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ChatGPT integration significantly boosts personalized learning outcomes: A Philippine study

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Abstract

This study investigated the impact of AI integration, specifically ChatGPT, on personalized learning involving 785 college students in the Philippines who took the online survey. Utilizing regression analysis and an Omnibus ANOVA test, the study examined the influence of AI Integration alongside demographic variables such as age, sex, educational level, and type of school on personalized learning. Results indicate that AI integration can explain a substantial portion of the variability in personalized learning outcomes (approximately 88.54%). Specifically, ChatGPT demonstrates a significant positive effect on personalized learning, suggesting that as ChatGPT integration increases, personalized learning experiences also increase. However, demographic variables such as age, sex, educational level, and type of school show minimal effects on personalized learning outcomes, except for a potential trend for higher scores in private universities and colleges compared to state universities and colleges. These findings underscore the pivotal role of AI technologies, like ChatGPT, in enhancing personalized learning experiences while highlighting the need for further exploration of contextual factors influencing educational outcomes. The implications extend beyond the study to offer insights for educational stakeholders and policymakers, emphasizing the potential benefits of AI-driven personalized learning initiatives. However, limitations such as sample characteristics, measurement bias, and technology accessibility should be addressed in future research endeavors to maximize the benefits of AI integration in education.

Keywords: *AI integration, ChatGPT, flow experience, learning engagement, personalized learning, quality of learning*

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1. Introduction

As higher education evolves to accommodate more adaptable and flexible career paths, personalized learning becomes increasingly vital in reflecting the diverse needs and expectations of students (Gunnoo, 2022; Hardy, 2023; Parikh, 2023). This shift towards individualized learning aligns with the growing demand for education that mirrors the personalized experiences offered by modern Artificial Intelligence (AI) technologies such as ChatGPT (Fütterer et al., 2023), there is a unique opportunity to reshape higher education by offering more adaptable, interactive, and student-centered learning experiences (Naik, 2023; Tulsiani, 2024; Estrellado & Millar, 2023). However, while the potential benefits of ChatGPT in personalized learning are vast (Mai et al., 2024; Montenegro-Rueda et al., 2023; Javaid et al., 2023; Cacicio & Riggs, 2023; Rejeb et al., 2024; Jo, 2024; Ahmed, 2023; Wu et al., 2024), challenges such as ensuring learning quality, engagement, interests, and academic integrity must be carefully considered (Tulsiani, 2024; Yu, 2024; Taani & Alabidi, 2024; Hasanein & Sobaih, 2023; Bin-Nashwan et al., 2023; Zeb et al., 2024; Michel-Villarreal et al., 2023; Zhang & Tur, 2023; Dempere et al., 2023; Kiryakova & Angelova, 2023; Jeyaraman et al., 2023; Islam & Islam, 2024; Gustilo et al., 2024; Labadze et al., 2023; Crompton & Burke, 2024; Liu et al., 2023). Despite these challenges, the integration of ChatGPT into higher education promises to fundamentally transform the learning experiences, preparing students for a future where AI plays an integral role in both work and life (Margarella, 2023; Tulsiani, 2024).

Personalized learning through AI integration has emerged as a promising approach to tailor education to the individual needs of learners (Rouhiainen, 2019; Katiyar et al., 2024; Bhutoria, 2022; Kamalov et al., 2023; Gligorea et al., 2023). Existing literature has highlighted the potential benefits of AI-driven personalized learning, emphasizing increased learner engagement (Sabzalieva & Valentini, 2023), enhanced retention rates, and improved academic performance (Jian, 2023; Ayeni et al., 2024). However, despite these advancements, there remains a critical gap in understanding the precise methodologies and mechanisms necessary to optimize the integration of AI into personalized learning frameworks (Asirit & Hua, 2023).

This study aimed to gather empirical evidence on the impact of AI integration, specifically the use of ChatGPT, on learners' personalized learning experiences. The research sought to contribute basis to the development of effective teaching strategies and interventions aimed at improving students' educational outcomes. By examining the relationship between AI

integration and indicators of personalized learning, the study aimed to determine if a significant linear relationship exists between the two variables. Additionally, the regression model employed in the study involved regressing the dependent variables representing indicators of personalized learning on the independent variables representing AI integration, while controlling for demographic variables. This approach allowed for an examination of the strength and direction of the relationships between the variables while considering the potential influence of demographic factors.

2. Literature Review

2.1. ChatGPT in Learning

The integration of ChatGPT in educational settings has sparked significant interest due to its potential to revolutionize learning experiences. Fütterer et al. (2023) delve into global reactions to ChatGPT's release, uncovering extensive discussions among educators regarding its advantages and concerns. Understanding these reactions is pivotal for identifying opportunities and challenges in integrating ChatGPT into education, underscoring the necessity for well-informed policy decisions and guidelines. For instance, Sabzalieva and Valentini (2023) demonstrate the diverse applications of ChatGPT in higher education, spanning teaching, learning experiences, research, and administration. While it enhances the learning process and streamlines administrative tasks, concerns about academic integrity, privacy, and accessibility highlight the importance of ethical regulation. However, ethically adapting ChatGPT can yield personalized learning experiences, administrative efficiency, research advancements, and community engagement, aligning with the objectives of the present study. Additionally, Margarella (2023) highlights ChatGPT's role as a virtual tutor, simplifying lesson planning and facilitating personalized interactions. Through structured prompts, educators can tailor interactions to individual needs, enriching dynamic learning environments, which resonates to explore personalized learning through AI integration in this study.

In Asirit and Hua's (2023) examination of AI awareness among college students in the Philippines, the findings underscored the importance of tailored AI education programs. These programs are seen as crucial in addressing knowledge gaps and preparing students for an AI-

driven future. These insights directly inform the development of personalized AI education programs, aligning perfectly with the focus of the present study on personalized learning through AI integration. Furthermore, Rejeb et al. (2024) delve into public sentiment regarding ChatGPT's impact on education. They highlight benefits such as improved writing abilities and the creation of interactive learning environments. This supports the hypothesis that AI integration, particularly ChatGPT, can enhance personalized learning experiences.

2.2. Personalized Learning

In higher education, personalized learning has emerged as a critical strategy to address the diverse needs of students, enhance engagement, and improve learning outcomes. For example, Parikh (2023) argues that personalized learning empowers educators to tailor experiences, utilizing responsive learning management systems and asynchronous learning arrangements to accommodate various student demographics. Similarly, Hardy (2023) underscores the importance of personalized learning in meeting evolving student expectations and fostering engagement. The systematic reviews by Yuyun and Suherdi (2023) and Zhong (2022) delve into the key components and design elements of personalized learning, laying the groundwork for understanding its implementation. Furthermore, Claned (2024) explores the transformative potential of AI in personalized education, offering adaptive learning experiences and personalized instruction to deepen engagement and improve outcomes. Several empirical studies showed the positive effects of personalized learning on learning enjoyment (Mötteli et al., 2023), motivation and engagement (Makhambetova et al., 2021; Gunawardena et al., 2024; Reber et al., 2018; Schmid et al., 2022), academic performance (Makhambetova et al. 2021; Phillips, 2023; Trevino, 2020; Onyenma et al., 2024) and achievement of learning outcomes (Abedi et al., 2021; Major et al., 2021; Thomas, 2023).

According to Ayeni et al. (2024), the integration of AI in education promises to revolutionize personalized learning. Through adaptive content delivery, intelligent tutoring systems, and other AI-driven technologies, personalized learning experiences are tailored to meet individual student needs, enhancing engagement and academic performance. The integration of AI in personalized learning presents new avenues for enhancing educational experiences. Gathering insights from empirical study, Dawes (2023) concludes that AI unlocks valuable insights into student behaviors and enhances teaching quality while Chawla (2024) suggested the transformative potential of generative AI by showcasing its ability to provide

tailored learning experiences and enhance engagement and quality. By leveraging AI, educators can offer adaptive learning pathways, personalized instruction, and instant feedback, ultimately revolutionizing traditional teaching methods and preparing students for an AI-driven future.

2.3. Theoretical and Conceptual Framework

This study is grounded in the Cognitive Load Theory (CLT) by Sweller et al. (2011), which suggests that learning is influenced by the cognitive load imposed on learners. AI integration in learning such as the use of ChatGPT, can help manage the cognitive load by providing adaptive learning experiences tailored to individual student needs, thus being viewed to optimize learning efficiency (Tulsiani, 2024). Drawing from the tenets of CLT, this study examined intrinsic cognitive load through the complexity of learning content and the cognitive effort demanded for comprehension. Furthermore, the investigation into extraneous cognitive load delves into the efficacy of instructional strategies in alleviating cognitive burden, alongside an assessment of the clarity and coherence of instructional materials to minimize distractions. Moreover, explicit teaching strategies, such as explicit instruction and structured practice activities, are explored for their role in providing clear guidance and reducing cognitive load, particularly for novice learners (Sweller et al., 2011). These indicators shed light on the influence of AI integration on learners' cognitive load management and their overall learning experiences.

On the other hand, the Flow Theory as proposed by Csikszentmihalyi (1990), describes the state of deep engagement and immersion in an activity. Personalized learning experiences tailored to students' abilities and interests through AI integration can foster flow states, leading to enhanced learning outcomes and satisfaction (Rouhiainen, 2019). This theory encompasses the dependent variables, which include the measurement of flow experiences. This involves assessing participants' self-reported experiences of being in a state of flow during learning activities. Furthermore, optimal learning engagement is evaluated by assessing participants' levels of engagement, focus, and enjoyment during learning tasks. Finally, the quality of the learning experience is examined by exploring participants' perceptions of the overall effectiveness and quality of the learning process.

The research of Naik (2023) provides crucial insights into the transformative potential of personalized learning paths facilitated by AI, aligning with the core principles of the regression analysis framework. By grounding the study in a theoretical framework integrating personalized learning principles, cognitive psychology, and AI algorithms, Naik establishes a solid foundation for understanding the positive correlation identified between AI-driven personalized learning paths and improved academic performance, engagement, and retention underscores the relevance of AI integration in optimizing personalized learning experiences.

Figure 1

Conceptual Framework

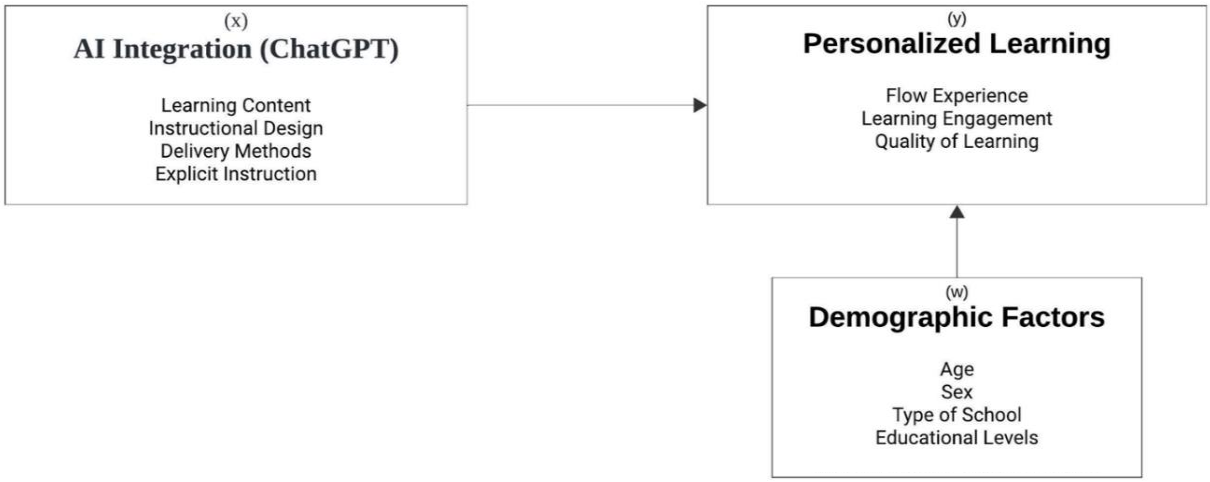

Figure 1 displays the conceptual framework of this study. This study employs a linear regression framework to examine the relationship between AI integration and personalized learning in higher education settings while considering the influence of demographic variables. The independent variables represent different aspects of AI integration, including learning content, instructional design, delivery methods, and explicit instruction facilitated by ChatGPT. These variables are hypothesized to impact personalized learning experiences, operationalized through flow experience, learning engagement, and quality of learning. By controlling for demographic factors such as age, sex, type of school, and educational levels the study aims to isolate the effects of AI integration on personalized learning outcomes.

3. Methodology

3.1. Research Design

This study employed a correlational research design (Sutradhar et al., 2023) to explore the relationship between AI integration, particularly ChatGPT, and personalized learning outcomes in higher education. Utilizing a cross-sectional approach (Wang & Cheng, 2020), data is collected at a single time point to assess how the variable are correlated. The primary variables in the linear regression analysis (Bevans, 2023) include ChatGPT utilization and personalized learning outcomes, measured by the flow of experience, learning engagement, and quality of learning. Demographic variables such as age, gender, educational level, and institution type are controlled to isolate the impact of AI integration on personalized learning outcomes. This is important because these factors can influence learning experiences, and controlling them ensures that the effects attributed to AI integration are not confounded by demographic differences (Hammer, 2011).

3.2. Respondents

The respondents for this study were college students in the Philippines through survey invitation email to participate (Lau, 2019). The selection was based on their fulfilment of the inclusion criteria; those who did not meet the criteria were excluded from data analysis (Dekkers et al., 2022). The study involved a sampling frame of 785 unduplicated students (262 State Universities and Colleges [SUCs], 260 Local Universities and Colleges [LUCs], and 263 Private Universities and Colleges [PUCs]), which exceeds the commonly accepted minimum sample size for linear regression analysis. According to de Longeaux (2021), a sample size of at least 500 is recommended to ensure robust and reliable regression estimates. The inclusion criteria encompassed students enrolled in any college courses in SUCs, LUCs, or PUCs, who have utilized ChatGPT in their learning tasks across online, hybrid, or asynchronous classes. Participants were informed as to the voluntary nature of the study.

3.3. Research Instrument

The research questionnaire utilized in this study consists of three parts: Part A focused on gathering respondents' demographic profiles, Part B assessed ChatGPT as the independent variable (IV) across all indicators including learning content, instructional design, delivery methods, and explicit instruction. This section utilizes a 5-point Likert scale ranging from "Poor" to "Excellent" for each indicator, with a total of 25 items (Mcleod, 2023). Part C

evaluated personalized learning, comprising three components: A) flow experience, adopted from the Flow Short Scale (FSS) (Rheinberg et al., 2003), with 13 items rated on a scale of 1 to 7 indicating worry score from "not at all" to "very much"; B) learning engagement, and C) quality of learning, both of which are researcher-made measures. Each of these sections employs a 5-point Likert scale ranging from "very dissatisfied" to "very satisfied" for satisfaction assessment, with 12 items each (Mcleod, 2023). The validity of the instrument was ensured through expert validation involving five experts (Elangovan & Sundaravel, 2021), while reliability was established with an internal consistency alpha of .93 (Bobbitt, 2023).

3.4. Data Collection Procedure

Data collection involved administering an online survey through college research offices, with informed consent obtained from participants. Informed consent was documented via digital signatures using JotForm, ensuring that participants understood the study's purpose, procedures, and their rights. Respondents were screened based on inclusion criteria to ensure eligibility, specifically enrollment in SUCs, LUCs, or PUCs in the Philippines and prior use of ChatGPT as instructed by their professors in their learning tasks. Reminders were sent to non-responders to boost participation rates. Eligible responses were included in the analysis based on the inclusion criteria.

3.5. Data Analysis

The data analysis procedure started with assumption checking to ensure the data meets linear regression requirements (Statisticslaerd, 2018). Upon confirmation of meeting assumptions, linear regression analysis is conducted to explore the relationship between AI integration aspects and personalized learning outcomes (Kanade, 2023). This analysis is performed using Jamovi statistical software (RCoreTeam, 2021; TheJamoviProject, 2022). Finally, results are interpreted to understand the significance of AI integration on personalized learning outcomes in higher education.

3.6. Ethical Considerations

This study rigorously followed the ethical guidelines delineated by Williams (2023) to ensure the responsible and respectful gathering of data through surveys. In line with these principles, participants are provided with comprehensive information about the survey's

objectives and their involvement, thereby obtaining informed consent. Upholding the paramount importance of confidentiality and anonymity, stringent measures, including the use of JotForm with encrypted data storage, are implemented to safeguard participants' privacy and ensure that individual responses remain secure and unidentifiable. Moreover, the survey design meticulously avoided bias and leading questions, maintaining neutrality to uphold the integrity of the data collected. Inclusivity across diverse demographics and backgrounds was also prioritized, ensuring a comprehensive representation of perspectives. Through transparent communication, participants were fully informed about the survey's purpose and the intended use of the data collected, fostering trust and credibility.

4. Results and Discussion

Integrating ChatGPT into educational settings holds the promise of revolutionizing personalized learning experiences (Carr, 2023). ChatGPT, an advanced AI model developed by OpenAI, offers educators innovative tools to tailor instruction and enhance individualized learning pathways. By simulating human-like conversation and providing intelligent responses, ChatGPT facilitates personalized support, immediate feedback, and expanded access to information. This section presents the results and discussion that delves into the empirical evidence and implications of ChatGPT on personalized learning, shedding light on its effectiveness and relevance in contemporary educational practices.

Table 1 presents the model fit measures for the regression analysis examining the impact of ChatGPT on personalized learning.

Table 1

Model Fit Measures

Model	R	R^2	Adjusted R^2	RMSE	F	df1	df2	p
1	0.941	0.8854	0.8845	0.191	4.74	10	774	< .001

The high R^2 value of 0.8854 suggests that a substantial portion, approximately 88.54%, of the variability in personalized learning outcomes can be explained by the integration of

ChatGPT, along with other variables in the model. This underscores the pivotal role of AI integration in shaping personalized learning experiences, as highlighted by Zhai (2023), who emphasizes the transformative potential of AI in education. Moreover, the statistically significant F-statistic and low p-value (< 0.001) reinforce the reliability and validity of the regression model as a whole. This indicates that the model effectively captures the relationship between AI integration and personalized learning outcomes, aligning with Montenegro-Rueda et al. (2023), who assert that AI technologies, including ChatGPT, have a positive impact on teaching and learning processes. Additionally, the low root mean square error (RMSE) of 0.191 suggests that the regression model has good predictive accuracy. This means that educators can confidently utilize the model to inform decisions regarding the implementation of AI integration strategies aimed at improving personalized learning experiences for students. This echoes the findings of Albdrani and Al-Shargabi (2023), who demonstrate the potential of ChatGPT in providing personalized learning experiences, albeit with careful attention to ethical considerations. Overall, the findings underscore the significant potential of AI integration in enhancing personalized learning outcomes in educational settings. By leveraging AI technologies effectively, educators can create dynamic and tailored learning environments that cater to individual student needs, ultimately fostering improved student engagement, performance, and overall learning experiences.

The Omnibus ANOVA test in table 2 was conducted to examine the collective impact of ChatGPT, age, sex, educational level, and type of school on personalized learning. The results indicate that ChatGPT significantly influences the dependent variable, as evidenced by a high F-value of 41.305 ($p < .001$). However, age, sex, educational level, and type of school do not demonstrate significant effects, with p-values above the commonly accepted threshold of .05. This implies that, within the context of the study, demographic variables such as age, sex, educational level, and type of school do not significantly influence the dependent variable. In other words, the personalized learning outcomes or the impact of ChatGPT on the dependent variable are not substantially affected by these demographic factors. Therefore, the effectiveness of personalized learning experiences facilitated by AI integration appears to be consistent across different demographic profiles, suggesting a degree of universality in its applicability.

Table 2

Omnibus ANOVA Test

	Sum of Squares	df	Mean Square	F	p
AI Integration (ChatGPT)	1.5288	1	1.5288	41.305	< .001
Age	0.0308	2	0.0154	0.416	0.660
Sex	0.0407	2	0.0203	0.549	0.577
Educational Level	0.0722	3	0.0241	0.650	0.583
Type of School	0.1122	2	0.0561	1.516	0.220
Residuals	28.6470	774	0.0370		

Note. Type 3 sum of squares

These findings align with research by Das and Malaviya (2023) on the impact of AI-driven personalisation on learners' performance, which demonstrates the positive correlation between personalized AI-based adaptive learning and improved academic achievement, learning engagement, and quality of learning. The results emphasize the transformative potential of AI-driven personalization in education, particularly through platforms like ChatGPT, to enhance personalized learning outcomes.

The model coefficients for personalized learning are presented in table 3, to assess the impact of various predictors, including ChatGPT, age, sex, educational level, and type of school, on the dependent variable. The results indicate that ChatGPT has a significant positive effect on personalized learning, with an estimated coefficient of 0.13373 (SE = 0.0208, $p < .001$). This suggests that as ChatGPT increases by one unit, personalized learning experiences increase by approximately 0.13373 units, holding other variables constant. Regarding demographic variables, age, sex, educational level, and type of school show mixed effects on personalized learning. Age groups 20-21 years old and above 22 years old do not significantly differ from below 19 years old in their impact on personalized learning ($p > .05$). Similarly, sex (female and non-binary) and different educational levels (second, third, and fourth year compared to the first year) also do not have significant effects on personalized learning ($p > .05$). However, the type of school shows some notable differences. Specifically, being enrolled in PUCs compared to SUCs demonstrates a trend towards significance ($p = 0.082$), suggesting that students in PUCs may have slightly higher personalized learning scores.

Table 3

Model Coefficient – Personalized Learning

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept [a]	4.2874	0.1008	42.54366	< .001	
AI Integration (ChatGPT)	0.1337	0.0208	6.42689	< .001	0.2257
Age:					
20-21 years old – Below 19 years old	-0.0031	0.0169	-0.18843	0.851	-0.0161
Above 22 years old – Below 19 years old	0.0113	0.0172	0.66099	0.509	0.0577
Sex:					
Female – Male	0.0185	0.0177	1.04619	0.296	0.0941
Non-binary – Male	0.0078	0.0164	0.47514	0.635	0.0397
Educational Level:					
Second Year – First Year	0.0189	0.0199	0.95447	0.340	0.0964
Third Year – First Year	0.0195	0.0199	0.98375	0.326	0.0992
Fourth Year – First Year	-6.47e−	0.0194	-0.00333	0.997	-3.28e−4
Type of School:					
LUCs – SUCs	0.0154	0.0170	0.91084	0.363	0.0785
PUCs – SUCs	0.02906	0.0167	1.74042	0.082	0.1476

[a] *Represents grand mean*

In summary, while ChatGPT significantly influences personalized learning, demographic variables such as age, sex, educational level, and type of school have minimal effects, except for a potential trend for higher scores in PUCs compared to SUCs. These findings underscore the importance of AI technologies like ChatGPT in enhancing personalized learning experiences while highlighting the need for further exploration of contextual factors influencing educational outcomes. As mentioned by Igbokwe (2023), the application of artificial intelligence (AI) in educational management has immense potential to revolutionize the field of education. AI-powered tools can not only personalize the learning experience but also streamline administrative tasks, automate grading and assessments, and optimize resource allocation.

5. Conclusion

The integration of AI into educational settings holds significant potential for revolutionizing personalized learning experiences, explaining approximately 88.54% of the variability in personalized learning outcomes. The results indicated that ChatGPT has a significant positive effect on personalized learning; this suggests that as the use of ChatGPT increases by one unit, personalized learning experiences increase by approximately 0.13373 units, holding other variables constant. These findings underscore the pivotal role of AI integration in enhancing personalized learning outcomes, aligning with previous research on the transformative potential of AI in education.

Integrating AI technologies like ChatGPT into educational settings has the potential to enhance personalized learning experiences and improve student outcomes. By leveraging AI-driven personalized learning, educators can create dynamic and tailored learning environments that cater to individual student needs, fostering improved student engagement, performance, and overall learning experiences. However, it is crucial to acknowledge the limitations of the study and consider factors such as technology accessibility, measurement bias, and the need for continuous evaluation when implementing AI-driven personalized learning initiatives. Policymakers should consider these findings when designing and funding educational programs, ensuring that AI integration is equitable and accessible to all students. Given the ethical concerns associated with AI technologies, educators and policymakers create transparency measures, such as detailed documentation of how AI systems make decisions and periodic public reports on the performance and fairness of AI tools. Additionally, establish clear accountability channels where students and parents can report and address concerns regarding AI usage.

Future research should explore long-term impacts, scalability, and the effectiveness of AI tools across diverse educational settings to build a comprehensive understanding of AI's role in education. By addressing these areas, it can better harness AI's potential to transform learning and achieve more inclusive and effective educational outcomes. Future studies should delve deeper into assessing how AI can adapt to various learning styles (e.g., visual, auditory, kinesthetic) and what adjustments are necessary to make AI tools more effective for different

types of learners. Experimental studies could test the efficacy of AI customization features tailored to individual learning preferences.

Educational institutions should invest in professional development programs to equip educators with the necessary skills and knowledge to effectively leverage AI technologies in teaching and learning. Training initiatives should focus on enhancing educators' ability to evaluate AI tools, ethical decision-making, and pedagogical strategies aligned with AI integration. Implement continuous assessment frameworks that track academic performance over time, allowing educators to identify trends, measure progress, and adjust AI-driven interventions accordingly. This could involve standardized testing, formative assessments, and performance-based tasks.

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