Jurnal Pendidikan Islam xx (x) (xxxx) -
DOI: https://doi.org/
http://journal.uinsgd.ac.id/index.php/jpi

p-ISSN: 2355-4339
e-ISSN: 2460-8149

VALUES-BASED ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE DISTANCE LEARNING IN ISLAMIC HIGHER EDUCATION

Shakhnoz Khikmatovna Samiyeva[1]*, Shirinboy Sharofovich Olimov[2], Sevara Uchkun kizi Barnoeva[2], Ulugbek Muradilloyevich Ibragimov[1], Nargiza Khakimovna Aslanova[2], Gulnoza Istam kizi Egamova[2], Sayyora Sidik kizi Mirzoeva[1], Zulaykho Khamidullaevna Khusniddinova[3]

[1]Bukhara State Technical University, Bukhara, Uzbekistan
[2]Bukhara State University, Bukhara, Uzbekistan
[3]Chirchik State Pedagogical University, Chirchik, Uzbekistan
*Corresponding Email: samieva-1978@mail.ru

Received: . Accepted: . Published: .

ABSTRACT

The increasing use of artificial intelligence (AI) in higher education offers new opportunities for enhancing distance learning. However, limited research exists on how AI-supported environments can simultaneously promote academic achievement, learner autonomy, sustainability awareness, and values-based education, especially within Islamic higher education. This study addresses this gap by developing and evaluating an AI-supported adaptive navigation model that integrates personalized learning with Sustainable Development Goals (SDG)-oriented and values-based principles. Using a quasi-experimental design, 84 undergraduate students from an Islamic institution in Uzbekistan were assigned to either an experimental group (n=42) using the AI platform or a control group (n=42) receiving traditional online instruction. Data were collected via achievement tests, engagement questionnaires, system analytics, motivation scales, and technology acceptance measures, then analyzed through descriptive statistics, t-tests, regression, and ANCOVA. Results showed the experimental group achieved significantly higher learning outcomes (M=82.63) than the control (M=74.18). They also exhibited greater engagement, autonomy, and sustainability awareness, illustrating the positive impact of the AI approach. Students expressed favorable views on ethical technology use, inclusive education, and the social benefits aligned with SDG 4. Overall, AI-supported adaptive navigation enhances learning by combining personalized feedback, structured pathways, and values-driven experiences. Theoretically, this study contributes to the emerging concept of values-based AI in education by combining Islamic educational philosophy, the Community of Inquiry framework, and Self-Determination Theory, highlighting how intelligent environments support meaningful learning, empowerment, and ethics. Practically, it underscores the potential of ethical digital environments to foster sustainable, inclusive, value-driven higher education within Islamic contexts.

Keywords: Artificial Intelligence, Distance Learning, Islamic Higher Education, Learner Autonomy, Sustainable Development Goals, Values-Based Education

INTRODUCTION

The rapid advancement of digital technology has transformed higher education worldwide, particularly through the widespread adoption of distance learning systems (Sheets & Snyder, 2025, Tella et al., 2025.) Universities increasingly utilize digital platforms to expand educational access, enhance learning flexibility, and support continuity of instruction across diverse social and geographical contexts (Schaal & Raiciulescu, 2026). When effectively designed, online learning environments can foster independent learning, technological literacy, and flexible knowledge acquisition while reducing barriers associated with time and location (Pikhart et al., 2023, Zaki, 2022). Within Islamic higher education institutions, digital transformation presents

additional opportunities to integrate scientific knowledge with ethical values, social responsibility, and inclusive educational practices (Shen et al., 2026). Such developments are particularly important as contemporary higher education increasingly seeks to balance technological innovation with human-centered and values-based approaches to learning.

Moreover, science and technology-based learning has become a strategic component of higher education because it equips students with the knowledge and skills necessary to address increasingly complex global challenges (Shen et al., 2025). The integration of digital tools, interactive media, and computational learning environments enables students to connect theoretical understanding with practical problem-solving experiences (Vanbecelaere et al., 2023. Previous studies have shown that innovative digital platforms can improve student engagement and cognitive development. For instance, Reskianissa et al. (2022) demonstrated that the use of TikTok-based learning activities enhanced students' computational thinking skills and learning participation during distance education. Likewise, the effectiveness of digital learning environments depends substantially on instructional design quality and teacher competence in developing meaningful e-learning content (Nafsi & Maryanti, 2022). Educational innovation is therefore not solely a technological matter but also a pedagogical one that requires purposeful learning design and appropriate instructional support (Xu et al., 2026, Abbas et al., 2023).

Despite these promising developments, substantial challenges continue to limit the effectiveness of distance learning (Ngalomba et al., 2025. Students frequently report lower levels of interaction, motivation, and learning satisfaction in online environments compared with conventional face-to-face instruction (Pikhart et al., 2023). Communication barriers, technological difficulties, and delayed feedback from instructors remain persistent obstacles to meaningful learning engagement (Yuhanna et al., 2020, Zaki, 2022). Similar concerns have been identified in higher education contexts where students appreciate the convenience of e-learning but experience limitations related to infrastructure, interaction quality, and practical application of knowledge (Talebiana et al., 2014). Moreover, science and technology courses often require authentic problem-solving, collaborative learning, and practical experiences that are difficult to facilitate effectively through conventional online learning platforms (Stecula & Wolniak, 2022). These limitations suggest that many existing learning management systems continue to function primarily as repositories of learning materials rather than as adaptive environments that actively support student learning.

Recent advances in Artificial Intelligence (AI) have created new opportunities to enhance distance learning through personalized feedback, adaptive learning pathways, and real-time analysis of learner progress. These capabilities can improve student engagement, learning effectiveness, and instructional responsiveness. However, existing studies have primarily focused on the technical functions of AI and their impact on academic performance, while limited attention has been given to how AI can support meaningful learning navigation, foster learner autonomy, and promote values-based educational outcomes. This issue is particularly relevant in Islamic higher education, where technological innovation is expected not only to improve learning effectiveness but also to cultivate ethical responsibility, social benefit, and holistic human development. Furthermore, the growing emphasis on Sustainable Development Goal 4 (SDG 4) has encouraged universities to promote inclusive, equitable, and quality education while fostering sustainability awareness and responsible citizenship. Nevertheless, AI-supported learning, online engagement, and sustainability-oriented education are often examined as separate domains, leaving limited understanding of how these dimensions can be integrated within a coherent learning framework in Islamic higher education.

To address this gap, this study develops and evaluates an AI-supported adaptive navigation model that integrates AI-driven feedback, structured learning pathways, and SDG-oriented educational principles to create a more responsive, learner-centered, and values-based

digital learning environment. The study is grounded in a values-based artificial intelligence framework derived from Al-Attas' concept of education, which emphasizes adab, ethical responsibility, and the meaningful use of knowledge for individual and societal benefit (Al-Attas, 1980). To explain learning processes and outcomes, the study further employs the Community of Inquiry framework, which conceptualizes meaningful online learning through the interaction of teaching, cognitive, and social presence (Garrison et al., 2000), and Self-Determination Theory, which highlights the roles of autonomy, competence, and relatedness in fostering learner motivation and engagement (Deci & Ryan, 2000). By integrating these perspectives, the study contributes to emerging discussions on values-based artificial intelligence and offers a framework for promoting meaningful learning, learner empowerment, sustainability awareness, and ethical educational transformation in Islamic higher education.

METHOD

This study employed a quasi-experimental pretest–posttest control group design to evaluate the effectiveness of an AI-supported adaptive navigation model in distance learning. The study involved 84 undergraduate students enrolled in a science and technology applications course at an Islamic higher education institution in Uzbekistan. Using purposive sampling, participants were selected based on course enrollment and regular participation in online learning activities. These participants were then assigned to an experimental group (n = 42) and a control group (n = 42) according to existing course sections, which helped ensure comparability between the groups. The intervention was conducted over eight weeks during one academic semester, providing an adequate period for assessing the impact of the model. Students in the experimental group learned through an AI-supported adaptive navigation platform that provided structured binary learning pathways, immediate semantic feedback, personalized recommendations, and task assistance. In contrast, students in the control group received the same course content through a conventional learning management system consisting of lecture videos, readings, and discussion forums, but without adaptive navigation or AI-generated feedback. This distinction was crucial for isolating the effects of the AI-supported system. Figure 1 illustrates the architecture of the AI-supported adaptive navigation system and the associated data collection process, further clarifying the methodology employed in this study.

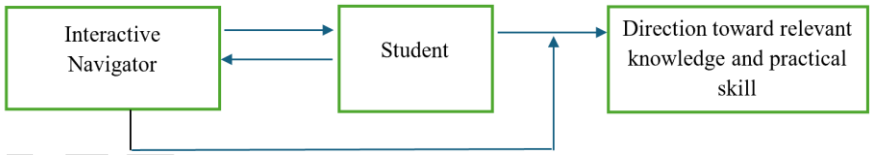

Figure 1. Architecture of the AI-Supported Adaptive Navigation System and Data Collection Process

Data were collected using three validated instruments: a Student Engagement Questionnaire measuring behavioral, emotional, and cognitive engagement, a 30-item Learning Achievement Test assessing students' understanding of science and technology concepts, and System Analytics Records capturing login frequency, navigation patterns, time-on-task, and task completion rates. Instrument validity was established through expert review by specialists in educational technology and Islamic higher education, while pilot testing involving 30 students outside the sample demonstrated satisfactory reliability (Cronbach's α = .82–.89). Subsequently, data collection began with pretesting to establish baseline equivalence between groups, followed by automated recording of learning interactions throughout the intervention and posttesting at the end of the study. The collected data were then analyzed using descriptive statistics, independent-samples t-tests, paired-samples t-tests, and ANCOVA with pretest scores as

covariates to examine differences in posttest outcomes between groups. Effect sizes were calculated using Cohen's d, and statistical significance was determined at $p < .05$. Ethical approval was obtained from the institutional research ethics committee, and informed consent was secured from all participants prior to data collection.

RESULTS AND DISCUSSION

Participant Characteristics and Baseline Equivalence

Prior to examining the effects of the AI-supported adaptive navigation model, baseline equivalence between the experimental and control groups was assessed to ensure that any post-intervention differences could be attributed to the treatment rather than pre-existing group characteristics. Independent-samples t-tests were conducted to compare participants' demographic characteristics, prior experience with learning management systems (LMS), and initial academic achievement. The results are presented in Table 1.

Table 1. Baseline Comparison of Participant Characteristics

Variable	Experimental	Control	P-Value
Mean age	20.8	21.1	.417
Female (%)	54.8	52.4	.826
Prior LMS experience (%)	71.4	69.0	.801
Pretest score (100)	63.42	62.75	.684

As shown in Table 1, no statistically significant differences were observed between the experimental and control groups across all baseline variables ($p > .05$). The two groups were comparable in terms of age, gender distribution, previous LMS experience, and pretest achievement scores. In particular, the similarity of pretest scores between the experimental group ($M = 63.42$) and the control group ($M = 62.75$) indicates that participants began the intervention with relatively equivalent levels of prior knowledge. These findings confirm the baseline equivalence of the two groups and support the validity of subsequent analyses examining the effects of the AI-supported adaptive navigation model on student learning outcomes, engagement, and motivation.

Effects of the AI-Supported Adaptive Navigation Model on Learning Achievement

To examine the effectiveness of the AI-supported adaptive navigation model on students' academic achievement, pretest and posttest scores were compared between the experimental and control groups. Table 2 presents the mean pretest, posttest, and gain scores for both groups following the eight-week intervention.

Table 2. Comparison of Learning Achievement

Group	Pretest Mean	Posttest Mean	Gain Score
Experimental	63.42	82.63	19.21
Control	62.75	74.18	11.43

As shown in Table 2, both groups demonstrated improvement in learning achievement following the intervention period. However, students in the experimental group achieved substantially higher posttest scores ($M = 82.63$, $SD = 6.81$) than those in the control group ($M = 74.18$, $SD = 7.24$). The gain score of the experimental group (19.21 points) was also notably

higher than that of the control group (11.43 points), indicating greater improvement in mastery of science and technology concepts.

To determine whether these differences remained significant after controlling for initial achievement levels, an analysis of covariance (ANCOVA) was conducted using pretest scores as the covariate. The results revealed a statistically significant treatment effect, $F(1,81) = 18.94$, $p < .001$, partial $\eta^2 = .189$. According to conventional benchmarks, the effect size indicates a moderate-to-large impact of the intervention on student achievement. These results demonstrate that students who learned through the AI-supported adaptive navigation model achieved significantly better academic outcomes than those who participated in conventional online learning.

Student Engagement and Behavioral Participation

To evaluate the influence of the AI-supported adaptive navigation model on student engagement, behavioral participation indicators were analyzed using system analytics records. These indicators included participation in theoretical learning tasks, completion of practical assignments, total theory submissions, and average weekly login frequency. To ensure a comprehensive assessment, the comparative results between the experimental and control groups are presented in Table 3. This comparison allows for a clearer understanding of the model's impact on different aspects of student engagement.

Table 3. Engagement Indicators

Indicator	Experimental	Control	p-value
Students responding to theory tasks	100%	78%	< .01
Total theory submissions	609	475	< .01
Practical assignment participation	90%	71%	< .05
Average weekly login frequency	5.8	3.9	< .01

Table 3 illustrates that students in the experimental group consistently exhibited higher levels of behavioral engagement compared to the control group. While all students in the experimental group took part in theoretical learning tasks, only 78% of students in the control group did the same. Similarly, practical assignment participation was higher among experimental-group students (90%) than control-group students (71%). The experimental group also generated a greater number of theory-task submissions (609 versus 475) and accessed the learning platform more frequently, with an average of 5.8 weekly logins compared with 3.9 in the control group.

Statistical comparisons indicated significant differences between groups across all engagement indicators ($p < .05$). These findings demonstrate that students who participated in the AI-supported adaptive navigation environment exhibited higher levels of participation, learning activity, and sustained interaction throughout the intervention period than those who engaged in conventional online learning.

Technology Acceptance of the AI-Supported Learning Environment

Students' perceptions of the AI-supported adaptive navigation platform were examined using a technology acceptance questionnaire. To begin with, the instrument measured perceived usefulness, perceived ease of use, and overall satisfaction with the learning environment. The reliability analysis was conducted subsequently, which indicated satisfactory internal consistency

for the scale (Cronbach's α = .88). Furthermore, the results derived from the analysis are presented in Table 4.

Table 4. Technology Acceptance of the AI-Supported Learning Environment

Dimension	Mean	SD	Interpretation
Perceived usefulness	4.42	0.51	High
Perceived ease of use	4.36	0.57	High
Satisfaction	4.31	0.60	High

As shown in Table 4, students reported highly positive perceptions of the AI-supported learning environment across all dimensions. Perceived usefulness received the highest mean score (M = 4.42, SD = 0.51), followed by perceived ease of use (M = 4.36, SD = 0.57) and overall satisfaction (M = 4.31, SD = 0.60). These findings indicate that students considered the platform beneficial, easy to navigate, and supportive of their learning activities throughout the intervention period.

Learner Motivation and Autonomy

To examine motivational outcomes associated with the AI-supported adaptive navigation model, students were asked to evaluate their experiences related to autonomy, competence, and relatedness. These dimensions were measured based on the principles of Self-Determination Theory. The descriptive results are presented in Table 5.

Table 5. Motivation and Learner Autonomy Outcomes

Dimension	Mean	SD
Autonomy	4.28	0.58
Competence	4.33	0.55
Relatedness	4.11	0.63

The results indicate positive motivational outcomes among students who participated in the AI-supported learning environment. Competence received the highest mean score (M = 4.33, SD = 0.55), followed by autonomy (M = 4.28, SD = 0.58) and relatedness (M = 4.11, SD = 0.63). Overall, students reported strong perceptions of self-directed learning, confidence in completing learning tasks, and meaningful connections with instructors and peers during the intervention.

Sustainability Awareness and Values-Based Educational Outcomes

Students were asked to evaluate their awareness of inclusive education, ethical technology use, social responsibility, and sustainable educational practices to examine how the AI-supported adaptive navigation model influences values-based learning. These indicators were selected because they reflect key dimensions of SDG 4 and align with Islamic educational principles emphasizing responsible knowledge use, ethical conduct, and social benefit. Additionally, by evaluating these aspects, the study aims to better understand how the navigation

model supports the development of values in educational contexts. The descriptive results are presented in Table 6.

Table 6. Sustainability Awareness and Values-Based Educational Outcomes

Indicator	Mean	Indicator
Inclusive learning awareness	4.39	Inclusive learning awareness
Ethical use of technology	4.41	Ethical use of technology
Social benefit of knowledge	4.35	Social benefit of knowledge
Sustainable education awareness	4.44	Sustainable education awareness

As shown in Table 6, students reported high levels of awareness across all values-based learning indicators, with mean scores ranging from 4.35 to 4.44 on a five-point scale. Sustainable education awareness received the highest rating (M = 4.44), followed by ethical use of technology (M = 4.41), inclusive learning awareness (M = 4.39), and social benefit of knowledge (M = 4.35). These findings indicate that participation in the AI-supported adaptive navigation environment was associated with positive perceptions of sustainability-oriented and socially responsible learning. Overall, students demonstrated a strong awareness of educational values related to inclusion, ethical use of technology, social responsibility, and sustainable development.

Learning Analytics and Predictors of Academic Achievement

To determine the factors influencing students' academic achievement, multiple regression analysis was applied to system analytics and questionnaire data. Specifically, the analysis considered student engagement, perceived usefulness of the learning platform, frequency of AI feedback use, and learner autonomy as predictors. These variables were selected based on prior research indicating their potential impact on academic success. The findings, which shed light on the relationships among these factors, are summarized in Table 7.

Table 7. Predictors of Academic Achievement

Predictor	Beta	p-value
Student engagement	.41	< .001
Perceived usefulness	.34	.002
AI feedback frequency	.29	.008
Autonomy	.21	.031

Table 7 portrays all four variables significantly predicted academic achievement. Student engagement emerged as the strongest predictor ($\beta = .41$, $p < .001$), followed by perceived usefulness of the platform ($\beta = .34$, $p = .002$), frequency of AI feedback use ($\beta = .29$, $p = .008$), and learner autonomy ($\beta = .21$, $p = .031$). Collectively, these variables explained 52% of the variance in students' final achievement scores ($R^2 = .52$), indicating substantial explanatory power. The results suggest that both behavioral factors (engagement and AI interaction) and learner perceptions (usefulness and autonomy) were associated with improved academic performance.

Evidence from achievement tests, engagement measures, motivation scales, and system analytics demonstrated a consistent pattern of positive outcomes among students who participated in the AI-supported adaptive navigation environment. Specifically, students with higher engagement levels, more frequent use of AI-generated feedback, and stronger perceptions of usefulness and autonomy tended to achieve better learning outcomes. Moreover, the convergence of evidence across multiple data sources provides additional support for the

observed relationships between participation in the intervention and improved student learning performance.

The empirical findings of this study provide crucial insights into the transformative potential of intelligent learning architectures within higher education. In particular, these insights are significant under the paradigm of values-based frameworks. By demonstrating a robust alignment between technological customization and learner-centered outcomes, this research effectively addresses long-standing calls to move beyond passive digital delivery. Instead, it advocates for highly responsive, pedagogical ecosystems. Moreover, the substantial variances observed between the experimental and conventional groups underscore an important point: when artificial intelligence is intentionally integrated to serve distinct educational objectives, it does not isolate the learner. Rather, it fosters a dynamic environment in which cognitive development and personal agency can thrive simultaneously. Consequently, these results, taken together, offer a strong foundation for redefining the parameters of distance education. They shift the discourse from a narrow focus on technological infrastructure to a more holistic consideration of pedagogical design, human relationality, and ethical accountability.

The findings demonstrate that the AI-supported adaptive navigation model significantly enhanced students' academic achievement, engagement, learner autonomy, technology acceptance, and sustainability awareness compared with conventional online learning. More importantly, the results suggest that the effectiveness of artificial intelligence in education is not determined solely by technological sophistication but also by how technology is pedagogically designed to support meaningful learning experiences. Specifically, the combination of adaptive feedback, structured learning pathways, and values-oriented learning activities created an environment that enabled students to engage more actively with learning content while simultaneously developing greater responsibility for their own learning. Therefore, these findings support the view that intelligent learning systems are most effective when they function as educational scaffolds rather than merely as content delivery mechanisms, emphasizing the importance of pedagogical integration.

From the perspective of Islamic educational philosophy, the findings indicate that artificial intelligence can contribute to educational development when it is aligned with the broader objectives of education as the cultivation of *adab* (ethical responsibility) and beneficial knowledge. Al-Attas (1980) argued that education should not be limited to the transmission of information but should foster disciplined individuals who use knowledge responsibly for personal and societal benefit. The high levels of sustainability awareness, ethical technology use, and social responsibility reported by students suggest that the integration of SDG-oriented content within the AI-supported environment extended learning beyond academic achievement alone. Rather than treating technology as a neutral instrument, the intervention positioned digital learning as a means of nurturing responsible and socially conscious learners. This finding is particularly relevant for Islamic higher education institutions seeking to balance technological innovation with ethical and values-based educational missions.

The significant improvement in student engagement can be understood through the Community of Inquiry framework. According to Garrison et al. (2000), meaningful online learning emerges through the interaction of teaching presence, cognitive presence, and social presence. Students who participated in the AI-supported adaptive navigation environment demonstrated higher rates of task completion, more frequent platform access, and stronger continuity of participation than those in the conventional learning environment. These outcomes suggest that adaptive feedback and structured learning pathways strengthened teaching presence by providing timely guidance and instructional support, while the integration of theoretical and practical learning activities enhanced cognitive presence. The findings

therefore extend previous research highlighting the challenges of maintaining participation and interaction in online learning environments (Pikhart et al., 2023, Yuhanna et al., 2020). Instead of seeing disengagement as an unavoidable issue in distance education, the findings show that well-designed learning settings can significantly boost student engagement and involvement.

This stabilization of student participation through digital scaffolding aligns closely with recent foundational interventions in early digital literacy. Vanbecelaere et al. (2023) demonstrated through a comprehensive meta-analysis that structured Tier 1 digital interventions are highly effective at establishing early cognitive baselines when combined with intentional pedagogical frameworks. Just as early childhood interventions require rigid instructional design to yield measurable gains, higher education digital landscapes demand deliberate socio-technological frameworks to sustain engagement. In primary education contexts, the success of integrating a pedagogical agent depends heavily on cultivating a robust sense of social presence within the virtual space (Xu et al., 2026). Building on this, the current study extends this logic by showing that when an AI system projects an empathetic, interactive, and responsive presence, it bridges the historical isolation felt by distance learners, effectively turning a cold interface into an active, values-driven co-facilitator.

The motivational outcomes of the study are consistent with Self-Determination Theory, which emphasizes the importance of autonomy, competence, and relatedness in supporting intrinsic motivation (Deci & Ryan, 2000). Specifically, students reported high levels of autonomy and competence, which suggests that personalized learning pathways and immediate feedback played a crucial role in helping them navigate learning tasks with greater confidence and independence. Additionally, the positive ratings for relatedness further indicate that technology-supported learning does not necessarily diminish interpersonal connection. On the contrary, these AI-supported systems may actually complement human interaction by reducing routine instructional burdens, thereby enabling educators to focus on more meaningful forms of academic support. Consequently, these findings reinforce the argument that artificial intelligence should be viewed primarily as a tool for enhancing human learning relationships rather than replacing them. Overall, the evidence presents a compelling case for integrating AI into educational practices in a way that supports and enriches the learning experience.

Another important contribution of this study concerns the integration of sustainability-oriented learning and Islamic educational values. Students reported strong awareness of inclusive education, ethical technology use, social responsibility, and the social benefits of knowledge. These outcomes reflect the objectives of Sustainable Development Goal 4, which promotes inclusive and quality education, while simultaneously resonating with Islamic educational principles emphasizing justice, stewardship, responsibility, and public benefit. The findings suggest that AI-supported learning environments can contribute to both cognitive development and moral-ethical formation when educational technologies are intentionally designed around values-based learning objectives. This contribution is particularly significant because many contemporary discussions of artificial intelligence in education focus primarily on efficiency and performance, often overlooking broader educational purposes.

To operationalize these ethical objectives, contemporary systems must directly address human-machine alignment. Shen et al. (2025) explored this dynamic by utilizing a value-sensitive design approach to align and compare the values of ChatGPT and humans acting as learning facilitators. Their work underscores that AI tools cannot remain value-neutral, rather, they must be intentionally programmed to reflect human-centered, pedagogical ethics. When digital systems successfully mirror these ethical parameters, they expand educational equity, mirroring how cloud-based solutions have been deployed as structural infrastructure to bridge severe digital divides in rural, disenfranchised regions (Shen et al., 2026). By contextualizing AI as both an ethical facilitator and an equalizing infrastructure, digital transformation in Islamic

institutions transcends simple institutional efficiency, functioning instead as a tool for structural justice and widespread public benefit (*maslahah*).

This systemic equity is further realized when spatial and geographical boundaries are explicitly dismantled via remote architectures. In the Global South, internationalization-at-a-distance and virtual mobility initiatives serve as vital instruments for democratization, allowing localized institutions to engage with global knowledge networks without losing their regional identity (Ngalomba et al., 2025). Emerging immersive technologies, such as the metaverse, are redefining these distant information landscapes, providing alternative, highly interactive simulated spaces that optimize specialized training and information delivery (Tella et al., 2025). Crucially, as empirical evidence notes that online delivery modes are fully capable of achieving rigorous compliance and safety learning objectives (Schaal & Raiciulescu, 2026), the core institutional focus must shift toward relational teaching paradigms that foster genuine human connection across distances (Sheets & Snyder, 2025). Thus, the current AI model operates not merely as an isolated technological system, but as a relational, accessible space that fulfills the Islamic mandate of seeking and distributing beneficial knowledge across diverse populations.

The regression analysis provides additional insight into the mechanisms underlying learning improvement. Student engagement emerged as the strongest predictor of achievement, followed by perceived usefulness, frequency of AI feedback use, and learner autonomy. These findings indicate that academic success was influenced not only by access to technological features but also by the extent to which students actively participated in learning activities and perceived value in the learning environment. The explanatory power of the model ($R^2 = .52$) further suggests that engagement, autonomy, and meaningful interaction with AI-supported feedback collectively contributed to learning achievement. This finding reinforces the importance of integrating pedagogical, motivational, and technological dimensions when designing intelligent learning environments.

The successful implementation of this AI-supported adaptive model underscores a broader imperative within contemporary educational technology: the need to balance systemic infrastructural scaling with deeply relational, human-centered design. At the micro-level of student interaction, research confirms that the efficacy of automated interventions, ranging from early childhood Tier 1 digital literacy systems (Vanbecelaere et al., 2023) to primary school pedagogical agents (Xu et al., 2026), relies inherently on establishing a strong sense of social presence and responsive feedback. When scaling these models in higher education, developers must explicitly use value-sensitive design frameworks to ensure AI mirrors human ethical standards (Shen et al., 2025), transforming cold interfaces into supportive, relational learning spaces (Sheets & Snyder, 2025). Ethically aligned technologies act as crucial infrastructures, bridging digital divides in rural areas (Shen et al., 2026) and enabling virtual mobility across the Global South (Ngalomba et al., 2025). Whether expanding access via immersive metaverse architectures (Tella et al., 2025) or demonstrating that online platforms can meet complex safety and learning goals (Schaal & Raiciulescu, 2026), digital transformation reaches its best potential when driven by a commitment to equity, access, and human connection.

Taken together, the findings contribute to emerging discussions on values-based artificial intelligence in higher education. The study extends existing research by demonstrating that AI-supported adaptive navigation can simultaneously promote academic achievement, learner empowerment, sustainability awareness, and ethical responsibility. Rather than positioning artificial intelligence as a purely technical innovation, the findings support a more holistic perspective in which technology serves educational, social, and ethical purposes. For Islamic higher education institutions, this perspective offers a pathway for integrating digital

transformation with the enduring goals of cultivating knowledgeable, responsible, and socially beneficial individuals.

Several limitations should be acknowledged. The study was conducted within a single institutional context, which may limit the generalizability of the findings to other educational settings. In addition, some measures relied on self-reported perceptions that may be influenced by response bias. Future studies should involve multiple institutions, longer intervention periods, and qualitative investigations into students' experiences with AI-supported learning. Comparative studies involving Islamic and non-Islamic higher education institutions may also provide deeper insight into how values-based educational environments shape the adoption and impact of artificial intelligence in education.

CONCLUSION

This study demonstrates that an AI-supported adaptive navigation model can significantly enhance academic achievement, student engagement, learner autonomy, and sustainability awareness in Islamic higher education. By integrating AI-driven feedback, structured learning pathways, and SDG-oriented educational values, the model provided a more responsive and meaningful learning environment than conventional online instruction. The findings further suggest that the effectiveness of artificial intelligence in education depends not only on technological capabilities but also on its alignment with pedagogical and ethical objectives. Grounded in Al-Attas' philosophy of education and supported by the Community of Inquiry and Self-Determination Theory frameworks, the study contributes to the emerging concept of values-based artificial intelligence in education, where technology serves as a means of fostering meaningful learning, ethical responsibility, and socially beneficial knowledge. These findings offer practical insights for universities seeking to integrate digital innovation with the broader educational mission of cultivating competent, responsible, and socially conscious graduates in an increasingly technology-driven world.

BIBLIOGRAPHY

Abbas, A. M., Hamid, T., Iwendi, C., Morrissey, F., & Garg, A. (2023). Improving Learning Effectiveness by Leveraging Spaced Repetition (SR). In N. Venkataraman, L. Wang, X. Fernando, & A. F. Zobaa (Eds.), *Big Data and Cloud Computing* (Vol. 1021, pp. 145–160). Springer Nature Singapore. https://doi.org/10.1007/978-981-99-1051-9_10

Al-Attas, S. M. N. (1980). *The concept of education in Islam*. Kuala Lumpur, Malaysia: ABIM.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. Retrieved from https://www.jstor.org/stable/249008

Deci, E. L., & Ryan, R. M. (2000). The what and why of goal pursuits: Human needs and self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2–3), 87–105. https://doi.org/10.1016/S1096-7516(00)00016-6

Nafsi, N.R.R., & Maryanti, M. (2022). Analysis of teacher skills in e-learning content development during distance learning during the covid-19 pandemic. *ASEAN Journal for Science Education*, *1*(1), 23-32. Retrieved from https://ejournal.bumipublikasinusantara.id/index.php/ajsed/article/view/14

Ngalomba, S., Mkwananzi, F., & Mukwambo, P. (2025). Internationalization at a distance via virtual mobility in the Global South: Advances and challenges. *British Journal of Educational Technology*, *56*, 927–946. https://doi.org/10.1111/bjet.13557

Pikhart, M., Klimova, B., Cierniak-Emerych, A., & Dziuba, S. (2023). A comparative analysis of perceived advantages and disadvantages of online learning. *Behavioral Sciences*, *13*, 262. https://www.mdpi.com/2076-328X/13/3/262#

Reskianissa, A., Sakti, A.W., & Azizah, N.N. (2022). TikTok platform to train middle school students' computational thinking skills in distance learning. *ASEAN Journal of Educational Research and Technology*, *1*(1), 79-86. Retrieved from https://ejournal.bumipublikasinusantara.id/index.php/ajert/article/view/41

Schaal, N. C., & Raiciulescu, S. (2026). Impact of Online Learning on Achievement of Learning Objectives for Safety and Environmental Courses. *American Journal of Distance Education*, *40*(2), 165–183. https://doi.org/10.1080/08923647.2025.2564521

Sheets, L. A., & Snyder, R. J. (2025). Relational Online Teaching: Connecting with Students at a Distance. *Journal of Library & Information Services in Distance Learning*, *19*(4), 233–247. https://doi.org/10.1080/1533290X.2025.2552113

Shen, Y., Huang, G., Le, H., Yu, S., Xu, M., Ouyang, J., Fan, Y., & Wang, Q. (2026). "Cloud for Youth": An implementation research of cloud-based solutions for bridging the digital divide in rural China. *British Journal of Educational Technology*, *57*, 844–868. https://doi.org/10.1111/bjet.70037

Shen, Y., Tang, L., Le, H., Tan, S., Zhao, Y., Shen, K., Li, X., Juelich, T., Wang, Q., Gašević, D., & Fan, Y. (2025). Aligning and comparing values of ChatGPT and human as learning facilitators: A value-sensitive design approach. *British Journal of Educational Technology*, *56*, 1391–1414. https://doi.org/10.1111/bjet.13562

Stecuła, K., & Wolniak, R. (2022). Advantages and disadvantages of e-learning innovations during the COVID-19 pandemic in higher education in Poland. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*, 159. https://doi.org/10.3390/joitmc8030159

Talebiana, S., Mohammadia, H.M., & Rezvanfara, A. (2014). Information and communication technology in higher education: advantages, disadvantages, conveniences and limitations of applying e-learning to agricultural students in Iran. *Procedia - Social and Behavioral Sciences*, *152*, 300–305. 10.1016/j.sbspro.2014.09.199

Tella, A., Oso, O. O., & Famuyiwa, S. T. (2025). Enhancing Information Delivery in Distance Learning Libraries Through Metaverse Technologies. *Journal of Library & Information Services in Distance Learning*, *19*(1–2), 1–27. https://doi.org/10.1080/1533290X.2025.2480549

Vanbecelaere, S., Said-Metwaly, S., Van den Noortgate, W., Reynvoet, B., & Depaepe, F. (2023). The effectiveness of Tier 1 digital interventions for early reading: A meta-analysis. *British Journal of Educational Technology*, *54*, 1397–1432. https://doi.org/10.1111/bjet.13351

Xu, K. M., Lin, L., Gorter, M., Schneider, S., Weidlich, J., Davis, R. O., Kreijns, K., & de Groot, R. (2026). Social presence: A key factor in embedding a pedagogical agent into online learning in primary education. *British Journal of Educational Technology*, *57*, 227–242. https://doi.org/10.1111/bjet.70006

Yuhanna, I., Alexander, A., & Kachik, A. (2020). Advantages and disadvantages of online learning. *Journal Educational Verkenning*, *1*(2), 13–19. Retrieved from https://elearningindustry.com/advantages-and-disadvantages-online-learning

Zaki, M.S. (2022). Advantages and disadvantages of online learning. The *Journal of International Social Research*, *15*(92). Retrieved from https://www.sosyalarastirmalar.com/abstract/advantages-and-disadvantages-of-online-learning-94993.html