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INTEGRATING AI AND MACHINE LEARNING TOOLS IN TEACHING: OPPORTUNITIES AND ETHICAL CHALLENGES

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ABSTRACT

The integration of Artificial Intelligence (AI) and Machine Learning (ML) tools into teaching and learning environments in higher education is transforming traditional pedagogical models. These technologies offer significant opportunities to personalised learning experiences, automate administrative processes, enhance student engagement, and support predictive analytics to identify at-risk students. Tools such as AI-driven tutoring systems, intelligent feedback engines, and adaptive learning platforms are increasingly being adopted in both online and blended learning contexts. However, the rapid integration of AI also introduces complex ethical challenges that higher education institutions must address, particularly around data privacy, algorithmic transparency, equity, and academic integrity. This study explores both the benefits and ethical implications of AI/ML integration in teaching, focusing on the context of private higher education institutions (PHEIs). A mixed-methods research design was employed. Quantitative data was gathered through structured surveys distributed to 320 academic staff and students across three PHEIs, assessing awareness, usage patterns, perceived effectiveness, and ethical concerns related to AI tools in teaching. To complement this, qualitative insights were drawn from 15 semistructured interviews with lecturers, instructional designers, and educational technology managers, focusing on practical challenges, institutional readiness, and ethical dilemmas encountered during implementation. The findings highlight growing enthusiasm among educators for AI's potential to support differentiated instruction and streamline academic workflows. However, participants expressed significant concern about data ownership, potential bias in algorithmic decision-making, and the diminishing role of human interaction in learning. Moreover, the lack of institutional policy and professional development in AI ethics emerged as a critical gap. The study concludes that while AI/ML technologies hold promise for enhancing teaching and learning, their implementation must be guided by ethical frameworks, regulatory compliance, and ongoing educator training. The research recommends the development of institutional guidelines on ethical AI use, investment in digital literacy programmes for staff, and continuous monitoring of AI-driven tools to ensure alignment with pedagogical goals and student well-being.

Keywords: *Artificial Intelligence in Education, Machine Learning, Ethical Challenges, Private Higher Education, Teaching and Learning Technologies*

INTRODUCTION & BACKGROUND TO THE STUDY

The rapid growth of Artificial Intelligence (AI) and Machine Learning (ML) is transforming multiple sectors, with higher education emerging as a key area of impact (Zawacki-Richter et al., 2019). In teaching and learning contexts, these technologies are opening new avenues for innovation and improved outcomes. AI-powered systems such as adaptive learning platforms, intelligent tutoring tools, predictive analytics, and automated feedback mechanisms are reshaping traditional pedagogical approaches. They enable more personalised learning at scale, streamline administrative processes, and foster deeper engagement for both students and lecturers (Luckin, 2018). However, alongside these opportunities come pressing ethical considerations. Concerning data privacy, algorithmic transparency, fairness, and the potential over-reliance on automated systems highlight the need for a balanced approach (Holmes et al., 2021). For private higher education institutions (PHEIs), which often differentiate themselves through innovation and student-centred models, this balance is particularly critical. These institutions must integrate AI effectively while safeguarding ethical standards and regulatory compliance (Williamson & Eynon, 2020).

Existing scholarship reflects this duality. Research demonstrates that AI-driven tools can enhance learning by personalising instruction and providing adaptive feedback (Kulik, 2016; Okonkwo & Ade-Ibijola, 2021; Anele et al., 2023). At the same time, global bodies such as UNESCO (2021, 2023) and the OECD (2021) emphasise the need for ethical frameworks that prioritise fairness, transparency, and data protection. Scholars also caution that without proper oversight, AI in education may perpetuate bias, deepen inequality, and undermine institutional trust (Holmes et al., 2019; García-López & Trujillo-Liñán, 2025). Still, emerging applications such as experiments with generative AI on platforms like Khan Academy illustrate the tangible benefits of these technologies for teaching support and student engagement (Khan, 2024).

This study aims to investigate the integration of AI and ML in teaching and learning within private higher education institutions. It explores both the opportunities and the ethical challenges. By drawing on the perspectives of students, educators, and institutional leaders, this research contributes to the broader discourse on the responsible and sustainable use of AI in higher education. The goal is to highlight strategies that ensure the benefits of AI are realised while mitigating the risks, thereby supporting a future where technology enhances rather than undermines human-centered education.

The remainder of this paper covers the problem statement, literature review, research design, finding and discussion, recommendations, limitations and future works, and conclusions.

PROBLEM STATEMENT

Although AI and ML in higher education are being widely embraced, immense knowledge gaps still prevail in dealing with the effective incorporation of these technologies in an ethical context, particularly among PHEIs. Although research highlights the capacity of AI to personalize learning, facilitate greater engagement, and automate administrative tasks (Luckin et al., 2016; Okonkwo & Ade-Ibijola, 2020), little attention has been given to ethical concerns, institutional readiness, and professional competence. Substantive concerns such as data privacy, algorithmic bias, transparency, and the risk of dehumanising learning have been under addressed, and the absence of blanket policies

and professional development initiatives are limiting evidence-informed adoption (Prinsloo & Slade, 2017; Zawacki-Richter et al., 2019; Williamson & Piattoeva, 2022). This study is therefore motivated by the need to investigate opportunities and challenges of AI/ML integration and provide pragmatic recommendations for PHEIs to leverage AI in a way that enhances learning while it maintains fairness, accountability, and human-driven pedagogy.

LITERATURE REVIEW

The integration of AI and ML tools into the educational landscape is ushering in a new era of teaching and learning. This transformation promises remarkable opportunities to enhance pedagogical practices and student experiences yet simultaneously raises profound ethical challenges that demand careful consideration and proactive solutions.

Opportunities of AI/ML in Teaching

Integrating Artificial Intelligence (AI) and Machine Learning (ML) into education offers transformative opportunities that extend well beyond conventional teaching practices. One of the most notable benefits is the capacity for personalised learning, where adaptive platforms tailor content delivery to individual student needs, thereby improving motivation and outcomes (Okonkwo and Ad-Ibijola, 2020; Holmes et al., 2019). AI makes learning more inclusive by removing barriers that often limit students. Tools such as real-time translation, speech-to-text services, and adaptive learning platforms (Dwivedi et al., 2024) help students from different backgrounds and with varying abilities to participate fully in class activities, ensuring that no learner is left behind (Zawacki-Richter et al., 2019). Furthermore, learning may occur outside of typical classroom settings thanks to AI-driven tutoring systems that offer ongoing coaching by recognising knowledge gaps and providing immediate feedback (Luckin et al., 2016). AI and ML help with institutional decision-making and instructor efficiency in addition to helping pupils. By automating monotonous administrative duties like grading, tools like Gradescope allow teachers to concentrate on teaching and student engagement (Hidalgo-Reyes et al., 2025). Data-driven systems like BrightBytes and Civitas Learning analyse student performance patterns to identify at-risk students and offer targeted interventions, ultimately increasing retention rates (Kim & Lee, 2019). Moreover, AI enables collaborative and immersive learning environments that let students actively explore simulations and real-world scenarios when combined with virtual and augmented reality (Dede, 2009). Together, these possibilities demonstrate how AI and ML could support global collaboration and lifelong learning while also facilitating more individualised, efficient, and inclusive educational settings.

Ethical Challenges in AI/ML Adoption

While AI offers notable benefits in education, its adoption also raises significant ethical concerns that cannot be overlooked. One of the most pressing issues is data privacy, as AI systems often require access to large amounts of personal and educational information (Ade-Ibijola & Okonkwo, 2023). Prinsloo and Slade (2017) emphasize that the misuse of student data, whether through questions of ownership, lack of consent, or intrusive monitoring, poses serious risks in learning environments. Another challenge lies in the lack of transparency in algorithmic decision-making, often referred to as the “black box” problem, which undermines accountability (Burrell, 2016). Closely linked to this is the problem of algorithmic bias, which can deepen existing educational inequalities. O’Neil (2016) highlights how biased data can reproduce or even amplify social discrimination, leading to unfair

outcomes in higher education contexts. Beyond these structural concerns, Selwyn (2019) cautions against the dehumanisation of learning, noting that excessive reliance on AI may erode opportunities for meaningful human interaction and mentorship, elements that remain central to holistic student development.

Institutional Readiness and Policy Gaps

The key determinant for ensuring proper adoption of AI and ML in education is the level of institutional readiness and the formulation of robust policy measures. PHEIs remain without welldefined strategies that outline the methods through which AI can be employed ethically and responsibly in teaching, learning, and governance (Zawacki-Richter et al., 2019). This lack of policy introduces uncertainty to teachers and administrators about best practices, and they are often left to resort to piecemeal or ad hoc approaches. The inability to implement policy also leaves essential issues such as accountability, data privacy, and equity to remain unaddressed, creating risks to both staff and students. Also of comparable importance is the demand for professional development in AI literacy. With increasing numbers of AI tools coming on the market, though, numerous academic staff lack the training to understand their functions, identify their limitations, and use them correctly within their departments (Luckin et al., 2016). Such a lack of expertise may result in underuse of the technologies or, alternatively, uncontrolled reliance on them in the absence of critical oversight (Holmes et al., 2019). In the absence of strict guidelines and targeted capacity-building measures, dangers of AI uptake, e.g., discriminatory algorithms, data exploitation, and unequal access to digital tools are heightened (Williamson & Piattoeva, 2022). Institutions that fail to place emphasis on preparation and policy development not only miss the chance to optimise the potential of AI and ML but also expose themselves to significant ethical and operational risk. Therefore, a combined focus on governance and professional skilling is needed to create a sustainable and responsible ecosystem for AI-driven education.

Theoretical and Practical Perspectives

The application of AI technologies to learning is influenced by practical and theoretical considerations. Perceived ease of use and perceived usefulness, as per the Technology Acceptance Model (TAM) (Davis, 1989), and social influence, communication channels, and relative advantage, as per Rogers' Diffusion of Innovations Theory (Rogers, 2003), all contribute significantly to shaping adoption. But research suggests that ethical considerations such as privacy, fairness, and responsibility are equally critical, as they directly affect teachers' and students' adoption of AI (Siau & Yang, 2017). Effective integration therefore requires approaches that align AI tools with pedagogical goals and ensure compliance with ethical principles, supported by teacher professional development, clear policies, and sustained institutional facilitation to allow responsible and meaningful usage.

RESEARCH DESIGN METHODOLOGY Research Design

This research aims to examine the use of AI and ML in education in the private higher education institutions with the hope of enhancing pedagogy and addressing ethical concerns. This study uses a mixed-methods research design involving both qualitative and quantitative to investigate AI/ML integration in PHEIs. The rationale for this format is that it allows the creation of both measurable data on patterns of adoption and high-quality data on stakeholders lived realities and moral issues (Creswell & Plano Clark, 2017). The sampling methods for selecting the population were non-probabilistic in

nature, including convenience and purposive sampling. The PHEIs were purposively sampled, while convenience sampling was used for data collection from the participants who were conveniently available at hand within the target population that could not be reached.

Quantitative Phase

The quantitative phase used a structured survey, filled in by 320 students and academic staff from three private institutions of higher learning. The survey contained closed-ended and Likert-scale questions to identify the following:

- ***Demographics:*** It shows the participant profile data.
- ***Usage Awareness:*** It shows the extent of awareness of participants about AI/ML tools for learning and teaching.
- ***AI/ML Awareness:*** It tests the extent of exposure of participants to AI/ML tools
- ***Perceived effectiveness:*** reflects the perceived effectiveness of AI/ML for teaching and improvement in student outcomes.
- ***Ethical concerns:*** It gauges concerns against data privacy, bias, and transparency.
- ***Institutional Support:*** policies, professional development, and confidentiality in the effective application of AI/ML.

The responses to the survey were examined using descriptive statistics to capture usage trends and regression analysis to explore relationships between measurement variables and perceptions of AI/ML implementation.

Qualitative Phase

Following the quantitative findings, a qualitative data collection was conducted through 15 semistructured interviews among educational technology managers, instructional designers, and lecturers. Participants were selected based on purposive sampling in order to include representation from different institutional roles. Interview questions investigated deeper into:

- Actual-world realities of AI/ML adoption.
- Institutional readiness and infrastructural ability.
- Perceived ethical concerns and ways to address them.

The qualitative data were coded thematically with Braun and Clarke's (2006) guide to facilitate the determination of emergent themes such as data ownership, algorithmic bias, and institutional policy necessity.

Ethical Considerations

The ethical clearance approval for this study was obtained for the Institutional research ethics committee. All interviewees were given informed consent on the assurance of anonymity and confidentiality. Data were kept securely and only for academic use, as is best practice for responsible research (Resnik, 2018).

Validity and Reliability

For reliability, the instrument for data collection, the questionnaire, was pretested with a group of academic staff before administration and some minor adjusting done to make it more understandable.

Triangulation between quantitative data and qualitative data provided robustness to the research by preventing conclusions from being drawn from only a single source of data.

Data Analysis

Various statistical tests were run to yield credible data depending on the research objectives. Inferential statistics were used to all the variables in the study to enable consideration of frequency and response percentage (%) of respondents. Measurement items' reliability analysis (criteria = 0.60) confirmed the measurement reliability. Cronbach alpha coefficient test verified that research variables were internally consistent ($\alpha > 0.98$). This is possible because the research was conducted in a unique environment, an institution of higher education where the belief and attitude of the respondents are constant. A multiple-regression was utilized to perform the test of the relationship between the perceived performance of AI/ML tools in learning (dependent variable) and learning opportunities and ethics (independent variables). The thematic analysis was used to draw insights into the qualitative data.

Reliability Analysis

To determine the internal consistency of the measurement items, reliability analysis was done based on Cronbach's α coefficients for constructed items. The reliability analysis of the survey data produced Cronbach's alpha coefficient of 0.983, indicating excellent internal consistency among the items. This suggests that the survey instrument used to measure perceptions of AI/ML in education is highly reliable. This level of reliability would be expected given the research setting, PHEIs, where the participants were bound together to share mutual experience and perception.

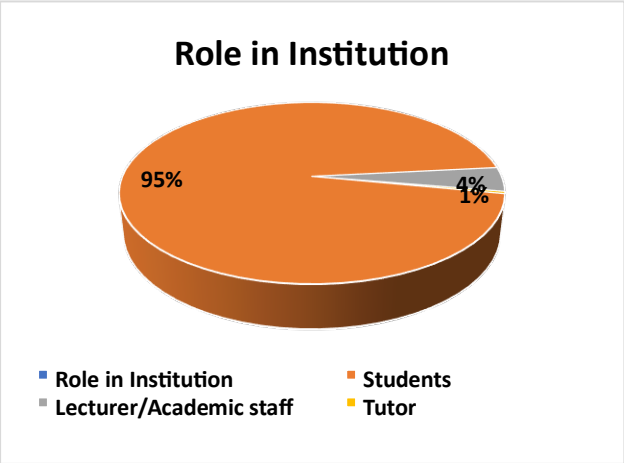
FINDINGS AND DISCUSSION

A mixed-methods strategy was employed to enable a thorough and comprehensive investigation, integrating quantitative and qualitative lines of inquiry. Quantitative data were collected through systematic surveys and semi-structured interviews carried out among students and lecturers at three PHEIs in South Africa. Outcomes of these approaches are presented in the subsequent sections.

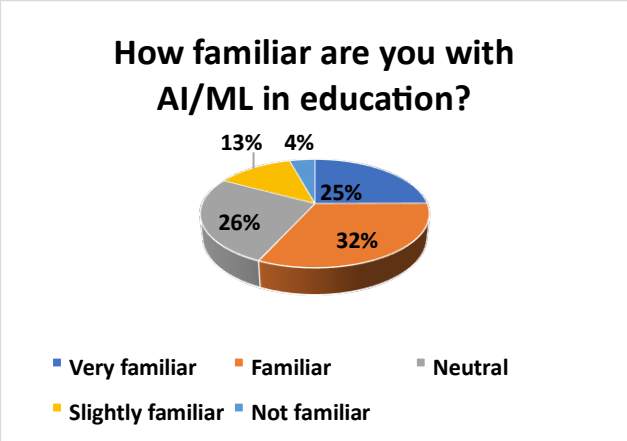
Quantitative Findings

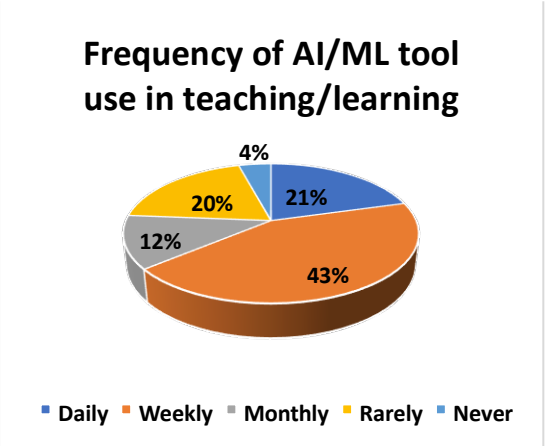
A total of 320 participants took part in the survey, including students, academic staff, and tutors. The survey gathered the participants' information and their perceptions on AI/ML awareness, perceived effectiveness of the use of AI/ML, ethical concerns, and institutional support on the use of AI/ML in PHEIs. Below are the findings.

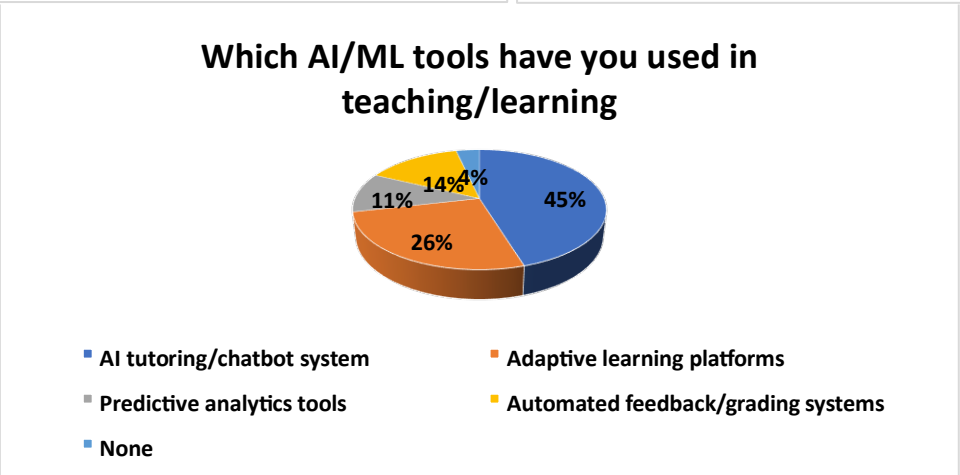
Demographics



AI/ML Awareness







Perceived Effectiveness

AI/ML resources make the teaching/learning more personalised (Personalised): 77% of the participants strongly agreed, 18% were neutral, and 5% strongly disagreed.

AI/ML resources make students more engaged (Engagement): 73% of the participants strongly agreed, 21% disagreed, and 6% strongly disagreed.
AI/ML resources allow to identify and support vulnerable students (Risk Support): 74% strongly agreed, 20% were neutral, and 6% strongly disagreed.

Overall, I am satisfied with AI/ML tools used in learning/teaching (Satisfaction): 73% were strongly satisfied, 22% neutral, and 5% dissatisfied.

Ethical Concerns

AI/ML systems used in education are transparent and explainable (Transparency): 63% strongly agreed, 28% were neutral, and 9% strongly disagreed.

Decision-making driven by AI is a cause for concern about bias (Bias): 57% strongly agreed, 30% were neutral, and 13% strongly disagreed.

AI/ML undermines academic integrity (Integrity): 52% strongly agreed, 31% were neutral, and 17% strongly disagreed.

Institutional Support

My institution has clear policies towards ethical use of AI in teaching/learning: 60% strongly agreed, 28% expressed no opinion, and 12% strongly disagreed.

My institution provides adequate training and development on AI/ML tools (Training): 52% strongly agreed, 31% expressed no opinion, and 17% strongly disagreed.

I feel confident with the effective and ethical application of AI/ML tools (Ethical): 64% strongly agreed, 26% expressed no opinion, and 10% strongly disagreed.

Qualitative Findings

Thematic analysis of was performed on the collected data and the obtained results are presented as follows.

Opportunities and Benefits

AI/ML tools save time by automating mundane chores such as grading and feedback, allowing teachers to focus more on teaching. AI/ML tools enable individualized learning, adaptive study paths, and immediate access to content. Tools also enhance engagement with interactive media such as chatbots and smart tutors.

Key feedback:

"Optimization helps with the redundancy of mundane tasks."

"AI/ML has helped automate mundane tasks, offer customized feedback, and create adaptive learning paths."

"It may help students prepare for their tests, exams and assignments better."

Ethical Issues

Issues of plagiarism, over-reliance on AI, data privacy risks, and algorithmic bias were identified by the respondents. Trustworthiness of AI-generated content and issues related to academic integrity were some of the key concerns. Environmental impact of AI usage was also identified.

Key feedback:

"Learners are over reliant on AI tools which is bad for learning and teaching."

"It is not reliable as a source of information. It is like Wikipedia, helpful for finding sources, but not a reliable source."

"Some challenges include upholding student data privacy, preventing misuse of AI tools in plagiarism."

Institutional Preparedness

Institutions are at varying stages of readiness. Some of them refer to having official policies and procedures, but others refer to not having clear-cut policies. The common thread is to have standardized policies, improved infrastructure, and organized training of staff and students.

Key feedback

"The institution is in the nascent stage of preparedness… more organized staff training, student sensitization programs, and investment in technical infrastructure are necessary." "More policies are needed because there is still no clarity around the use of AI.

Role of AI/ML in Higher Education

AI/ML is widely regarded as an adjunct tool rather than a replacement for human teachers. Interviewees emphasised its role as secondary like a textbook or research assistant, used to automate tasks but leave intact critical thinking and human judgment.

Multi-regression Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.0	0.888	0.788	0.615	0.776

Coefficients

index	Model	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
const	1	0.708	1.438	1.2265618951190898	0.492	0.632
Personalised	1	-0.047	0.298	-0.0808094351603578	-0.157	0.878
Engagement	1	0.267	0.202	0.46271161448623854	1.325	0.212
Risk support	1	1.072	0.282	1.8576048297525003	3.801	0.003
Transparency	1	-0.397	0.268	-0.6876052375838574	-1.479	0.167

Bias	1	0.862	0.602	1.4940777035170645	1.432	0.18
Integrity	1	-0.553	0.478	-0.9579162703499533	-1.156	0.272
Policies	1	0.022	0.376	0.03815778754000264	0.059	0.954
Training	1	-0.532	0.582	-0.9219108964603038	-0.913	0.381
Ethical	1	0.106	0.548	0.18355515216361556	0.193	0.85

The regression analysis examined the relationship between satisfaction with AI/ML tools (*Satisfaction*), the dependent variable and several independent variables, including *personalised, engagement, at-risk, transparency, bias, integrity, policies, training, and ethical*. The model demonstrated a strong fit, with an R^2 of 0.788 and an adjusted R^2 of 0.615, indicating that approximately 62% of the variation in satisfaction can be explained by the independent variables. This level of explanatory power suggests that the model provides a meaningful representation of the factors influencing satisfaction in this context, which is considered strong for social science research.

DISCUSSION

The findings of this study present a nuanced yet encouraging picture of how AI and machine learning (ML) tools are being integrated into private higher institutions (PHEIs). Quantitative results reveal relatively high levels of awareness and usage, with many participants reporting familiarity with and active use of tools such as AI tutoring systems and adaptive learning platforms. These results reinforce earlier evidence by Zawacki-Richter et al. (2019), who documented a growing global interest in AI-driven educational technologies. Similarly, Luckin et al. (2016) highlight AI's potential to reshape education through personalised learning, enhanced engagement, and tailored support for vulnerable learners—an idea that resonates with the 74% of participants in this study who confirmed that AI/ML can play a meaningful role in identifying and assisting underperforming students.

The qualitative findings deepen this understanding by capturing participants' perceptions of both opportunities and concerns. Reported benefits centred on efficiency, student engagement, and personalisation, findings that align with Holmes et al. (2021), who argue that AI can not only reduce administrative workload for educators but also foster more learner-centred experiences. At the same time, concerns around bias, reliability, academic integrity, and over-reliance on AI emerged strongly. These reflect wider debates in the literature (e.g., Williamson & Piattoeva, 2022), which caution against uncritical adoption due to risks such as algorithmic bias, data privacy violations, and ethical dilemmas. Institutional readiness appeared as a recurring theme, with participants highlighting gaps in policy frameworks, digital infrastructure, and staff training across PHEIs. This mirrors Selwyn's (2019) observation that while AI adoption in education is accelerating, institutional capacity often lags behind the pace of technological change. Taken together, the findings suggest that while AI/ML use is expanding, long-term and sustainable integration will require deliberate strategies that prioritise ethics, inclusivity, and supportive policy environments.

Interestingly, the study also found that although institutional and ethical factors such as bias, governance, and transparency shape general attitudes toward AI/ML tools, the strongest predictor of user satisfaction was the perceived ability of these systems to support vulnerable or at-risk students. This finding aligns with Holmes et al. (2021), who emphasise that AI's primary value in education lies in enabling personalised learning and targeted interventions, and with Zawacki-Richter et al. (2019), who note that educators particularly value AI applications that directly address student needs and

improve learning outcomes. Surprisingly, institutional support mechanisms such as guidelines, training, and policies did not emerge as strong predictors of satisfaction. This suggests that while governance and ethical frameworks remain essential for responsible adoption, they do not in themselves drive user satisfaction unless the tools deliver tangible improvements in the student learning experience.

RECOMMENDATIONS

The study highlights that successful AI/ML integration in education is not only a matter of technology but also of institutional readiness, ethical norms, and user attitudes, presenting AI as a human–technology symbiosis. Institutions should realistically focus on using AI to support vulnerable learners, demonstrate tangible improvement of learning results, and maintain ethical control to be able to keep trusting. Staff training and digital literacy programs are required to ensure that teachers can use AI tools effectively and ethically. Strong policy structures need to be present to prevent misconduct and disparity, and AI needs to be introduced as a supplement to, rather than a replacement for, teachers to enhance human judgement, critical thinking, and creativity.

CONCLUSIONS

This study examined the use of Artificial Intelligence (AI) and Machine Learning (ML) in South African private higher education institutions (PHEIs), focusing on their pedagogical potential and associated ethical concerns. Using a mixed-methods design, the findings show that AI/ML are increasingly integrated into teaching and learning, offering benefits such as personalization, efficiency, and enhanced student engagement. At the same time, significant ethical, institutional, and pedagogical challenges remain. The results highlight AI's dual role as both a driver of innovation and equity and a potential risk if applied without safeguards. To ensure responsible adoption, institutions must balance innovation with ethical governance, strengthen staff and student competencies, and invest in training, infrastructure, and policy frameworks. Ultimately, AI/ML should be positioned not as replacements for educators but as partners in advancing pedagogy and broadening access to interactive learning.

Limitations and Future Works

The study is limited by its focus on three PHEIs and a small number of qualitative interviews, and this can restrict the generalisability of the findings. Future studies could include more than one institution type, larger participant samples, and longitudinal analyses to determine the long-term impact of AI/ML tools on teaching and learning. In addition, further studies need to examine robust ways of integrating ethical frameworks, building staff digital literacy, and addressing algorithmic bias in different learning environments.

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