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# AI Integration in IT Education: Challenges, Opportunities, and Future Directions

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## Abstract

The rapid advancement of artificial intelligence (AI) has generated significant interest within the educational sector, particularly in information technology (IT) education. This study explored the current challenges, opportunities, and future directions of AI in IT education in the Philippines, a nation working to enhance its educational system in the face of digital transformation. Through a survey research design, data were collected from IT students and educators. Results highlight the key challenges, such as inadequate infrastructure, limited resources, gaps in AI literacy, and concerns around ethics and data privacy. Despite these challenges, opportunities such as personalized learning, streamlined administrative processes through task automation, and advancements in research through improved data collection, processing, and analysis provide hope for the integration of AI in IT curricula. Moving forward, efforts should focus on curriculum development, supportive policy frameworks, and continuous research to leverage AI's benefits in IT education. With robust government support, industry collaboration, and ethical AI practices, the Philippines can effectively use AI to transform IT education and equip students for a tech-driven future.

## Introduction

Artificial intelligence (AI) is transforming various industries, including education. In the context of information technology (IT) education, AI offers significant opportunities to enhance learning, streamline administrative tasks, and provide personalized educational experiences (Ayeni et al., 2024; Makinde et al., 2024; Onesi-Ozigagun et al., 2024). In developing countries like the Philippines, AI integration in IT education can bridge knowledge gaps and produce a workforce ready for future technological advancements (Abulibdeh et al., 2024). However, the successful integration of AI in IT education faces several challenges. These challenges are largely due to issues such as limited resources (Chisom et al., 2023), infrastructure (Abulibdeh et al., 2024; Joseph & Uzondu, 2024), and technical expertise, as well as concerns regarding digital equity and literacy (Adel et al., 2024; Luckin, 2025).

In the Philippines, the integration of AI into IT education is constrained by inadequate technological infrastructure, high costs, and a lack of local expertise to support AI-driven educational tools (Naseeb & Bhatti, 2024; Yigitcanlar et al., 2023). Although the Philippine government has introduced initiatives to promote AI in education, these efforts have been slow to materialize due to systemic challenges, such as underfunded schools, lack of internet connectivity in rural areas, and outdated curricula (Cruz, 2020; Dela Cruz & Dela Cruz, 2020; Que, 2021; Ramoso & Cruz, 2024; Torres & Ortega-Dela Cruz, 2022; Villanueva & Cruz, 2019). Additionally, educators may struggle with understanding and applying AI-driven technologies in classrooms (Almethen, 2024), as well as concerns about the digital divide among students.

On the other hand, AI provides significant opportunities to reshape the educational landscape in IT (Ozer et al., 2024). AI can foster innovation in curriculum design, offer real-time feedback through intelligent tutoring systems, and equip students with relevant skills for the digital economy (Ahmed & Meraj, 2024; Ejjami, 2024). The Philippines, through collaborative efforts between educational institutions and the private sector, has the potential to leverage AI for a more dynamic and responsive IT education system. As AI becomes increasingly important in the global workforce, Filipino IT students must be equipped with AI literacy to compete internationally. However, without knowing and understanding the specific challenges faced by the IT education sector, the initiative to address them will remain futile.

This study explored the current challenges, opportunities, and prospects of AI in IT education in the Philippines, a country striving to improve its educational system in the face of digital transformation. We aim to provide insights into how the Philippines can leverage AI to elevate its IT education sector while addressing existing barriers. The Philippines faces unique barriers that are similar to those of other developing countries worldwide. Hence, this study will offer recommendations for improving AI integration to support both IT students and teachers and maximize the benefits of AI in higher education. This study will also add to the body of knowledge, both theory and practice, contributing valuable insights for higher education institutions looking to maximize AI's educational potential. Specifically, the study (i) identified the perceived challenges in incorporating AI technologies into the curriculum; (ii) examined the opportunities that AI offers in enhancing IT education in the Philippines; and (iii) assessed the future directions of AI adoption in the Philippine IT education sector.

## Theoretical Framework

This study is anchored on the *Technology Acceptance Model (TAM)* developed by Davis (1989), which explains how users come to accept and use new technologies. The model identifies two key determinants: Perceived Usefulness (PU)—the belief that technology enhances performance—and Perceived Ease of Use (PEOU)—the belief that using it requires minimal effort. These factors influence users' attitudes, intentions, and actual technology adoption (Davis, 1989; Venkatesh & Davis, 2000). TAM is particularly suited for this study, which examines the challenges, opportunities, and future directions of AI integration in IT education in the Philippines. It provides a framework for understanding how educators and students perceive the value and usability of AI tools, and how these perceptions shape their readiness to adopt AI in educational settings. The model also supports the analysis of contextual barriers such as limited infrastructure and ethical concerns, helping to inform recommendations for curriculum, policy, and institutional support.

## Materials and Methods

### *Research design*

This study employed a survey research design to investigate the current challenges, opportunities, and future directions of artificial intelligence (AI) integration in Information Technology (IT) education in the Philippines. Survey research is a quantitative methodology that systematically gathers data from a defined population or sample to generate statistically meaningful insights into specific issues (Creswell & Creswell, 2017). This approach is particularly suited for examining broad patterns, perceptions, and trends across diverse respondent groups. In this study, data collection was conducted through structured, in-person surveys, enabling the researchers to ensure clarity in item interpretation and increase response accuracy. The use of standardized questionnaires facilitated the collection of consistent, comparable data across participants, while face-to-face administration allowed for real-time clarification of survey items, minimizing potential misinterpretations (Cruz, 2022). This method supports both descriptive and inferential analyses, providing a foundation for understanding how various stakeholders perceive and experience the role of AI in IT education across the country.

### *Research participants*

A total of 298 respondents participated in answering the survey. Specifically, the respondents were composed of randomly selected 280 BSIT students. This study also employed purposive sampling, specifically utilizing a complete or total enumeration of all 18 regular Information Technology (IT) faculty members at a Public University in Laguna, Philippines. Given the relatively small population size of the college, it was both practical and methodologically sound to include the entire population of regular IT professors. This approach ensured comprehensive data collection and minimized sampling bias, thereby enhancing the reliability and representativeness of the findings within the context of the institution.

### *Instrumentation*

The instruments for identifying the current challenges, opportunities, and future directions of AI in IT education were developed by the researchers. These were developed after an extensive literature review. The concepts were measured using a self-administered questionnaire consisting of 34 items, specifically, 11 statements referring to the challenges, 18 statements for opportunities, and four statements for future directions, and one statement that refers to the respondents' overall outlook on AI in IT education. It employed a seven-point Likert scale for each statement, ranging from "strongly disagree" (7) to "strongly agree" (1). To ensure content validity, the initial draft of the questionnaire was reviewed by subject matter experts in IT education and artificial intelligence. Based on their feedback, minor revisions were made to improve the clarity, relevance, and alignment of the items with the study's objectives.

Prior to the main data collection, the instrument underwent pilot testing to assess its reliability and internal consistency. The pilot test was conducted with a group of 10 BSIT students and 10 IT faculty members from a comparable higher education institution not included in the main study. The participants were selected based on similar academic backgrounds and institutional contexts. Feedback from the pilot participants also helped confirm the clarity of instructions and ease of comprehension of the survey items.

Using data from the pilot group, the reliability of the instrument was evaluated through Cronbach's Alpha. The results indicated a high level of internal consistency, with an overall Cronbach's Alpha coefficient of 0.89. Subscale reliability scores were similarly robust: 0.85 for the challenges subscale, 0.91 for the opportunities subscale, and 0.83 for the future directions subscale. These values indicate that the instrument demonstrates strong reliability and is well-suited for capturing perceptions related to AI in IT education.

The researchers ensured ethical conduct in this study by prioritizing informed consent. Prior to administering the survey, they explained the study's objectives thoroughly to the student respondents. Students were informed that participation was entirely voluntary and had no impact on their academic standing. Additionally, respondents were assured they could withdraw from the survey at any time if they felt uncomfortable. Moreover, to uphold confidentiality, each respondent was assigned a unique code number, which they used in place of identifying information when completing the survey. This coded system allowed the researchers to link responses to individual surveys without revealing personal identities, ensuring privacy. Data reports presented aggregate findings, omitting any personally identifiable details, and responses were not quoted directly. This approach preserved anonymity, safeguarding respondents' identities throughout the study.

### *Data analysis*

The quantitative data were analyzed using descriptive statistics, specifically means and standard deviations, to summarize and interpret central tendencies and variability in the responses. Whereas the qualitative data collected from the open-ended questions were transcribed verbatim.

## Results

### *Perceived challenges in incorporating AI technologies into the curriculum*

In this study, "perceived challenges" specifically refers to the obstacles that IT educators and students identify when it comes to incorporating AI technologies into the curriculum. The viewpoints and experiences of individuals actively involved in the educational process are reflected in these challenges.

Among the 11 statements referring to challenges faced by IT educators and students in incorporating AI technologies into the curriculum (Table 1), the top five challenges include the following: how to remain up to date with the AI technology developments and best practices; the knowledge and understanding of AI's capabilities and limitations may hinder the ability to use AI technologies effectively; its adoption in higher education to remain globally competitive; issues related to privacy and data security may arise from the collection and use of student data; and access to AI tools and resources may create inequality in AI literacy opportunities.

Table 1: Perceived challenges in incorporating AI technologies into the curriculum.

| Challenges | Mean | SD |
|---|---|---|

| | | | |
|---|---|---|---|
| 1 | AI technologies evolve rapidly, making it challenging for IT educators and students to keep up to date with the latest developments and best practices. | 1.89 | 3.82 |
| 2 | Many students and educators may not fully comprehend the capabilities and limitations of AI, hindering their ability to use AI technologies effectively. | 2.04 | 3.49 |
| 3 | The adoption of AI in higher education is essential to remain competitive globally. | 2.08 | 3.65 |
| 4 | Privacy and data security issues arise from the collection and use of student data. | 2.24 | 3.05 |
| 5 | Not all students and teachers have equal access to AI tools and resources, creating inequality in AI literacy opportunities. | 2.25 | 3.23 |
| 6 | Ensuring that AI-enhanced learning maintains a balance between technology and pedagogy is crucial. | 2.28 | 4.55 |
| 7 | Overreliance on AI may lessen human-to-human interaction in education. | 2.33 | 4.37 |
| 8 | Smaller institutions like our university may lack the resources to invest in AI infrastructure and expertise. | 2.41 | 3.13 |
| 9 | Bias in AI algorithms can perpetuate discrimination and inequality. | 2.41 | 3.92 |
| 10 | IT professors are adequately prepared and trained to use AI technologies in teaching. | 2.50 | 4.03 |
| 11 | Faculty and staff at my university are resistant to adopting AI technologies. | 2.76 | 4.11 |
| | n=298 | | |

For AI technologies to be effectively integrated into the curriculum, educators need a solid understanding of AI concepts and technologies. However, in many developing countries, teachers often lack both the training and resources necessary to build this proficiency, which hinders their ability to incorporate AI effectively into their teaching practices.

As IT student-respondents mentioned:

> AI is widely used, and I think educators and staff should be more focused on students concerning this matter. AI has tremendous benefits, and it is indeed powerful. But, I believe academic cheating will become a big challenge with the rise of AI -(R40*)*

> AI is an incredibly powerful tool with the potential to bring about transformative changes, but if misused, it can also have destructive consequences. Its ability to automate processes, make decisions, and process vast amounts of data makes it highly susceptible to misuse in areas like privacy invasion, bias, and even manipulation. -(R215)

### *Perceived opportunities that AI offers in enhancing IT education*

The term "perceived opportunities" in this study describes how IT educators and students evaluate the value of AI technology in improving IT education. Their opinions on the possible advantages and enhancements that artificial intelligence (AI) can offer to the educational process are encapsulated in this phrase.

Findings revealed that among the top five opportunities (Table 2) identified by the respondents include: AI-powered adaptive learning platforms tailor educational content to individual students' needs, pace, and learning styles; AI technology provides language translation and speech recognition which can facilitate global access to educational content; intelligent tutoring systems provide real-time feedback and assistance to students; AI accelerates research by automating data analysis and simulation; and AI can make IT education more inclusive by providing tailored accommodations for students with disabilities.

Table 2: Perceived opportunities that AI offers in enhancing IT education.

| | Opportunities | Mean | SD |
|---|---|---|---|
| 1 | AI-powered adaptive learning platforms tailor educational content to individual students' needs, pace, and learning styles. | 2.02 | 1.94 |
| 2 | AI technology provides language translation and speech recognition, which can facilitate global access to educational content. | 2.05 | 2.88 |
| 3 | Intelligent tutoring systems provide real-time feedback and assistance to students. | 2.08 | 1.14 |
| 4 | AI accelerates research by automating data analysis and simulation. | 2.09 | 2.62 |
| 5 | AI can make IT education more inclusive by providing tailored accommodations for students with disabilities. | 2.12 | 2.56 |
| 6 | AI automates administrative tasks such as enrolment, admissions, and student support services. | 2.13 | 2.12 |
| 7 | AI chatbots provide 24/7 student support and answer frequently asked questions. | 2.15 | 0.29 |
| 8 | Collaboration between AI and human researchers can lead to groundbreaking discoveries. | 2.16 | 1.77 |
| 9 | AI-driven personalized learning experiences benefit students. | 2.16 | 0.49 |
| 10 | AI augmentation can stimulate creativity, problem-solving, and innovation. | 2.24 | 0.83 |
| 11 | AI aids student researchers in data collection, and pattern recognition. | 2.26 | 2.21 |
| 12 | Predictive analytics help educational institutions allocate resources effectively and improve student retention rates. | 2.26 | 0.22 |
| 13 | AI-powered adaptive learning platforms can provide personalized learning experiences that can boost student engagement and knowledge retention. | 2.33 | 1.35 |
| 14 | AI-powered tools can encourage creative collaboration among students and educators. | 2.34 | 0.67 |

| | | | |
|---|---|---|---|
| 15 | Natural language processing supports literature reviews and content summarization. | 2.40 | 2.40 |
| 16 | Virtual advisors assist students in course selection and academic planning. | 2.41 | 1.23 |
| 17 | AI can identify at-risk students early and provide timely interventions. | 2.46 | 1.44 |
| 18 | AI has improved the quality of education in higher institutions. | 2.47 | 0.97 |
| | n= 298 | | |

AI-driven technologies hold significant promise for transforming education in the Philippines. By leveraging AI-powered platforms, students can receive tailored learning experiences that match their unique needs (Ali et al., 2024; Onesi-Ozigagun et al., 2024; Tilepbergenovna, 2024). These platforms assess individual learning paces and adapt content to each student's level, which is particularly valuable in addressing the challenges posed by large class sizes and varying levels of academic preparedness. Teachers can provide more focused, efficient support with this approach. As IT student-respondents mentioned:

> It's understandable to feel both amazed and cautious about AI's rapid evolution. AI has incredible potential to transform IT education by personalizing learning and automating complex tasks, but its growth also brings questions about balancing technology with human-centred teaching and ethical considerations. - (R12)

> AI tools are indeed valuable resources for me and my classmates, offering deeper insights into how AI works and helping us build practical skills. - (R14)

> Engaging with these tools now gives us a strong foundation for using AI effectively in our field. - (R16)

*Future directions of AI adoption in the IT education sector*

In this study, "future directions" refers to the perspectives of IT educators and students on the potential pathways and considerations for adopting AI in the IT education sector. This term captures their evaluations of how AI integration could shape the future of IT education (Table 3). The respondents strongly agreed how AI will play a more significant role in IT education in the future; how AI technologies can address the evolving needs of the IT industry in educational programs; thus, investment in AI technologies for IT education is a wise long-term strategy as it will help address the challenges faced by higher education institutions. Overall, respondents in the study expressed a positive outlook on AI's potential impact on the future of IT education, seeing it as a beneficial advancement for the field.

Table 3: Future directions of AI adoption in the IT education sector.

| | Future Directions | Mean | SD |
|---|---|---|---|
| 1 | AI will play a more significant role in IT education in the future. | 1.75 | 4.51 |

| | | | |
|---|---|---|---|
| 2 | AI will help address the challenges faced by higher education institutions. | 1.89 | 4.87 |
| 3 | Investment in AI technologies for IT education is a wise long-term strategy. | 1.97 | 4.73 |
| 4 | AI technologies can address the evolving needs of the IT industry in educational programs. | 2.00 | 4.60 |
| | Overall Outlook | | |
| 5 | I am optimistic about the positive impact of AI on the future of IT education. | 1.92 | 4.95 |
| | n=298 | | |

Two respondents expressed their overall outlook on AI:

> The future of AI holds vast potential, and understanding how to utilize this technology will significantly impact the future of IT worldwide. -(R39)

> As technology advances and evolves daily, mastering the fundamentals of AI in this rapidly growing field of IT could lead to breakthroughs beyond what human intelligence can currently foresee. -(R107)

## Discussion

IT education in the Philippines has indeed grown, with more institutions offering programs in computer science and information systems. Yet, as noted by Umali (2024), there remains a gap in integrating AI technologies into these curricula. Traditional teaching methods still dominate, which often limits students' hands-on exposure to and understanding of AI, underscoring the need for curriculum reforms to incorporate more innovative practices. The current IT curriculum in the Philippines mainly emphasizes traditional programming and software development (Dela Cruz & Dela Cruz, 2020), falling short of adequately addressing AI literacy. While the Philippine Commission on Higher Education (CHED) has started revising the curriculum to include AI components, the process remains gradual, causing many institutions to lag behind. This lack of standardized AI curriculum guidelines contributes to inconsistencies in how AI is taught across various institutions, limiting students' readiness for AI-driven fields.

Budget constraints, especially for public institutions, prevent universities from obtaining the high-performance computing resources and AI tools necessary for practical, hands-on AI learning (Altinay et al., 2024; Aderibigbe et al., 2023). This financial constraint further widens the gap in AI education, as IT students and educators may lack access to the tools required to develop practical skills in AI technologies.

The integration of AI in education introduces significant concerns regarding data privacy and security. In developing countries like the Philippines, where digital security policies may lack the rigour found in more developed nations, there is increased apprehension about the collection, storage, and use of student data by AI systems. This underscores the importance of strengthening data protection measures to ensure ethical AI deployment in educational settings (Abulibdeh et al., 2024; Nguyen et al., 2023).

The identified challenges reflect key constructs of the Technology Acceptance Model (TAM)—Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) (Davis, 1989). Difficulty in keeping up with AI advancements and limited understanding of AI capabilities suggest low PEOU, as users may view AI tools as complex or difficult to implement. Concerns over data privacy, inequitable access, and global competitiveness affect PU, as these issues may reduce confidence in AI's value and fairness in education.

These challenges highlight how negative perceptions can hinder AI adoption in IT education, supporting TAM's premise that both usefulness and ease of use influence technology acceptance. Addressing these barriers is essential for fostering a supportive environment for AI integration.

The perceived opportunities identified in this study align with the Perceived Usefulness (PU) construct of the Technology Acceptance Model (TAM) (Davis, 1989). Respondents recognized AI's potential to enhance IT education through personalized learning, real-time feedback, automated research, and inclusive tools, all of which highlight AI's value in improving educational outcomes. These benefits increase the perceived usefulness of AI, which, according to TAM, positively influences its acceptance and adoption in educational contexts.

Because AI can provide individualized adjustments for individuals with impairments, it has the potential to improve inclusivity in IT education (Almufareh et al., 2024; Harkins-Brown et al., 2025). AI can support a range of learning needs through assistive technology and adaptive learning tools, increasing accessibility to educational materials and fostering an inclusive learning environment.

Through speech recognition and language translation, artificial intelligence (AI) technology improves access to educational content globally (Hu, 2024; Patty, 2024; Son et al., 2025). By helping educators and students get across language obstacles, these tools facilitate access to and interaction with global resources, promoting more inclusive and accessible learning settings. Teachers can concentrate more on teaching by using AI to lessen their administrative workload. Routine chores like scheduling, grading, and attendance tracking can be automated by AI-powered systems, giving IT teachers more time to interact with students more successfully (Igbokwe, 2023; Srinivasa et al., 2022). For instance, intelligent tutoring systems offer real-time feedback and assistance to students, allowing them to receive immediate support and guidance as they learn (Kochmar et al., 2022). This responsiveness promotes a more engaging and encouraging learning environment by addressing learning gaps as they appear and reinforcing comprehension.

AI greatly speeds up research procedures by automating functions like simulation and data processing (Pramod et al., 2022; Wang et al., 2019). Complex analyses take less time and effort because of this automation, which frees up researchers' time to concentrate on more advanced problem-solving and creative endeavours. Research and development (R&D) activities in the Philippines can benefit from the incorporation of AI into IT education. AI tools can help teachers and students perform more effective research, analyze big data sets, and produce insights that can spur innovation in the IT industry.

The respondents' views on future directions reflect strong alignment with the Perceived Usefulness (PU) construct of the Technology Acceptance Model (TAM) (Davis, 1989). Their agreement that AI will play a vital role in addressing industry needs and advancing IT education suggests a high perceived long-term value. This positive outlook supports TAM's premise that when users see clear benefits in a technology's future application, they are more likely to support and adopt it. The findings indicate a readiness among stakeholders to embrace AI as a strategic investment in the future of IT education.

As AI is incorporated more into curricula and instructional resources, it is expected to play a bigger part in the future of IT education, influencing both teaching methods and student experiences. The creation of AI-enhanced learning environments is key to the future of AI in Philippine IT education. Students will be able to interact with real-world AI applications in a controlled environment through virtual labs, AI-driven simulators, and smart classrooms. As a result, students will be better equipped to meet the expectations of the IT sector by gaining hands-on exposure with AI technology.

AI technologies have the ability to match educational curricula to the changing demands of the IT sector, guaranteeing that students acquire the necessary information and abilities to satisfy industry demands. A strong collaboration between academia and industry will be essential for the future of AI in IT education. Industry leaders can offer valuable insights into the latest AI developments and provide students with opportunities for internships and practical experience. By giving educational institutions access to AI tools and technology that might otherwise be too costly, businesses can also aid in closing the resource gap (Goralski & Tan, 2020). According to Gillani et al. (2023), investing in AI technologies for IT education is viewed as a strategic, long-term approach that can enhance educational quality, better prepare students for industry demands, and future-proof the curriculum against rapidly evolving technological trends. AI is expected to play a pivotal role in addressing the challenges faced by higher education institutions, offering solutions like personalized learning, efficient resource management, and enhanced research capabilities, which can improve educational outcomes and operational efficiency (Khachatryan, 2023; Zawacki-Richter et al., 2019).

## Conclusion

### *Study's contribution*

This study contributes to the growing body of literature on artificial intelligence in education by providing empirical insights into the current challenges, opportunities, and future directions of AI integration in IT education in a developing country such as the Philippines. By capturing the perspectives of both IT educators and students, the study offers a contextualized understanding of the technological, pedagogical, and institutional factors shaping AI adoption in higher education. It supports the application of the Technology Acceptance Model (TAM) in understanding the acceptance and readiness for AI in educational settings, particularly in a developing country context where digital transformation is underway but unevenly distributed.

### *Implications for policy and practice*

The findings suggest several key implications for policymakers, educators, and institutional leaders. There is an urgent need to integrate AI competencies—including technical skills, ethics, and literacy—into IT curricula, alongside targeted training programs for faculty and students to bridge knowledge gaps. Investment in digital infrastructure is critical, particularly to provide equitable access to AI tools in underserved areas. Additionally, establishing robust ethical guidelines and data governance frameworks is essential to address privacy and fairness concerns. Finally, fostering strong public-private partnerships will be vital to ensure AI adoption in education is relevant, sustainable, and inclusive.

### *Study limitations and future research*

This study provides valuable insights but is limited by its focus on a single institution, restricting the generalizability of findings across the Philippines. The cross-sectional design captures perceptions at one point in time, without reflecting how attitudes or readiness may evolve.

Additionally, reliance on self-reported data introduces potential bias and limits insight into actual AI usage. Future research should address these limitations by expanding the sample to include diverse institutions, employing longitudinal designs to observe changes over time, exploring effective pedagogical models for AI integration, and evaluating the real-world impact of AI on learning outcomes, faculty workload, and institutional efficiency.

While AI integration in IT education in the Philippines presents clear challenges—particularly related to infrastructure, literacy, funding, and ethics—it also offers transformative opportunities. These include personalized learning, automation of administrative tasks, and enhanced research capacity. Realizing these benefits requires strategic curriculum reforms, supportive policies, continuous investment, and ethical implementation. With sustained government support and active industry collaboration, the Philippines, as a developing country, can position itself to harness AI's potential to modernize IT education and prepare students for a technology-driven future.

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## Declaration of Originality

This research is the authors' original work. All sources of information are clearly referenced in accordance with academic standards.

## Author Bios

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