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Lighting the Path: Enhancing Student Acceptance of Artificial Intelligence-Assisted Tutoring in Open, Distance, and Digital Education Higher Institutions

Zahir Osman*
Open University Malaysia, Faculty of Business & Management
*Corresponding Author Email: zahir_osman@oum.edu.my

Aliza Ali
Faculty of Education, Open University Malaysia
Email: aliza_ali@oum.edu.my

Raziana Che Aziz
Faculty of Technology and Applied Sciences, Open University Malaysia
Email: raziana@oum.edu.my

Hamidah Mat
Faculty of Social Sciences & Humanities, Open University Malaysia
Email: hamidah_mat@oum.edu.my

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Abstract

This study emphasises the crucial role of AI-assisted tutoring acceptance among students in Open Distance Digital Education (ODDE) higher institutions, highlighting its potential to significantly enhance learning experiences and outcomes in digital environments. As technological integration becomes increasingly vital in education, understanding factors that influence students' acceptance is essential for the effective implementation and adoption of AI tools. The study aims to investigate the relationships between perceived usefulness, perceived ease of use, and student engagement as they influence acceptance of AI-assisted tutoring, with engagement serving as a mediating variable. Data were collected through a structured survey distributed via purposive sampling to 492 students across various ODDE institutions. The analysis employed Partial Least Squares-Structural Equation Modelling (PLS-SEM) to assess the hypothesised relationships and path coefficients. Results revealed that perceived usefulness had a strong, direct impact on acceptance, while perceived ease of use influenced acceptance indirectly through student engagement; both relationships were

statistically significant. Specifically, the study confirmed that empowering students with easy-to-use, valuable AI tools and fostering engagement can significantly boost acceptance levels. Future research should explore the longitudinal effects of AI adoption and include qualitative insights to better understand barriers and motivators. Practically, the findings suggest that higher education policymakers should focus on designing user-friendly AI systems, providing continuous training, and implementing engagement strategies like gamification and interactive activities to foster acceptance.
Keywords: Perceived Ease of Use, Perceived Usefulness, Students' Engagement, Acceptance

Introduction

Artificial intelligence (AI)-Assisted Tutoring in Open Distance Digital Education (ODDE) is increasingly recognised as a transformative approach, enhancing learning experiences and outcomes for students globally (Ali et al., 2024; Zhang & Hou, 2024). The integration of AI technologies in education offers personalised learning pathways, real-time feedback, and adaptive environments, which are crucial for remote learners (Al-Dokhny et al., 2024). However, the acceptance intention among students in these settings is complex, influenced by technological familiarity, perceived usefulness, and trust in AI systems (Supriyanto et al., 2024). Current issues and trends indicate that while AI can significantly support learning, students' acceptance intentions aren't solely determined by the technology's capabilities (Intaratat et al., 2024). Factors such as cultural acceptance, digital literacy levels, and privacy concerns play pivotal roles (Mohsin et al., 2024; Almogren et al., 2024). Geographical differences illustrate that technologically advanced regions tend to show higher adoption rates (Jeilani & Abubakar, 2025). Institutions are exploring blended models that combine human and AI tutors, addressing AI's limitations like a lack of emotional intelligence (Wang & Yu, 2025; Qi & Li, 2023). Research gaps focus on several key areas. There are limited longitudinal studies that track AI tutoring impacts over time within ODDE, crucial for holistic evaluation (Tian et al., 2024). More culturally specific acceptance models are needed, given the wide variance in AI adoption across educational cultures and socio-economic contexts (Pan et al., 2024). While technical efficacy is often highlighted, psychological and social dimensions impacting acceptance require more exploration (Jeilani & Abubakar, 2025). The significance of studying AI-assisted tutoring acceptance is profound for stakeholders. Policymakers can gain evidence-based insights for implementing AI technologies in education, ensuring equitable access and addressing privacy issues (Ali et al., 2024). ODDE institutions can leverage findings to enhance student engagement and learning outcomes, tailoring AI solutions to align with institutional goals and student needs (Zhang & Hou, 2024). Academicians benefit from understanding AI's impact on learning processes, aiding curriculum development that effectively integrates AI (Al-Dokhny et al., 2024). Students gain the most as AI offers personalized learning experiences catering to individual needs, pace, and learning styles, enhancing educational outcomes and satisfaction (Supriyanto et al., 2024; Wang & Yu, 2025). By thoroughly addressing the factors influencing acceptance intentions, this study aims to facilitate smoother AI-assisted tutoring integration in ODDE, contributing to a more effective, inclusive educational landscape globally (Ali et al., 2024; Pan et al., 2024). This study aims to assess the direct and indirect relationship between perceived usefulness and perceived ease of use with AI-assisted tutoring acceptance Intention with students' engagement as a mediator among students in Open, Distance, and Digital Education (ODDE) Higher Institutions.

Literature Review

Underpinning Theory

The Technology Acceptance Model (TAM), developed by Davis (1989), posits that perceived usefulness and perceived ease of use are primary determinants of an individual's intention to adopt new technology. Perceived usefulness refers to the degree to which a person believes that using a particular system will enhance their performance, while perceived ease of use pertains to the effortlessness associated with system use. These perceptions influence users' attitudes, which then shape their behavioural intention to use the technology, ultimately leading to actual adoption (Davis, 1989). Self-Determination Theory (SDT), developed by Deci and Ryan (1985), emphasises the importance of intrinsic motivation, autonomy, and competence in driving human behaviour. Central to SDT is the concept of psychological needs autonomy, competence, and relatedness that must be fulfilled to foster sustained engagement and motivation. When individuals feel competent and autonomous in their interactions with technology, they are more likely to develop internal motivation to engage actively with it (Deci & Ryan, 1985). Combining TAM with SDT provides a comprehensive framework for understanding technology acceptance. TAM explains how perceptions influence behavioural intentions, while SDT adds the motivational dimension, proposing that perceived ease of use and perceived usefulness can enhance feelings of competence and autonomy, thereby increasing engagement. The link between perceived ease of use and engagement suggests that when users find systems accessible and easy to navigate, their intrinsic motivation and engagement deepen, which, in turn, promotes acceptance. Thus, integrating TAM with SDT offers a nuanced view of both cognitive and motivational factors influencing technology adoption.

Relationship between Perceived Ease of Use, Students' Engagement & Intention to Accept

The relationship between perceived ease of use, students' engagement, and acceptance intention of AI-assisted tutoring among students in higher education is complex yet interconnected. Perceived ease of use refers to how effortlessly students perceive interacting with AI tutoring systems. When these systems are user-friendly and intuitive, students are more likely to develop positive intentions to use them, supported by recent studies highlighting the importance of perceived institutional support and perceived learning outcomes in shaping acceptance (Jeilani & Abubakar, 2025). This ease reduces frustration and cognitive effort, encouraging engagement and adoption. Students' engagement influences their motivation and involvement in the learning process. When students are actively engaged, they are more receptive to adopting new technologies, which fosters a positive attitude toward AI tools (Almulla, 2024). Engagement acts as a mediating factor, strengthening the relationship between perceived ease of use and acceptance intention. Studies also indicate that acceptance of AI systems like ChatGPT in higher education is significantly influenced by engagement, perceptions of usefulness, and ease of use (Almogren et al., 2024; Moradi, 2025). Creating an environment that fosters engagement by designing user-friendly systems and providing adequate training can enhance students' willingness to incorporate AI-assisted tutoring into their learning activities (Dahri et al., 2024). Higher education institutions that focus on these aspects can improve acceptance rates and promote effective use of AI tools, ultimately leading to better educational outcomes (Supriyanto et al., 2024). *Therefore, the following hypotheses were proposed for this study:*

H1: There is a relationship between perceived ease of use and intention to accept AI-

assisted tutoring among students in the open, distance, digital education higher institutions.

H2: There is a relationship between perceived ease of use and students' engagement towards the intention to accept AI-assisted tutoring among students in the open, distance digital education higher institutions.

H3: There is a mediating effect of students' engagement on the relationship between Perceived ease of use and intention to accept AI-assisted tutoring among students in the open, distance, and digital education higher institutions.

Relationship between Perceived Usefulness, Students' Engagement & Intention to Accept

The relationship between perceived usefulness, students' engagement, and acceptance intention of AI-assisted tutoring among students in higher institutions is interconnected and dynamic. Perceived usefulness refers to the belief that using AI tutoring systems will enhance learning outcomes and improve academic performance (Nguyen et al., 2025). When students recognise the benefits and value of AI tools, their motivation to adopt and consistently use these systems increases (Gao et al., 2025). Students' engagement, which reflects their active involvement and motivation in learning, plays a crucial role in shaping acceptance (Mohamad & Osman, 2025). Engaged students are more likely to develop positive attitudes toward using AI tools regularly, as their active participation enhances their willingness to embrace new technologies (Huang et al., 2024). The stronger their level of engagement, the more inclined they are to interact and invest in AI-assisted tutoring as a vital part of their learning process (Duy et al., 2025). This relationship suggests that boosting students' perception of usefulness and fostering higher levels of engagement through targeted training and supportive environments can significantly enhance their willingness to accept and adopt AI-driven educational solutions (Acosta-Enriquez et al., 2024). Essentially, when students see real value in AI tools and feel actively involved in their use, their acceptance intention is likely to be higher, leading to better integration of AI-assisted tutoring into higher education learning practices (Ni & Cheung, 2023). *Thus, the following hypotheses were proposed for this study:*

H4: There is a relationship between perceived usefulness and intention to accept AI-assisted tutoring among students in the open, distance, digital education higher institutions.

H5: There is a relationship between perceived usefulness and students' engagement towards the intention to accept AI-assisted tutoring among students in the open, distance digital education higher institutions.

H6: There is a relationship between students' engagement and intention to accept AI-assisted tutoring among students in the open, distance, digital education higher institutions.

H7: There is a mediating effect of students' engagement on the relationship between perceived usefulness and intention to accept AI-assisted tutoring among students in the open, distance, and digital education higher institutions.

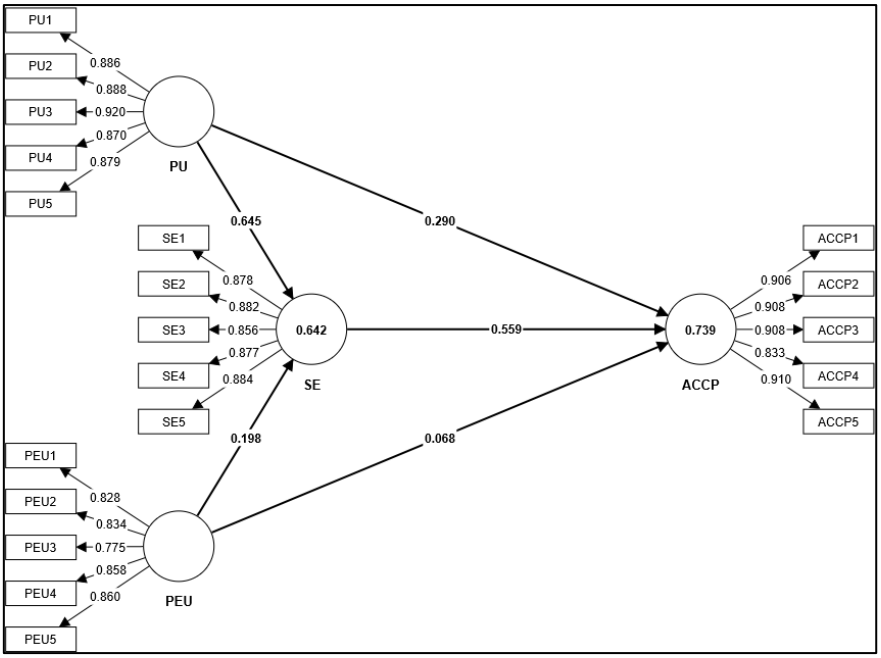

Figure 1: Research Model

Note: PU=Perceived Usefulness PEU=Perceived Ease of Use SE=Students' Engagement ACCP=Acceptance

Methodology

This research sought to thoroughly examine both the direct and indirect effects of perceived ease of use, perceived usefulness, and AI tutoring acceptance intention, with students' engagement serving as a mediator, among learners in open, distance, and digital higher education institutions. To accomplish this, a survey was conducted to collect primary data, with the measurement instruments carefully selected after a comprehensive review of existing literature to ensure reliability and validity. The questionnaires were distributed via email to targeted participants using purposive sampling, due to the lack of a complete sampling frame. A total of 20 observed variables were analyzed, including exogenous variables such as perceived ease of use (5 items) and perceived usefulness (5 items), adapted from Davis (1989). The mediator identified was students' engagement, based on Deci and Ryan (1985) (5 items), while the dependent variable was intention to accept, drawn from Venkatesh and Davis (2000) (5 items). Participants responded to each item using a five-point Likert scale from strongly disagree to strongly agree. From 691 distributed surveys, 536 usable responses were received, resulting in a response rate of 77.5%, which was adequate for structural equation modelling (SEM). Of these, 492 responses met the quality criteria for analysis. Data analysis and hypothesis testing were performed using SmartPLS 4 software, renowned for its effectiveness in SEM techniques, due to its strong assessment features and ability to handle complex multivariate data, aligning with the study's aims and following the guidelines set by Ringle et al. (2022). This software facilitated detailed evaluation of both measurement and structural models, allowing for a comprehensive testing of the proposed hypotheses.

Data Analysis

Respondents Profile

The study's demographic data offers a snapshot of participant characteristics. Females comprise 66.5% of the sample, with males at 33.5%, indicating a gender imbalance. Age-wise, the majority are younger adults, with 35.4% under 30 and 40.2% between 31 and 40 years, highlighting a youthful demographic. Representation drops significantly in the older age groups, with only 4.7% aged 51-60 and 1.6% over 60, suggesting the focus is on early to mid-career learners. In terms of study year, first-year students form the largest group at 34.6%, followed by second-year (21.1%) and third-year students (17.5%). The numbers decline with advanced years, indicating fewer students in later stages. This trend could point to program attrition rates or the accelerated completion of studies. Regarding program level, 57.3% are enrolled in Bachelor programs, with 20.1% in Master's, 14.6% in Diplomas, and fewer in Doctoral (7.7%) and Certificate (0.2%) programs. The high concentration in undergraduate studies suggests that findings may largely reflect the experiences and intentions of Bachelor students. Overall, the 492 respondents provide a valuable overview for analyzing perceived usefulness, engagement, and acceptance intention of AI-assisted tutoring in higher education.

Common Method Bias

Based on the table provided, an analysis of common method bias is conducted using full collinearity variance inflation factors (VIF), as recommended by Kock and Lynn (2012) and Kock (2015). Generally, VIF values should be below 3.3 to suggest minimal common method bias. In this analysis, the VIF values for most constructs hover around this threshold. For acceptance, a VIF of 3.243 with perceived usefulness is noted. Similarly, perceived usefulness exhibits a VIF of 3.273 concerning acceptance. Students' engagement shows VIF values ranging between 2.608 and 3.157 concerning the other constructs. Although some values are close to 3.3, none exceed it, suggesting that common method bias is not a significant concern. The results indicate that multicollinearity is reasonably controlled, providing confidence in the study's findings regarding perceived ease of use, perceived usefulness, students' engagement, and acceptance intention of AI-assisted tutoring. This approach aligns with best practices for ensuring reliable and valid research outcomes.

Table 1
Full Collinearity (VIF)

	ACCP	PEU	PU	SE
ACCP		3.243	3.281	2.608
PEU	2.216		1.893	2.195
PU	3.273	3.022		3.195
SE	2.778	3.157	3.015	

Measurement Model

The analysis of construct reliability and validity based on the provided table focuses on evaluating Cronbach's alpha, composite reliability (CR), average variance extracted (AVE), and item loadings, following the guidelines of Hair et al. (2019). For the construct "Acceptance," Cronbach's alpha is an impressive 0.937, indicating excellent internal consistency, while the composite reliability is slightly higher at 0.941. The AVE of 0.798 suggests a high level of convergent validity, as values above 0.50 are considered acceptable. Item loadings for this

construct range from 0.833 to 0.910, all well above the recommended threshold of 0.70, confirming strong indicator reliability. For "Perceived Ease of Use," the Cronbach's alpha is 0.888 and CR is 0.893, both demonstrating satisfactory reliability. The AVE is 0.692, surpassing the acceptable minimum and indicating robust convergent validity. Loadings vary from 0.775 to 0.860, ensuring reliable indicator measurements. The "Perceived Usefulness" construct shows high reliability with a Cronbach's alpha of 0.933 and composite reliability of 0.934. An AVE of 0.790 supports the construct's convergent validity, with item loadings ranging from 0.870 to 0.920, underscoring strong reliability. Lastly, "Students' Engagement" reports a Cronbach's alpha of 0.924 and CR of 0.925, reaffirming strong internal consistency. The AVE of 0.766 indicates sound convergent validity, and item loadings between 0.856 and 0.884 confirm robust measurement reliability. Overall, the constructs demonstrate reliable and valid measurements, meeting the recommended criteria and supporting the integrity of the study's findings. Finally, the Heterotrait-Monotrait ratio (HTMT) values presented in Table 3 demonstrate that discriminant validity is established, as all values are below the 0.85 threshold. This ensures that the constructs are distinct yet interrelated (Henseler et al., 2015). These findings collectively confirm the constructs' reliability and validity, thereby strengthening the credibility of the subsequent analyses and interpretations carried out in this study.

Table 2
Construct Reliability and Validity & Items Loadings

Constructs	Items	Loadings	CA	CR	AVE
Acceptance	ACCP1	0.906	0.937	0.941	0.798
	ACCP2	0.908			
	ACCP3	0.908			
	ACCP4	0.833			
	ACCP5	0.910			
Perceived	PEU1	0.828	0.888	0.893	0.692
Ease of Use	PEU2	0.834			
	PEU3	0.775			
	PEU4	0.858			
	PEU5	0.860			
Perceived	PU1	0.886	0.933	0.934	0.790
Usefulness	PU2	0.888			
	PU3	0.920			
	PU4	0.870			
	PU5	0.879			
Students'	SE1	0.878	0.924	0.925	0.766
Engagement	SE2	0.882			
	SE3	0.856			
	SE4	0.877			
	SE5	0.884			

Notes: CA=Cronbach Alpha CR=Composite Reliability AVE=Average variance Extracted

Table 3
Heterotrait-Monotrait (HTMT) Ratios

	ACCP	PEU	PU
PEU	0.715		
PU	0.833	0.801	
SE	0.894	0.738	0.849

Structural Model

This research assessed the structural model by the procedures described by Hair et al. (2017), emphasising pathway coefficients (β) and the coefficient of determination (R^2). Using a Partial Least Squares (PLS) method, the analysis was conducted with 5,000 bootstrapped samples to determine the significance of the path coefficients. The findings from hypothesis testing are presented in Table 4, which includes beta values, t-statistics, and p-values, offering clear insights into the magnitude and significance of the relationships among the variables. This comprehensive approach strengthens the reliability of the study's findings by offering an in-depth understanding of how the variables interact with one another, ensuring the conclusions are well-founded and robust. The hypothesis testing results reveal several significant relationships among the variables. *H1* posited that perceived ease of use (PEU) directly influences acceptance (ACCP), but with a beta of 0.068, a t-statistic of 1.735, and a p-value of 0.083, this hypothesis is rejected since the p-value exceeds 0.05, indicating a non-significant direct effect. Conversely, *H2* hypothesised that PEU influences students' engagement (SE), which is supported by a beta of 0.198, a t-statistic of 4.142, and a p-value of 0.000, leading to its acceptance, confirming that perceived ease of use significantly impacts engagement. *H3* examined the indirect effect of PEU on acceptance through engagement, and with a beta of 0.111, a t-value of 3.693, and a p-value of 0.000, this mediation effect is statistically significant, leading to acceptance of this hypothesis. *H4* tested the direct influence of perceived usefulness (PU) on acceptance, which is strongly supported by a beta of 0.290, a t-value of 4.193, and a p-value of 0.000; thus, it is accepted. *H5* showed that perceived usefulness significantly impacts engagement, supported by a high beta of 0.645, a t-value of 12.891, and a p-value of 0.000, leading to its acceptance. *H6* demonstrated that engagement significantly affects acceptance with a beta of 0.559, t-value of 8.352, and p-value of 0.000, affirming its contribution to acceptance. Lastly, *H7* confirmed the indirect effect of perceived usefulness on acceptance through engagement, with a beta of 0.361, a t-value of 6.567, and a p-value of 0.000, supporting this mediating hypothesis. Overall, most direct and mediated relationships are statistically significant, barring the direct influence of perceived ease of use on acceptance.

Table 4
Hypothesis Testing Result

Hypotheses	Beta	T statistics	P values	2.50%	97.50%	Decision
H1: PEU -> ACCP	0.068	1.735	0.083	-0.003	0.151	*Rejected*
H2: PEU -> SE	0.198	4.142	0.000	0.105	0.291	*Accepted*
H3: PEU -> SE -> ACCP	0.111	3.693	0.000	0.059	0.175	*Accepted*
H4: PU -> ACCP	0.290	4.193	0.000	0.159	0.425	*Accepted*
H5: PU -> SE	0.645	12.891	0.000	0.542	0.734	*Accepted*
H6: SE -> ACCP	0.559	8.352	0.000	0.421	0.682	*Accepted*
H7: PU -> SE -> ACCP	0.361	6.567	0.000	0.258	0.472	*Accepted*

Note: significant p<0.05

Effect Sizes(f^2)

Based on Cohen's (1992) guidelines, the effect sizes (f^2) from Table 5 indicate varying levels of influence among the constructs. The effect size of perceived ease of use (PEU) on acceptance (ACCP) is small at 0.008, suggesting a minimal impact. In contrast, perceived usefulness (PU) has a moderate effect size of 0.097 on acceptance, approaching a large effect, but the most substantial influence is observed with students' engagement (SE), which has a large effect size of 0.429. The impact of perceived usefulness (PU) on engagement (SE) is very large at 0.538, indicating a significant and meaningful effect overall.

Table 5
Effect Sizes(f^2)

	ACCP	SE
PEU	0.008	0.051
PU	0.097	0.538
SE	0.429	

PLSpredicts & Cross-Validated Predictive Ability Test (CVPAT)

Following the guidelines of Shmueli et al. (2016, 2019), the PLS-predict performance demonstrates that the PLS-SEM RMSE values generally surpass those of the linear model benchmarks, indicating better predictive accuracy. Specifically, Table 6 shows that in 8 out of 10 cases, the PLS-RMSE values are lower than the LM-RMSEA, with smaller RMSEs observed for ACCP2, ACCP3, ACCP5, SE1, SE2, SE4, SE5, and ACCP4, suggesting these PLS predictions are more accurate than the linear model predictions. This confirms the robustness of PLS-SEM in predictive contexts, especially where the RMSEs are consistently smaller, supporting the model's predictive validity. Based on the CVPAT results following Hair et al. (2022) and Liengaard et al. (2021), the negative average loss difference values for ACCP, SE, and overall (- -0.392, -0.399, and -0.396, respectively) indicate that the PLS-SEM model exhibits superior predictive ability compared to benchmarks. The high t-values (9.084, 9.699, and 9.867) and p-values of 0.000 across all constructs (Table 7) confirm these differences are statistically significant. These results demonstrate that the model has strong cross-validated predictive relevance, supporting its reliability in predicting the outcomes in the study context.

Table 6
PLSpredicts

	Q^2predict	PLS-RMSE	LM-RMSEA	PLS-LM
ACCP1	0.529	0.599	0.602	-0.003
ACCP2	0.568	0.566	0.572	-0.006
ACCP3	0.539	0.576	0.587	-0.011
ACCP4	0.339	0.857	0.851	0.006
ACCP5	0.491	0.620	0.619	0.001
SE1	0.537	0.616	0.630	-0.014
SE2	0.513	0.588	0.599	-0.011
SE3	0.413	0.730	0.729	0.001
SE4	0.509	0.619	0.631	-0.012
SE5	0.467	0.692	0.693	-0.001

Table 7
Cross-Validated Predictive Ability Test (CVPAT)

	Average loss difference	t-value	p-value
ACCP	-0.392	9.084	0.000
SE	-0.399	9.699	0.000
Overall	-0.396	9.867	0.000

Importance-Performance Map Analysis (IPMA)

The Importance-Performance Map Analysis (IPMA), as recommended by Ringle and Sarstedt (2016) and Hair et al. (2018), provides insights into the relative importance and performance of key constructs influencing acceptance of AI-assisted tutoring. In this analysis, perceived usefulness (PU) shows the highest importance (0.651) and performance (75.431), indicating its critical role but also room for improvement. Engagement (SE) has high importance (0.559) but the lowest performance score (68.158), revealing a substantial gap between its significance and current levels. Perceived ease of use (PEU) shows the lowest importance (0.179) but relatively higher performance (71.534). To enhance overall acceptance, efforts should focus on improving students' engagement, which has the lowest performance but high importance. Strategies include developing engaging AI interfaces, incorporating interactive features, and providing targeted engagement training, all aimed at boosting students' interaction and satisfaction with AI tools, thus positively impacting their acceptance of AI-assisted tutoring in ODDE settings.

Table 8
Importance-Performance Map Analysis (IPMA)

	Importance	Performance
PEU	0.179	71.534
PU	0.651	75.431
SE	0.559	68.158

Discussion & Conclusion

Discussion

To effectively increase the acceptance of AI-assisted tutoring among students in open, distance, and digital education (ODDE) higher institutions, it is essential to adopt comprehensive strategies that focus on improving perceived usefulness (PU), perceived ease of use (PEU), and student engagement, with an emphasis on leveraging engagement as a mediating factor. The results from hypothesis testing indicate that perceived usefulness has a strong, positive influence on both acceptance and engagement, evidenced by a significant beta of 0.290 and 0.559, respectively. When students recognise the tangible benefits and added value of AI tools, their willingness to accept and use these systems increases markedly (Dahri et al., 2024). Therefore, institutions should emphasise demonstrating how AI can enhance learning outcomes, such as improving academic performance and providing personalised feedback. Practical measures may include showcasing success stories, offering workshops that highlight specific benefits, and integrating AI features that directly improve performance, thus fostering perceptions of usefulness. Furthermore, perceived ease of use also plays a crucial role, particularly in fostering student engagement, as indicated by a beta of 0.198, which signifies that user-friendly interfaces facilitate deeper involvement (Gao et al., 2025). To address this, institutions should invest in designing AI platforms that are

intuitive, accessible, and require minimal effort from students to operate. Features such as simple navigation, clear instructions, and responsive feedback can alleviate apprehension and reduce cognitive overload, making students more comfortable and willing to engage with the technology (Pan et al., 2024). Additionally, providing continuous tutorials, user support, and easy onboarding processes can reinforce positive perceptions of usability and boost overall confidence in using AI systems. Incorporating engaging instructional elements like gamification, interactive scenarios, and customised feedback can further elevate students' motivation, which directly influences engagement, an important mediator in this context. These features make learning more dynamic and enjoyable, increasing students' sustained interaction with AI tools, leading to higher acceptance rates. Moreover, consistent orientation sessions, training modules, and ongoing technical support are vital in demonstrating the usability and practical benefits of AI tools, reinforcing perceptions of ease and usefulness (Wang & Yu, 2025). While perceived usefulness has a stronger influence on acceptance, the importance of perceived ease of use should not be underestimated, as it significantly impacts engagement, which then mediates acceptance. A possible reason why some hypotheses, such as PEU directly influencing acceptance, might not be supported is resistance to technology adoption stemming from initial unfamiliarity, fear of the new system, or reluctance to change established learning habits. This highlights the need for institutions to continuously familiarise students with AI tools, promote positive attitudes towards technology, and address barriers to ease of use. Overall, persistent efforts to boost perceptions and engagement will significantly enhance acceptance of AI-assisted tutoring, ultimately improving learning experiences and outcomes in ODDE higher education environments.

Theoretical Implications

The present study contributes significantly to the existing theoretical frameworks of the Technology Acceptance Model (TAM) and Self-Determination Theory (SDT) by providing nuanced insights into how perceived usefulness, perceived ease of use, and students' engagement interact to influence the acceptance of AI-assisted tutoring in ODDE higher education contexts. It affirms and extends TAM by empirically demonstrating that perceived usefulness (PU) exerts a dominant influence on acceptance, while perceived ease of use (PEU) influences acceptance indirectly through engagement, which emphasizes the mediating role of motivation and involvement concepts central to SDT (Davis, 1989; Ryan & Deci, 1985). The findings reveal that engagement serves as a vital mechanism through which perceptions of technology translate into acceptance, highlighting the importance of intrinsic motivation and active participation, a core emphasis of SDT. This study's novel contribution lies in positioning engagement not just as a dependent outcome but as a mediating concept that bridges perceived ease of use and acceptance, providing a deeper understanding of the motivational processes that underpin technology adoption. It also introduces the idea that enhancing perceived usefulness alone isn't sufficient unless it is complemented by strategies that foster engagement, echoing SDT's emphasis on competence, autonomy, and relatedness in motivation. These insights suggest that future research could refine TAM by integrating engagement as a core construct, bringing a more holistic view that combines cognitive perceptions and motivational drivers, thus building a richer, behaviorally oriented extension of the model that better explains technology acceptance in educational settings.

Practical Implications

The practical implications of this study are particularly relevant for higher education institutions in ODDE settings aiming to enhance student acceptance and engagement with AI-assisted tutoring. First, the study highlights the critical importance of designing AI platforms that are highly user-friendly, emphasising intuitive interfaces, clear instructions, and minimal effort required for navigation, which can significantly boost perceived ease of use and subsequently foster greater student engagement. Institutions should also focus on clearly demonstrating the tangible benefits and practical value of AI tools, such as improved learning outcomes and personalised support, to enhance perceived usefulness. Incorporating interactive features like gamification, real-time feedback, and personalised learning pathways can further motivate students and heighten their engagement, leading to increased acceptance. Additionally, continuous orientation sessions, technical support, and training programs should be implemented to address students' potential unfamiliarity or resistance to new technologies, thus strengthening perceptions of ease and usefulness over time. Educational policymakers and administrators must understand that simply providing AI tools is insufficient; rather, strategic efforts are needed to cultivate positive perceptions and active user engagement. By fostering a supportive environment that emphasises usability and perceived value, institutions can facilitate higher acceptance rates, ultimately improving the effectiveness of AI-driven instruction and benefiting students' learning experiences and outcomes in digital learning environments.

Suggestions for Future Studies

Future studies should explore the longitudinal effects of AI-assisted tutoring on student acceptance and engagement over extended periods to understand how perceptions and usage evolve. Investigating different educational contexts, such as vocational or adult learning environments, could reveal varying motivational factors and acceptance patterns. Researchers might also examine the role of individual differences, such as digital literacy, self-efficacy, or prior technology experience, to better tailor AI implementation strategies. Additionally, future work could incorporate qualitative methods, such as interviews or focus groups, to gain deeper insights into students' perceptions and barriers to AI adoption. Exploring the influence of institutional support, cultural factors, and environmental variables on perceived usefulness, ease of use, and engagement could further refine models of technology acceptance. Finally, integrating emerging theories related to technology acceptance, motivation, and engagement could lead to the development of more comprehensive, hybrid models that better predict and enhance AI adoption in educational settings, ultimately contributing to the effective integration of AI tools across diverse learning environments.

Conclusion

This study provides valuable insights into the factors influencing the acceptance of AI-assisted tutoring in ODDE higher education institutions, highlighting the critical roles of perceived usefulness, perceived ease of use, and student engagement. The findings confirm that perceived usefulness has a strong direct impact on acceptance, while perceived ease of use influences acceptance indirectly through engagement, emphasising the importance of fostering active participation among students. The study underscores that enhancing perceived benefits and designing user-friendly AI platforms, coupled with strategies to boost student engagement, are essential for promoting wider adoption of AI technologies in online

learning environments. These results offer practical guidance for educators and policymakers aiming to leverage AI to improve learning outcomes. Additionally, the integration of engagement as a mediating variable enhances the theoretical understanding of technology acceptance, providing a more comprehensive framework for future research. Overall, the study advances both practical implementation strategies and theoretical models, paving the way for more effective integration of AI tools within higher education.

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