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Artificial intelligence in e-learning: Promoting women's education in virtual universities

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ABSTRACT: The integration of artificial intelligence (AI) in e-learning has the potential to transform educational experiences, particularly in virtual university settings. This study explores the effectiveness and impact of AI-driven e-learning tools on female students at an online university. The primary purpose is to evaluate how these tools enhance educational outcomes, engagement, and inclusivity, while addressing challenges specific to female learners. A mixed-methods approach was employed, involving a structured questionnaire distributed to 95 female students across four faculties: Medical, Computer Science, Business Administration, and Education. The study utilized both quantitative and qualitative data collection techniques to assess students' perceptions of AI tools. Statistical analysis of survey responses provided insights into the effectiveness of AI tools in improving access to resources, supporting personalized learning, and enhancing overall engagement. The results indicate a generally positive perception of AI-driven e-learning tools among participants. Most students reported that AI tools effectively enhance educational outcomes and engagement, with notable improvements in accessibility and inclusivity. However, there are mixed opinions on the extent of these benefits, highlighting areas for further development. In conclusion, AI-driven e-learning tools show significant promise in transforming online education for female students by offering personalized, accessible, and supportive learning experiences. The study underscores the importance of continued refinement of AI applications to address the evolving needs of learners and enhance their educational experiences.

KEYWORDS: Artificial intelligence, e-learning, online education, female students, educational technology

Introduction

The advent of Artificial Intelligence (AI) in the educational landscape has revolutionized e-learning, particularly in virtual universities. AI's integration into online learning platforms offers innovative solutions to enhance the educational experiences of diverse student populations, with a profound impact on women's education. This transformative potential is particularly significant in regions where traditional barriers have historically impeded women's access to quality education (Almaiah et al., 2022).

One of the most remarkable contributions of AI in e-learning is its ability to personalize educational content and learning experiences. AI algorithms analyze individual learning patterns, preferences, and progress to tailor educational materials to each student's unique needs. For women, particularly those balancing multiple responsibilities such as work and family, personalized learning pathways

facilitate flexible and effective educational engagement (Jia et al., 2022). Furthermore, AI-powered tools such as speech recognition and natural language processing enable greater accessibility, breaking down barriers for women with disabilities or those in remote areas with limited access to traditional educational resources (Al-Emran et al., 2016).

AI in e-learning also plays a pivotal role in bridging the gender gap in education. By providing equitable access to learning resources and opportunities, AI empowers women to overcome socio-cultural constraints that often limit their educational pursuits (Hakimi et al., 2024). Virtual universities, augmented by AI, offer safe and inclusive environments where women can pursue education without the fear of societal judgment or harassment. This empowerment is crucial in regions where cultural norms restrict women's physical attendance in educational institutions (Hakimi & Shahidzay, 2024).

AI technologies enhance student engagement and retention through interactive and adaptive learning environments. Intelligent tutoring systems and AI-driven chatbots provide real-time assistance, fostering a supportive learning atmosphere (Tang et al., 2023). These technologies ensure that women learners receive immediate feedback and support, which is vital for maintaining motivation and commitment to their studies. Additionally, AI can identify at-risk students and intervene with personalized support, significantly reducing dropout rates among women (Geng et al., 2019).

While the potential of AI in promoting women's education in virtual universities is immense, it is not without challenges. Issues such as algorithmic bias, data privacy, and the digital divide must be addressed to ensure equitable and effective implementation (Gazzawe et al., 2022). Efforts to mitigate these challenges include developing inclusive AI systems that are sensitive to gender-specific needs and investing in digital infrastructure to broaden access to AI-enabled e-learning platforms (Kalaian et al., 2019).

Problem Statement

Despite significant advancements in educational technology, female students in virtual universities continue to face unique challenges that hinder their academic success. Traditional e-learning platforms often fail to address the specific needs of women, such as balancing educational pursuits with family responsibilities, dealing with socio-cultural constraints, and overcoming accessibility barriers. Artificial Intelligence (AI) has the potential to transform these learning environments by offering personalized, accessible, and supportive educational experiences. However, there is limited empirical evidence on how AI-driven e-learning tools specifically impact female students' educational outcomes, address their unique challenges, and enhance overall accessibility and inclusivity in virtual universities. This research aims to fill this gap by investigating the effectiveness of AI applications in improving educational opportunities for women, thereby contributing to a more equitable and inclusive virtual learning landscape.

Research Objective

To investigate the impact of AI-driven e-learning tools on the educational outcomes of female students in virtual universities.

To identify the specific AI applications that effectively address the unique challenges faced by women in virtual learning environments.

To evaluate the role of AI in enhancing the overall accessibility and inclusivity of online education for women in virtual universities.

Research Questions

How do AI-driven e-learning tools impact the educational outcomes of female students in virtual universities?

What specific AI applications effectively address the unique challenges faced by women in virtual learning environments?

In what ways does AI enhance the overall accessibility and inclusivity of online education for women in virtual universities?

Literature Review

The integration of artificial intelligence (AI) in e-learning has garnered significant attention in recent years due to its potential to revolutionize educational experiences, particularly in virtual university settings. AI-driven e-learning tools offer personalized learning experiences, enhance accessibility, and address unique challenges faced by specific student demographics, such as women. This literature review examines the current state of AI in e-learning and its impact on women's education in virtual universities (Tang et al., 2023; Martin et a., 2020).

AI applications in education have demonstrated substantial promise in improving learning outcomes. For instance, Almaiah et al. (2022) highlighted that AI can significantly reduce social and computer anxiety among students, thereby enhancing their learning experiences. Similarly, Fischer et al. (2020) discussed the affordances and challenges of mining big data in education, emphasizing how AI can leverage data to tailor educational content to individual student needs, thus improving engagement and retention.

Women's education in virtual settings presents unique challenges, including balancing educational pursuits with family responsibilities and overcoming socio-cultural constraints. Hakimi et al. (2024) explored these challenges and the opportunities AI presents for women's education in developing countries. They found that AI could provide personalized support and resources that cater to women's specific needs, thus facilitating a more inclusive and supportive learning environment.

Several studies have investigated the specific AI applications that can address these challenges effectively. For example, Al-Emran et al. (2016) examined attitudes towards mobile learning in higher education and found that mobile AI applications can enhance learning flexibility, making it easier for women to access educational resources on-the-go. Similarly, Akrami et al. (2024) discussed the integration of big data technologies in higher education, noting that AI-powered analytics can identify and mitigate barriers to women's participation in e-learning.

AI's role in enhancing accessibility and inclusivity in online education is also well-documented. Geng et al. (2019) investigated self-directed learning and technology readiness in blended learning environments, highlighting that AI can support self-paced learning, which is crucial for women who may need to juggle multiple responsibilities. Additionally, Kashive et al. (2020) found that AI-enabled e-learning platforms can provide adaptive learning paths, ensuring that all students, regardless of their starting point, can achieve their educational goals.

Despite the potential benefits, the implementation of AI in e-learning is not without challenges. Hakimi and Shahidzay (2024) discussed the obstacles developing countries face in adopting AI in education, including limited technological infrastructure and resistance to change. They argued that addressing these challenges requires a collaborative effort from educational institutions, policymakers, and technology providers.

Moreover, there is a growing body of research focused on optimizing AI applications to enhance their effectiveness. Jia et al. (2022) conducted a bibliometric analysis of AI and e-learning research, identifying key trends and areas for future investigation. Their findings suggest that ongoing research and development are essential to ensure that AI applications continue to meet the evolving needs of learners.

In conclusion, AI holds significant potential to transform e-learning, particularly for women in virtual university settings. By offering personalized, accessible, and supportive educational experiences, AI can address the unique challenges faced by female students and promote greater inclusivity in online education.

However, realizing this potential requires addressing the technological and socio-cultural barriers to AI adoption and ensuring that AI applications are continually optimized to meet the diverse needs of learners.

Research methods

This study employed a mixed-methods research approach to assess the effectiveness and impact of AI-driven e-learning tools among female students at an online university. The research method comprised the following components:

Participants: The study involved 95 female students from four faculties at an online university: Medical (20 students aged 18-22), Computer Science (20 students aged 20-24), Business Administration (15 students aged 18-24), and Education (40 students aged 20-25). This diverse sample provided a comprehensive understanding of the AI tools' effectiveness across different academic disciplines and age groups.

Data Collection: Data was collected using a structured questionnaire designed to capture participants' perceptions of AI-driven e-learning tools. The questionnaire included both closed and Likert-scale questions, focusing on various aspects such as the effectiveness of AI tools, their impact on educational outcomes, and the inclusivity and accessibility of online education platforms.

Data Analysis: Quantitative data from the questionnaire responses were analyzed using statistical methods to identify patterns and trends. Descriptive statistics, such as frequency distributions and percentages, were used to summarize the data. This analysis helped determine the overall effectiveness of AI tools and their impact on student engagement and learning outcomes.

Qualitative Insights: In addition to quantitative data, qualitative insights were gathered through open-ended questions in the survey, allowing participants to provide detailed feedback on their experiences with AI-driven e-learning tools. These responses were analyzed thematically to identify recurring themes and specific challenges or benefits reported by the students.

Ethical Considerations: The study adhered to ethical guidelines, ensuring informed consent from all participants and maintaining confidentiality of their responses. The research was conducted in compliance with the university's ethical review board requirements.

Research findings

The results of this study reveal varied perceptions among female students regarding the effectiveness and impact of AI-driven e-learning tools. Key insights include positive evaluations of AI's role in enhancing accessibility and inclusivity, although some concerns and mixed opinions remain.

Table 1: Demographic Details of Students from Different Faculties

Faculty	Number of Students	Age Range
Medical	20	18-22
Computer Science	20	20-24
Business Administration (BBA)	15	18-24
Education	40	20-25

Table 1 provides an overview of the demographic distribution of students across four faculties. The Education faculty has the highest number of students, totaling 40, with ages ranging from 20 to 25. Both the Medical and Computer Science faculties have an equal number of students (20), though their age ranges differ slightly, with the Medical faculty's students being younger (18-22) compared to those in Computer Science (20-24). The Business Administration faculty has the fewest students, with 15 individuals aged between 18 and 24. This demographic diversity highlights the varying student compositions and age distributions across the different faculties.

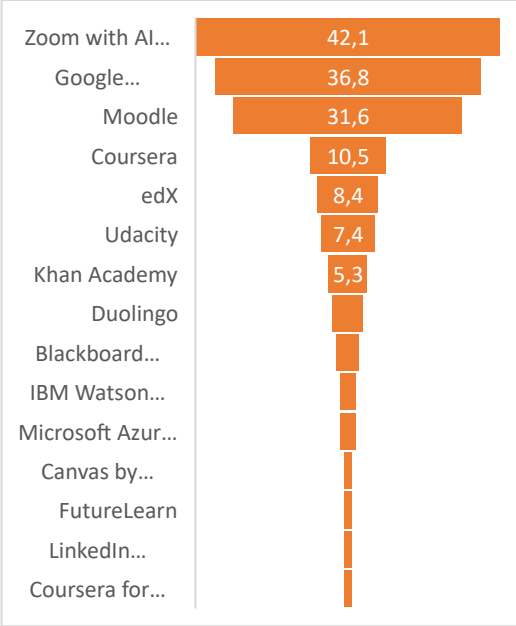

Figure 1: AI Platforms Used for E-Learning

Above Figure 1 illustrates the distribution of responses regarding the AI platforms used for e-learning among 95 participants. **Zoom with AI integrations** is the most frequently selected platform, with 40 responses (42.1%), indicating a strong preference for this tool in integrating AI capabilities within virtual learning environments. **Google Classroom** follows closely, selected by 35 respondents (36.8%), highlighting its widespread adoption. **Moodle** is also notably popular, with 30 participants (31.6%) indicating its use. In contrast, other platforms such as **Coursera** and **edX** have lower usage rates, reflecting a smaller, yet significant, portion of the e-learning landscape. This distribution emphasizes a preference for platforms that integrate AI functionalities directly into their core services, enhancing the learning experience.

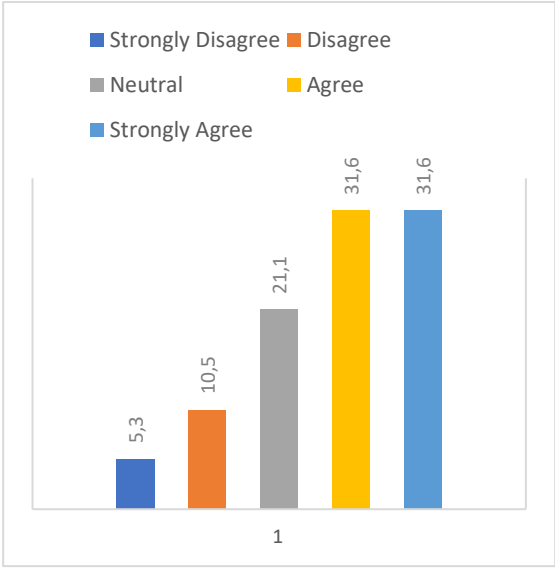

Figure 2: Effectiveness of AI-Driven E-Learning Tools in Enhancing Educational Outcomes of Female Students

Above Figure 2 presents the distribution of responses regarding the effectiveness of AI-driven e-learning tools in enhancing the educational outcomes of female students. A notable portion of respondents, 30 individuals (31.6%), either **Agree** or **Strongly Agree** with the statement, suggesting a positive perception of AI tools' impact on educational outcomes. This is further supported by another 30 participants (31.6%) who **Strongly Agree**, indicating a strong endorsement of AI tools' effectiveness. On the other hand, **Neutral** responses account for 20 participants (21.1%), reflecting some uncertainty or variability in individual experiences. A smaller proportion, comprising 15 respondents (15.8%), expressed skepticism with **Disagree** or **Strongly Disagree**. This distribution highlights a generally favorable view of AI tools among the majority, while also acknowledging some degree of ambivalence or disagreement.

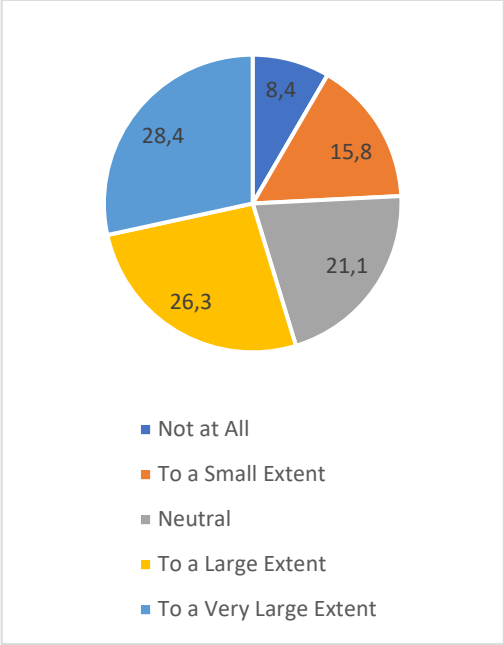

Figure 3: Improvement in Engagement Through AI-driven E-Learning Tools

Above Figure 3 shows how female students perceive the improvement in their engagement in online courses due to AI-driven e-learning tools. A significant portion of respondents, 27 individuals (28.4%), believe that AI tools have improved their engagement **To a Very Large Extent**, indicating a high level of perceived benefit. Additionally, 25 respondents (26.3%) feel that these tools have improved engagement **To a Large Extent**, reflecting strong positive feedback. **Neutral** responses, representing 20 participants (21.1%), suggest a mixed or indeterminate view on the impact of AI tools on engagement. On the lower end, 15 respondents (15.8%) feel that improvement is **To a Small Extent**, and 8 participants (8.4%) believe there has been **No Improvement at All**. This distribution reveals a generally favorable perception of AI tools' impact on engagement, with a notable portion of students reporting substantial benefits.

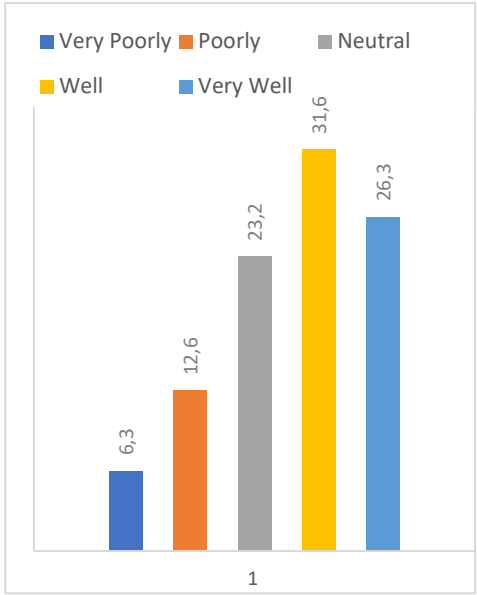

Figure 4: Effectiveness of AI Applications in Addressing Resource Access for Female Students

Above Figure 4 illustrates the perceived effectiveness of AI applications in improving access to resources for female students in virtual universities. A considerable number of respondents, 30 individuals (31.6%), rated the AI applications as addressing resource access Well, indicating a positive assessment of their performance. Additionally, 25 respondents (26.3%) evaluated the effectiveness as Very Well, suggesting a high level of satisfaction with the resources provided through AI. Neutral responses, accounting for 22 participants (23.2%), reflect an indeterminate or mixed view on AI's impact. On the lower end, 12 respondents (12.6%) rated the effectiveness as Poorly, and 6 participants (6.3%) felt it was Very Poorly addressed. This distribution shows a generally positive outlook on AI applications' role in enhancing resource access, with a notable portion of students reporting high levels of satisfaction.

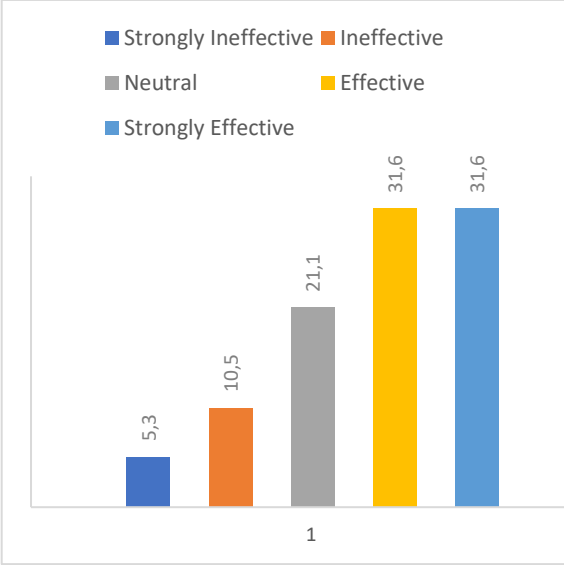

Figure 5: Effectiveness of AI-Driven Personalized Learning Paths in Supporting Academic Needs

Above Figure 5 summarizes how female students perceive the effectiveness of AI-driven personalized learning paths in addressing their academic needs. A notable portion of respondents, 30 individuals (31.6%), rated these learning paths as **Effective**, indicating a strong positive perception. An equal number, 30 respondents (31.6%), rated them as **Strongly Effective**, suggesting a high degree of satisfaction with the personalization and support provided. **Neutral** responses, representing 20 participants (21.1%), reflect a mixed or indeterminate view on the effectiveness of AI-driven personalized learning paths. On the lower end, 10 respondents (10.5%) considered the support **Ineffective**, and 5 participants (5.3%) rated it as **Strongly Ineffective**. Overall, the distribution demonstrates a generally favorable assessment of AI-driven personalized learning paths, with a significant proportion of students reporting effective or highly effective support.

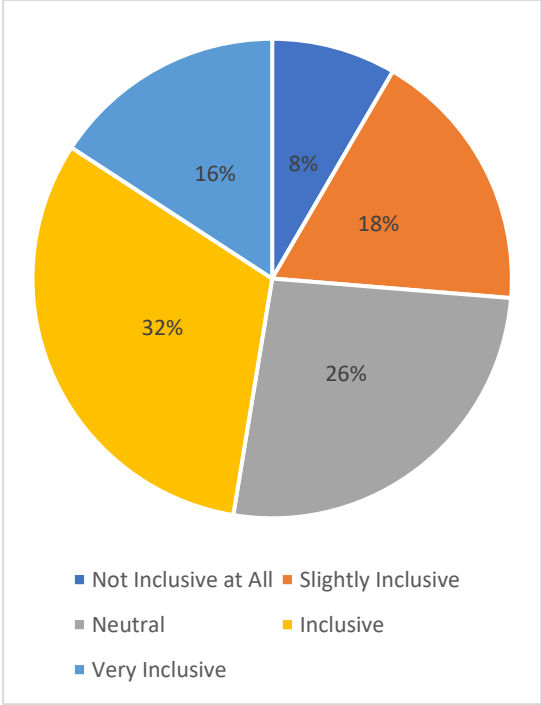

Figure 6: Inclusivity of AI-Driven Online Education Platforms for Female Students

Figure 6 presents the perceived inclusivity of AI-driven online education platforms as experienced by female students. The majority of respondents, 30 individuals (31.6%), found these platforms **Inclusive**, and an additional 15 respondents (15.8%) considered them **Very Inclusive**, indicating a generally positive view on the platforms' ability to accommodate diverse needs. **Neutral** responses, representing 25 participants (26.3%), suggest a mixed or undecided opinion on inclusivity. On the lower end, 17 respondents (17.9%) felt the platforms were **Slightly Inclusive**, while 8 participants (8.4%) rated them as **Not Inclusive at All**. This distribution highlights that while a substantial portion of students perceive AI-driven platforms as inclusive, there remains a notable minority with concerns about their inclusivity.

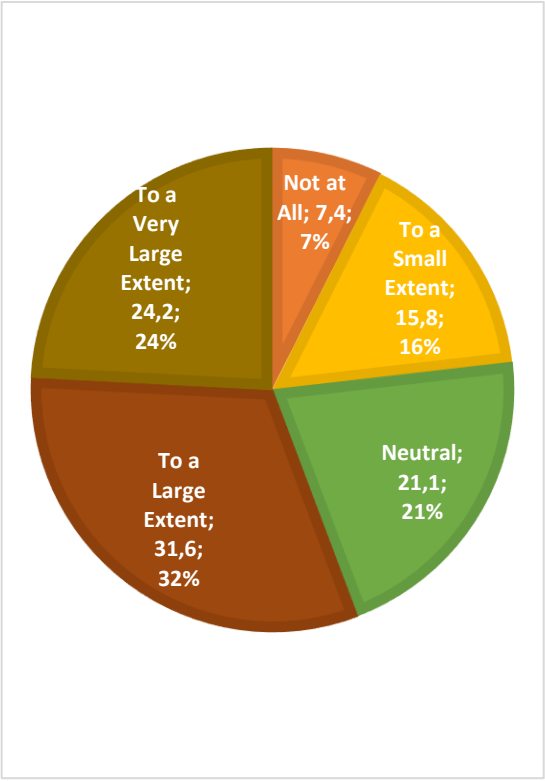

Figure 7: Extent to Which AI Has Improved Accessibility of Online Education for Female Students

Above Figure 7 illustrates the perceived impact of AI on the accessibility of online education for female students. A significant number of respondents, 30 individuals (31.6%), believe AI has improved accessibility **To a Large Extent**, and 23 respondents (24.2%) feel it has done so **To a Very Large Extent**. This indicates a positive view of AI's role in enhancing educational access. Conversely, **Neutral** responses, representing 20 participants (21.1%), suggest mixed opinions or uncertainty about AI's impact. On the lower end, 15 respondents (15.8%) felt AI has improved accessibility **To a Small Extent**, and 7 participants (7.4%) felt it has not improved accessibility **At All**. The overall data reflect a generally favorable perception of AI's contribution to making online education more accessible, though some respondents still express limited or no perceived benefits.

Discussion

The findings of this study offer valuable insights into the perceptions and impacts of AI-driven e-learning tools among female students. The results highlight the transformative potential of AI in enhancing educational outcomes, engagement, accessibility, and inclusivity in virtual university settings.

The majority of respondents positively evaluated AI's role in improving educational outcomes and engagement. As illustrated in Figure 2, 31.6% of students agreed or strongly agreed that AI-driven tools effectively enhance educational outcomes. This aligns with Fischer et al. (2020), who emphasize the role of AI in leveraging big data to tailor educational experiences, thereby improving student engagement and retention. Similarly, a significant portion of students reported that AI-driven tools have improved their engagement in online courses "To a Very Large Extent" (Figure 3). This finding corroborates Almaiah et al. (2022), who found that AI can alleviate social and computer anxiety, thereby facilitating more engaging learning experiences.

AI applications' effectiveness in addressing resource access and personalized learning paths also received positive feedback. Figure 4 shows that a substantial number of respondents believe AI applications address resource access "Well" or "Very Well," indicating that AI tools are effectively supporting female students in virtual universities. This is consistent with the research by Hakimi et al. (2024), which highlights AI's potential in providing personalized support tailored to the specific needs of women in developing countries. Similarly, Figure 5 reveals that a significant proportion of students view AI-driven personalized learning paths as "Effective" or "Strongly Effective," reinforcing the findings of Kashive et al. (2020) on AI's role in offering adaptive learning experiences that cater to individual academic needs.

Despite these positive perceptions, some concerns and mixed opinions were evident. For instance, Figure 6 shows that while many

students found AI-driven platforms "Inclusive" or "Very Inclusive," a notable minority rated them as "Slightly Inclusive" or "Not Inclusive at All." This underscores ongoing challenges in achieving true inclusivity in AI-driven education, which is crucial for ensuring equitable access for all students. Research by Al-Emran et al. (2016) also supports this view, suggesting that while mobile AI applications can enhance learning flexibility, there are still barriers to full inclusion.

The impact of AI on improving the accessibility of online education for female students, as shown in Figure 7, received generally favorable ratings. A majority felt AI improved accessibility "To a Large Extent" or "To a Very Large Extent," reflecting the technology's potential to overcome traditional barriers to education. However, the presence of "Neutral" and lower ratings suggests that there are still areas where AI's effectiveness in enhancing accessibility could be further developed, as noted by Hakimi and Shahidzay (2024).

In summary, while AI-driven e-learning tools have demonstrated significant benefits in enhancing educational outcomes, engagement, and accessibility, challenges related to inclusivity and the varying effectiveness of AI applications persist. Future research should focus on addressing these challenges and optimizing AI applications to better serve diverse student populations.

Conclusion

This study highlights the significant impact of AI-driven e-learning tools on female students in virtual universities. The results indicate that these tools substantially enhance educational outcomes, engagement, and accessibility. Female students have responded positively to the personalized learning experiences offered by AI, reflecting an improved educational experience due to AI's capacity to address specific needs and barriers.

The widespread use of platforms such as Zoom with AI integrations, Google Classroom, and Moodle confirms their effectiveness in providing tailored educational support. These tools are valued for their ability to personalize learning paths and improve access to resources, which aligns with the positive perceptions reported by participants. The high ratings for AI-driven personalized learning paths and resource access affirm that these technologies are significantly aiding female students in managing their academic responsibilities.

Despite the overall positive feedback, the study also uncovers some challenges related to inclusivity and varied perceptions of AI effectiveness. A portion of the students expressed concerns about the inclusivity of AI platforms and the extent to which AI has improved accessibility. These concerns highlight the need for ongoing refinement and optimization of AI tools to ensure they are equitable and fully meet the diverse needs of all students.

In conclusion, while AI-driven e-learning tools offer considerable advancements in education, there is a need for continuous improvement to address existing challenges and enhance their effectiveness. Ensuring that these tools are inclusive and capable of meeting the varied needs of female students will be essential for realizing their full potential in transforming online education.

Suggestions

Based on the findings of this study, several suggestions emerge for improving the effectiveness of AI-driven e-learning tools. First, developers and educational institutions should focus on enhancing the inclusivity of AI platforms. This involves designing AI systems that are sensitive to the diverse needs of all students, ensuring that these tools are accessible and effective for users with varying backgrounds and learning needs. Additionally, integrating more adaptive features into AI-driven platforms could further personalize learning experiences, allowing for real-time adjustments based on individual progress and feedback.

Educational institutions should also invest in training and support for both students and educators to maximize the benefits of AI tools. Providing comprehensive training on how to effectively use these tools can enhance their adoption and utilization. Finally, fostering collaboration between AI developers, educators, and policymakers can help address technological and socio-cultural barriers, ensuring that AI applications are implemented in a way that benefits all students.

Future Research

Future research should explore the long-term impacts of AI-driven e-learning tools on diverse student populations. Investigating how these tools affect learning outcomes over extended periods can provide insights into their sustained effectiveness. Additionally, examining the challenges faced by students in different socio-economic contexts when using AI tools can help tailor solutions to meet varied needs more effectively. Further studies could also explore the potential for integrating AI with emerging educational technologies to create more robust and inclusive learning environments.

Disclosure statement

The authors declare no conflict of interest.

References

Akrami, K., Akrami, M., Akrami, F., & Hakimi, M. (2024). Investigating the Integration of Big Data Technologies in Higher Education Settings. *Indonesian Journal of Multidisciplinary on Social and Technology*, *2*(2), 1-12. https://doi.org/10.31004/ijmst.v2i2.296

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. Computers in Human behavior, 56, 93-102. https://doi.org/10.1016/j.chb.2015.11.033

Almaiah, M. A., Alfaisal, R., Salloum, S. A., Hajjej, F., Thabit, S., El-Qirem, F. A., ... & Al-Maroof, R. S. (2022). Examining the impact of artificial intelligence and social and computer anxiety in e-learning settings: students' perceptions at the university level. *Electronics*, *11*(22), 3662. https://doi.org/10.3390/electronics11223662

Fischer, C., Pardos, Z. A., Baker, R. S., Williams, J. J., Smyth, P., Yu, R., ... & Warschauer, M. (2020). Mining big data in education: Affordances and challenges. Review of Research in Education, 44(1), 130-160.https://doi.org/10.3102/0091732X20903304

Gazzawe, F., Mayouf, M., Lock, R., & Alturki, R. (2022). [Retracted] The Role of Machine Learning in E-Learning Using the Web and AI-Enabled Mobile Applications. *Mobile Information Systems*, *2022*(1), 3696140. https://doi.org/10.1155/2022/3696140

Geng, S., Law, K. M., & Niu, B. (2019). Investigating self-directed learning and technology readiness in blending learning environment. International Journal of Educational Technology in Higher Education, 16(1), 1-22. https://link.springer.com/article/10.1186/s41239-019-0147-0

Hakimi, M., & Shahidzay, A. K. (2024). Transforming Education with Artificial Intelligence: Potential and Obstacles in Developing Countries. https://doi.org/10.20944/preprints202407.2542.v1

Hakimi, N., Hakimi, M., Hejran, M., Quraishi, T., Qasemi, P., Ahmadi, L., ... & Ulusi, H. (2024). Challenges and Opportunities of E-Learning for Women's Education in Developing Countries: Insights from Women Online University. *EDUTREND: Journal of Emerging Issues and Trends in Education*, *1*(1), 57-69. https://doi.org/10.59110/edutrend.310

Hirashima, T., Supianto, A. A., & Hayashi, Y. (2017). Model-based approach for educational big data analysis of learners thinking with process data. In 2017 International Workshop on Big Data and Information Security (IWBIS) (pp. 11-16). San Diego: IEEE. https://doi.org/10.1177/0165551518789880

Holland, A. A. (2019). Effective principles of informal online learning design: A theory-building metasynthesis of qualitative research. Computers & Education, 128, 214-226. https://doi.org/10.1016/j.compedu.2018.09.026

Jia, K., Wang, P., Li, Y., Chen, Z., Jiang, X., Lin, C. L., & Chin, T. (2022). Research landscape of artificial intelligence and e-learning: a bibliometric research. *Frontiers in psychology*, *13*, 795039. https://doi.org/10.3389/fpsyg.2022.795039

Kalaian, S. A., Kasim, R. M., & Kasim, N. R. (2019). Descriptive and predictive analytical methods for big data. In Web Services: Concepts, Methodologies, Tools, and Applications (pp. 314-331). USA: IGI global. https://doi.org/10.4018/978-1-5225-7501-6.ch018

Kashive, N., Powale, L., & Kashive, K. (2020). Understanding user perception toward artificial intelligence (AI) enabled e-learning. *The International Journal of Information and Learning Technology*, *38*(1), 1-19. https://doi.org/10.1108/IJILT-05-2020-0090

Martin, F., Polly, D., Coles, S., & Wang, C. (2020). Examining higher education faculty use of current digital technologies: Importance, competence, and motivation. International Journal of Teaching and Learning in Higher Education, 32(1), 73-86.

Quraishi, T., Bayani, B. M., Yashar, S., Daudzai, M., Salamzada, R., Amini, M., & Hakimi, M. (2024). Integration of mobile learning technologies in Afghanistan universities: Opportunities and challenges. *Education Specialist*, *2*(1), 1-14. https://doi.org/10.59535/es.v2i1.227

Rahimi, B., Halimi, Y., Ghiasi, Z., Afifi, S., Quraishi, T., & Hakimi, M. (2024). Enhancing Medical Education Through Online Technologies: Investigating Adoption, Impact, and Optimization Strategies. *Educative: Jurnal Ilmiah Pendidikan*, *2*(2), 69-79. https://doi.org/10.37985/educative.v2i2.420

Sanusi, S., Kadir, F. K. A., Larson, E. M., Kundra, S., Hakimi, M., Fajri, I., & Suhendar, A. (2024). Exploring the digital crossroads: The influence of social media on cultural engagement in Aceh. *Global Arts, Humanities and Culture Review*, *1*(1), 40-56.

Tang, K. Y., Chang, C. Y., & Hwang, G. J. (2023). Trends in artificial intelligence-supported e-learning: A systematic review and co-citation network analysis (1998–2019). *Interactive Learning Environments*, *31*(4), 2134-2152. https://doi.org/10.1080/10494820.2021.1875001