall, this structured search strategy was designed to capture a comprehensive and relevant body of literature, ensuring that the identified studies provide valuable insights into college students' acceptance of Artificial Intelligence tools.

Ethical Considerations

To ensure the quality, credibility, and ethical integrity of the study, the researchers strictly adhered to established research protocols. The researchers applied for approval from the PUP Research Ethics Committee (REC), in accordance with the requirements set by the Philippine Health Research Ethics Board (PHREB). Additionally, the list of systematic literature included in the review was independently checked and validated by three research experts to ensure accuracy, minimize bias, and uphold ethical standards in the selection and inclusion of studies.

RESULTS and DISCUSSION

This section presents the analysis and interpretation of the data gathered from the literatures. The findings are organized based on the research questions. The thematic presentation follows the sequence outlined in the study's statement of the problem to ensure coherence and alignment with the research objectives.

1. Distinctive Characteristics of Literature on College Students' Acceptance of AI Tools

The body of literature on AI adoption in education, especially among college students, is characterized by a mix of qualitative, quantitative, and mixed methods approaches. Many studies, like Alharbi (2023), use the PRISMA method to systematically review large datasets of academic articles, focusing on how AI tools like Grammarly and other writing assistants are perceived in foreign language learning.

Theoretical frameworks like the Diffusion of Innovation Theory, as utilized by Alhumaid et al. (2023), and the Unified Theory of Acceptance and Use of Technology (UTAUT), featured in Gonzales-Calatayud et al. (2024) are foundational to understanding students' attitudes and behaviors regarding AI tools. These theories emphasized the role of perceived usefulness, ease of use, and social influence in the acceptance of new technologies.

Additionally, many studies employ survey-based research designs, like Alhumaid et al. (2023), which distributed 400 questionnaires to university students in the UAE to explore their acceptance of AI. With a 97% response rate, this study reflects the high interest and engagement of students in AI-related educational tools. Another common method is content analysis, as seen in Al-Tkhayneh et al. (2023), which analyzed secondary sources such as journal articles to study the social and legal risks of AI.

Moreover, mixed-method studies, such as Awalín et al. (2023), combine both qualitative and quantitative approaches to provide a comprehensive overview of AI's role in education. These studies frequently explore specific tools, such as AI-based writing assistants and automated feedback systems, within the higher education context, examining how these technologies can be applied to improve learning outcomes and engagement.

2. Evolution of Research Productivity on AI Tool Adoption in Educational Settings (2013–2023)

Research productivity on AI tool adoption in education has significantly increased over the last decade. A bibliometric analysis of studies from 2013 to 2023 reveals a growing interest in applying AI to various educational contexts, with substantial increases in the number of published articles starting around 2020, coinciding with the rise of more advanced AI tools like ChatGPT.

For instance, Bilad et al. (2023) and Chui, et al. (2023), noted a surge in AI-related research in educational settings post-2020. The use of the PRISMA method in their review highlights the systematic growth of AI adoption studies in higher education. Similarly, Hinojo-Lucena et al. (2019) conducted a bibliometric study that indicated a steady increase in AI publications from 2015 onwards, reflecting the broader academic interest in AI's potential in educational innovation.

By 2023, studies like Aithal and Aithal (2023), Baidoo-anu and Owusu (2023), Chaka (2023), and Patil, et.al (2024) began exploring more futuristic applications of AI tools like ChatGPT in education, reflecting the rapid evolution of research topics towards cutting-edge AI tools. This study, which is exploratory, gathers information from various scholarly sources using AI-based search tools, highlighting how technology itself is facilitating more advanced research.

In earlier years (2013–2018), research largely focused on theoretical explorations of AI in education, such as Chassignol et al. (2018), who examined AI trends in education from a narrative overview perspective. However, by 2020, the focus had shifted to empirical applications of AI tools, with a sharp increase in studies assessing AI's practical impact on teaching, learning, and assessment, as evidenced by Chen et al. (2020), which received 575 citations, making it one of the most influential studies in this field.

3. Patterns of Collaboration Among Authors Studying AI in Education

The patterns of collaboration among researchers in AI and education reveal a robust tendency toward international and interdisciplinary partnerships. Many studies reflect cross-institutional cooperation, particularly among institutions in Asia, Europe, and North America. For instance, the research conducted by Alharbi (2023) highlights collaboration between multiple institutions to analyze AI's impact on foreign language learning. This type of international partnership is vital, as it allows researchers to leverage diverse educational contexts and perspectives, thereby enriching the overall quality of the research.

Collaboration patterns also demonstrate significant interdisciplinary engagement. A notable example is the work of Shaikh et al. (2022), which brings together experts in both educational technology and machine learning. This intersection is essential, as it underscores the necessity for varied skill sets to thoroughly explore the multifaceted role of AI in education. Similarly, studies such as those by Aithal and Aithal (2023), which focus on ChatGPT's role in higher education, illustrate how scholars from diverse academic backgrounds unite to understand the pedagogical implications of AI tools.

These partnerships enhance the scope of AI research by incorporating insights from various disciplines, including computer science, linguistics, psychology, and education. This interdisciplinary approach fosters a more comprehensive understanding of how AI tools can be effectively adopted in different educational contexts. Moreover, such collaborations can lead to innovative methodologies and frameworks that address complex challenges in integrating AI into educational systems, further propelling the field forward.

4. Citation Impact of Studies Focusing on the Acceptance of AI Tools by College Students

The citation impact of studies on AI adoption in education varies significantly, influenced by the scope and methodology of the research. High-impact studies, such as those by Chen et al. (2020), which have been cited 575 times, underscore the growing influence of AI research within the educational sector. The substantial citation count indicates that comprehensive reviews and empirical studies play a crucial role in shaping future research directions, as they provide foundational knowledge that other scholars build upon.

Conversely, studies like Al-Tkayneh et al. (2023), which examine the social and legal risks of AI in education, exhibit lower citation counts (only 2 citations) due to their recent publication date and narrower focus. However, as the field of AI research expands and these newer studies gain more visibility, it is anticipated that their citation numbers will increase. This suggests a lag in recognition for emerging topics that may eventually gain traction as the discourse around AI's role in education continues to evolve.

Notably, citation impact tends to be higher for studies employing systematic reviews or meta-analyses. For example, works by Bilad et al. (2023) offer valuable overviews of the field, which are frequently referenced by subsequent researchers. Such studies not only synthesize existing knowledge but also highlight gaps in the literature, guiding future research endeavors and contributing to a more cohesive understanding of AI's educational implications.

5. Evolution of Research Topics on AI Acceptance in Education

Research on AI acceptance in education has undergone significant evolution over the past decade. Early studies predominantly centered on the theoretical implications of AI, often exploring its potential transformative effects on education. However, recent investigations have shifted toward practical applications, examining how specific AI tools are integrated into teaching and learning environments.

For instance, the study by Alhumaid et al. (2023) emphasized the practical use of AI in higher education through online surveys measuring student acceptance of tools like ChatGPT in UAE universities. This focus on operationalization reflects an increasing recognition of the need for empirical evidence regarding AI's effectiveness and acceptance in educational contexts.

Other studies, such as those by Singh and Das (2022) and Fitria (2021) showcased the application of AI in areas such as student assessment, personalized learning, and digital literacy. This transition from theoretical explorations to applied research aligns with the rapid advancement of AI technologies and their growing integration

into educational settings. By focusing on practical implications, researchers can better understand the benefits and challenges of implementing AI tools in real-world educational scenarios.

Furthermore, emerging topics like the ethical considerations of AI in education, as discussed in Al-Tkayneh et al. (2023), illustrate the field's increasing awareness of the broader societal impacts of AI adoption. These discussions are becoming increasingly relevant as AI tools become more ubiquitous in both K-12 and higher education environments. The growing emphasis on ethical considerations not only highlights the responsibility of educators and policymakers to ensure equitable AI use but also reflects a broader societal discourse about technology's role in shaping educational experiences. As this dialogue progresses, it will be crucial for researchers to continue exploring the ethical dimensions of AI to inform best practices and safeguard against potential risks.

Conclusions

The systematic review of studies on college students' acceptance of AI tools in education reveals several key trends. First, the distinctive characteristics of the literature include diverse methodological approaches, such as qualitative, quantitative, and mixed methods, with theoretical frameworks like UTAUT and the Diffusion of Innovation Theory being widely applied. The research covers various educational contexts, predominantly higher education, with an emphasis on AI's role in language learning, academic writing, and STEM education.

The productivity of research on AI adoption has increased significantly from 2013 to 2024, with a notable surge in publications post-2020 due to the rise of AI-based tools and the necessity of digital education during the COVID-19 pandemic. Studies that conducted systematic reviews and bibliometric analyses are particularly influential, contributing to the growth of the field by providing comprehensive overviews and identifying gaps for future exploration.

Collaboration among researchers is increasingly international and interdisciplinary, involving experts from education technology, computer science, and pedagogy. These collaborations enhance the depth and breadth of AI research in education, leading to higher citation impacts for studies that combine multiple academic perspectives.

In terms of citation impact, high-quality meta-analyses and systematic reviews tend to be the most influential, with studies like Chen et al. (2020) receiving hundreds of citations, signaling their critical role in shaping the direction of AI research in education. Finally, research topics have evolved from theoretical explorations of AI's potential to more practical applications, with an emerging focus on ethical considerations, data privacy, and personalized learning.

Recommendations

In light of the conclusions, the study recommends Enhancing Interdisciplinary Research: Given the complex nature of AI's role in education, further interdisciplinary collaboration between experts in AI technology, pedagogy, and educational policy is essential. This will facilitate more comprehensive studies that address both the technical and educational implications of AI adoption. Focus on Ethical and Social Implications: As AI tools become more prevalent in educational settings, researchers should prioritize studies that explore the ethical considerations and societal impacts of AI in education. Topics like bias in AI algorithms, data privacy, and AI's role in shaping educational equity should be further investigated to ensure responsible AI integration. Expand Research on AI's Practical Applications: While much progress has been made in theoretical research, future studies should focus more on empirical evidence related to the effectiveness of AI tools in improving student outcomes, engagement, and learning experiences. This includes assessing AI's impact on personalized learning, student assessment, and teacher-student interaction. Increase Longitudinal Studies: To better understand the long-term effects of AI adoption in education, researchers should conduct longitudinal studies that track how AI tools influence learning over extended periods. This will provide deeper insights into how students' acceptance of AI tools evolves as they become more integrated into daily educational practices. Strengthen Global Collaboration: Encouraging more international collaboration among researchers, especially in developing countries, will broaden the scope of AI research and ensure that the benefits of AI in education are equitably distributed. Collaborative efforts could lead to innovative solutions that address regional educational challenges using AI technologies.

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