

Exploring AI-Driven Personalization in Open and Distance Learning: Learner Engagement, Inclusivity, and Ethical Implementation

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Abstract

Open and Distance Learning (ODL) has significantly transformed education by eliminating geographical and financial barriers, thereby providing diverse learners with access to quality educational opportunities. However, it continues to face persistent challenges, including low learner engagement, high dropout rates, and difficulties in addressing diverse learner needs and digital literacy gaps. This study explores the role of Artificial Intelligence (AI) in addressing these challenges by enabling personalized learning pathways, fostering inclusivity, and promoting equitable access to education. Using a qualitative case study approach, data were collected through interviews with 20 learners and 4 instructors during AI generative workshops. Thematic analysis identified key findings, highlighting AI's ability to enhance learning efficiency, improve access to resources, and provide inclusive solutions for learners with diverse needs, including those with disabilities. However, significant barriers remain, such as limited awareness and training, ethical concerns related to data privacy, and infrastructural limitations. Participants emphasized the importance of strategic planning, ethical implementation, and continuous capacity building for instructors to fully realize AI's transformative potential. This study provides actionable insights for leveraging AI to improve engagement, retention, and learning outcomes in ODL environments while addressing ethical and practical challenges to ensure sustainable and equitable adoption.

Keywords: Artificial Intelligence, Personalization, Learner Engagement, Inclusivity, Open and Distance Learning (ODL)

Introduction and Background

The increasing accessibility of open and distance learning (ODL) has transformed education by eliminating geographical and financial barriers, allowing learners worldwide to access quality educational opportunities. This democratization of education supports global initiatives to promote lifelong learning and reduce educational inequities, particularly in

underserved communities (Espín, 2023; Tiwari, 2023). Despite its potential, ODL faces challenges related to learner engagement and retention due to the diversity in student backgrounds, needs, and learning preferences. Factors such as varying levels of digital literacy, differences in learning styles, and limited real-time instructor support often result in high dropout rates, undermining the effectiveness of ODL initiatives (Nguyen et al., 2021; Vieira et al., 2024).

Advancements in artificial intelligence (AI) offer solutions to address these challenges by personalizing the learning experience. AI technologies, such as adaptive learning systems and intelligent tutoring programs, have demonstrated their ability to analyze large datasets, identify learning patterns, and customize content to meet the unique needs of each learner (Holmes et al., 2022; Mishra, 2024). For instance, AI-driven learner profiling enables educators to deliver tailored content and feedback, enhancing engagement and supporting learners in achieving better outcomes (Gu, 2024; Arya & Verma, 2024). Additionally, AI's ability to provide real-time feedback and adapt to individual learning paces has further strengthened its role in addressing engagement challenges in ODL settings (Sayed et al., 2020; Tapalova et al., 2022).

Beyond personalization, AI promotes inclusivity and equitable access to education. By accommodating diverse learner needs, including those with disabilities or limited digital skills, AI-driven tools reduce barriers to learning and foster equity in educational opportunities (Espín, 2023; Tiwari, 2023). These tools also bridge the digital divide by delivering tailored learning experiences that address socio-economic disparities and cultural differences, ensuring that ODL remains accessible to a wide range of learners (Gu, 2024).

However, the integration of AI in education is not without challenges. Ethical concerns, such as data privacy and algorithmic bias, as well as the infrastructure required for AI implementation, must be addressed to ensure sustainable and equitable adoption (Smith & Jones, 2023; Holmes et al., 2022). Furthermore, effective teacher training programs are necessary to equip educators with the skills to leverage AI technologies responsibly and effectively in educational settings (Nguyen et al., 2021; Vieira et al., 2024).

This paper explores the transformative potential of AI in personalizing ODL experiences, focusing on its ability to enhance engagement, foster inclusivity, and reduce dropout rates. By examining recent research, the discussion highlights AI's role in creating impactful and equitable learning experiences while addressing the challenges associated with its implementation. The integration of artificial intelligence (AI) in personalizing open and distance learning (ODL) experiences offers transformative potential for education. This review categorizes existing research into themes such as efficiency, inclusivity, challenges, and future directions, highlighting AI's capacity to revolutionize educational outcomes. Key aspects of AI's role in ODL personalization are outlined below, supported by relevant literature.

Efficiency and Personalization

AI technologies like adaptive learning systems and intelligent tutoring enhance the efficiency of learning by tailoring content to individual needs. These systems analyze learner data to provide personalized educational experiences, fostering engagement and improved outcomes (Holmes et al., 2022; Mishra, 2024). Personalized learning pathways enable real-

time feedback and content adaptation, allowing students to progress at their own pace (Arya & Verma, 2024; Gu, 2024). Efficiency and personalization in education have been significantly enhanced by the integration of artificial intelligence (AI). AI technologies such as adaptive learning systems and intelligent tutoring programs have the ability to tailor educational content to individual learning styles, preferences, and paces. These systems analyze vast datasets from learner interactions, allowing for the customization of content delivery and learning pathways (Holmes et al., 2022). By providing real-time feedback and adapting instruction dynamically, AI-driven platforms create a more engaging and efficient learning environment compared to traditional methods (Arya & Verma, 2024; Mishra, 2024).

Personalized learning pathways facilitated by AI have demonstrated a measurable impact on learning outcomes. For instance, these pathways allow students to focus on areas where they need improvement while progressing faster through content they have already mastered. This individualized approach fosters greater learner engagement and improves knowledge retention (Gu, 2024; Tapalova et al., 2022). By responding to the specific needs of learners, AI helps reduce cognitive overload and provides a seamless learning experience tailored to individual capabilities (Espín, 2023).

The efficiency of AI extends to its capacity to automate routine educational tasks, enabling instructors to dedicate more time to personalized teaching. Tasks such as grading, content delivery, and performance tracking are streamlined through AI, reducing administrative burdens and allowing educators to focus on developing and implementing innovative pedagogical strategies (Holmes et al., 2022; Vieira et al., 2024). This efficiency is particularly beneficial in ODL environments, where instructors often manage large and diverse cohorts of students (Nguyen et al., 2021).

Moreover, AI-driven systems enable a data-informed approach to education by collecting and analyzing metrics such as engagement rates, assessment performance, and time spent on tasks. These insights help educators identify learning gaps and adapt instructional strategies, accordingly, further enhancing the personalization and efficiency of the educational experience (Mishra, 2024; Smith & Jones, 2023). For example, adaptive quizzes and assignments powered by AI provide targeted support to learners, ensuring they receive timely interventions to address their challenges (Gu, 2024).

In addition to improving individual learning experiences, AI has demonstrated its scalability in supporting diverse learner groups. The ability of AI systems to process and adapt to vast amounts of data makes them an effective tool for delivering personalized learning at scale, particularly in large ODL courses where traditional approaches might fall short (Sayed et al., 2020). This scalability ensures that learners from varied cultural, linguistic, and socio-economic backgrounds can access high-quality, customized educational experiences (Tapalova et al., 2022).

Overall, the role of AI in enhancing efficiency and personalization in education is a significant step toward addressing the challenges of engagement and retention in ODL settings. By leveraging adaptive technologies, educators can create learning environments that are not only efficient but also responsive to the diverse needs of students. This alignment of

technology with pedagogy paves the way for more inclusive and impactful learning experiences.

Inclusivity and Equitable Access

AI-driven tools support inclusivity by providing resources tailored to diverse learning needs, ensuring equitable access to quality education. They help bridge the digital divide, addressing barriers like socio-economic disparities and geographical constraints (Espín, 2023; Tapalova et al., 2022). For example, AI-enabled platforms adapt content for students with varying learning preferences, fostering inclusivity and equity in education (Sayed et al., 2020).

Artificial intelligence (AI) has emerged as a transformative tool for fostering inclusivity and equitable access to education, particularly in open and distance learning (ODL) environments. By leveraging its ability to adapt to diverse learning needs and preferences, AI-driven tools address barriers that have traditionally excluded certain groups of learners. These tools support learners from varied socio-economic, cultural, and linguistic backgrounds, as well as those with disabilities, ensuring that education becomes a universally accessible resource (Espín, 2023; Tapalova et al., 2022).

One of the most significant contributions of AI to inclusivity is its capacity to customize learning experiences. For example, adaptive learning platforms use data-driven insights to tailor content delivery and support services to individual learners' abilities and needs. This approach ensures that students with disabilities or those requiring additional academic support receive targeted interventions, enabling them to achieve educational success on par with their peers (Sayed et al., 2020; Vieira et al., 2024). By offering features such as text-to-speech, closed captioning, and language translation, AI tools enhance accessibility for learners with sensory or linguistic challenges, thus promoting equity in learning opportunities (Holmes et al., 2022).

AI also plays a critical role in bridging the digital divide, a persistent challenge in education. While traditional educational methods often fail to accommodate the diverse contexts of learners, AI-driven systems provide tailored resources and pathways that cater to students from underserved regions or marginalized communities (Gu, 2024; Arya & Verma, 2024). These technologies mitigate disparities by offering flexible learning solutions that consider factors such as limited internet connectivity or constrained access to physical educational infrastructure (Espín, 2023). For instance, offline AI-powered tools or lightweight applications ensure that learners in remote areas can access high-quality educational content without requiring continuous online connectivity (Tiwari, 2023).

Inclusivity is further supported by AI's ability to recognize and respect cultural and linguistic diversity. Multilingual AI platforms allow learners to access content in their native languages, reducing language barriers and enhancing comprehension (Tapalova et al., 2022; Nguyen et al., 2021). Additionally, culturally responsive AI tools incorporate localized examples and contexts, making learning more relatable and effective for students from different regions and traditions (Mishra, 2024).

Equitable access to education also depends on providing personalized support to learners who may face socio-economic challenges. AI-driven platforms offer scalable solutions to

deliver customized educational experiences at a lower cost compared to traditional methods, making quality education more affordable and accessible (Gu, 2024; Espín, 2023). For example, automated tutoring and feedback systems reduce the reliance on human instructors, enabling institutions to reach larger learner populations without compromising on the quality of instruction (Vieira et al., 2024).

However, while AI holds the potential to promote inclusivity and equitable access, its implementation must be carefully managed to address systemic issues. Infrastructure gaps, particularly in low-resource settings, and the risk of algorithmic bias could inadvertently exacerbate existing inequalities if not appropriately mitigated (Smith & Jones, 2023; Holmes et al., 2022). Effective teacher training and ongoing monitoring of AI systems are essential to ensure that these tools are deployed ethically and inclusively, supporting all learners equitably (Nguyen et al., 2021).

In summary, AI-driven tools in education are redefining inclusivity and equitable access by addressing barriers related to disabilities, socio-economic disparities, and cultural differences. By personalizing learning experiences and bridging the digital divide, AI has the potential to create more inclusive educational environments. Continued innovation, coupled with ethical implementation, will ensure that these advancements benefit all learners, irrespective of their circumstances.

AI in Education

The utilization of AI in education has expanded through adaptive technologies and analytics. Studies demonstrate AI's ability to analyze vast datasets, identifying patterns to create customized learning paths (Holmes et al., 2022). This capability underscores its role in transforming traditional learning paradigms and improving educational outcomes (Gu, 2024).

AI in Education

Artificial intelligence (AI) has revolutionized education by introducing advanced tools and methodologies that enable personalized and adaptive learning experiences. The application of AI in education spans various domains, including data analytics, intelligent tutoring systems, and adaptive learning platforms. These technologies leverage vast datasets to identify patterns in learner behavior, preferences, and performance, creating tailored educational pathways that enhance engagement and outcomes (Holmes et al., 2022; Mishra, 2024). By automating routine educational tasks and providing real-time feedback, AI supports both educators and learners in achieving their objectives more efficiently.

One of AI's most notable contributions to education is its ability to personalize learning. Adaptive learning systems use algorithms to analyze individual learner data, such as engagement levels, comprehension rates, and performance metrics, to adjust content delivery dynamically (Gu, 2024; Arya & Verma, 2024). This customization ensures that students receive instruction suited to their unique needs and abilities, fostering deeper engagement and retention of knowledge (Espín, 2023). For instance, AI-driven tutoring systems can simulate one-on-one interactions by providing targeted explanations, answering questions, and offering personalized study plans (Sayed et al., 2020).

In addition to personalizing learning, AI facilitates scalability in education. Traditional classroom settings are often constrained by limited resources and teacher availability, which can impede personalized instruction, particularly in large or diverse classes. AI-powered tools address this limitation by enabling educators to manage and support large cohorts effectively (Tapalova et al., 2022). These tools automate administrative tasks, such as grading and tracking student progress, freeing educators to focus on more complex aspects of teaching and mentorship (Nguyen et al., 2021; Vieira et al., 2024).

AI also enhances collaborative and interactive learning environments. For example, intelligent virtual assistants and chatbots provide learners with instant support and guidance, replicating the benefits of human interaction in digital settings (Tiwari, 2023). These tools enable students to engage in collaborative problem-solving, access supplementary resources, and receive immediate feedback, fostering a more interactive and engaging educational experience (Holmes et al., 2022). Moreover, AI-based learning analytics help educators identify struggling students early, enabling timely interventions to prevent disengagement or dropouts (Mishra, 2024).

Another critical application of AI in education is its role in fostering inclusivity and equity. Multilingual AI platforms and tools that accommodate diverse learning needs allow students from different linguistic and cultural backgrounds to access quality education (Espín, 2023; Tapalova et al., 2022). For learners with disabilities, AI-powered assistive technologies, such as text-to-speech and voice recognition, provide essential support that enhances accessibility and inclusion (Gu, 2024).

While the benefits of AI in education are substantial, challenges remain in its integration. Ethical concerns, such as data privacy and algorithmic transparency, must be addressed to ensure that AI tools are used responsibly and equitably (Smith & Jones, 2023; Holmes et al., 2022). Additionally, disparities in digital infrastructure and access to AI technologies can exacerbate existing inequalities in education, particularly in low-resource settings (Tiwari, 2023). Comprehensive teacher training and capacity-building initiatives are necessary to equip educators with the skills to utilize AI effectively and ethically in their teaching practices (Nguyen et al., 2021; Vieira et al., 2024).

In summary, AI has become a transformative force in education, offering personalized, scalable, and inclusive solutions that enhance learning experiences. By leveraging data-driven insights and adaptive technologies, AI supports both educators and learners in achieving their goals. However, the successful integration of AI in education requires careful consideration of ethical, infrastructural, and pedagogical factors to ensure its benefits are realized equitably. Continued research and development will be essential in unlocking AI's full potential to improve educational systems worldwide.

Learner Profiling in ODL

Narimani and Barberà (2024) emphasize the critical role of multi-dimensional learner profiles in improving course recommendation systems, particularly by integrating course features from diverse sources and employing machine learning algorithms. While their study highlights the necessity of modeling learners' micro-behaviors for precision, it does not explore how this modeling could be operationalized. In contrast, Barthakur et al. (2023) take a broader

approach, discussing cognitive, behavioral, and competency-based profiling methods in learning analytics. They argue that combining these profiling dimensions could achieve scalable solutions across educational systems, implicitly agreeing with Narimani and Barberà on the need for comprehensive profiling but extending the discussion by addressing scalability. This scalability focus suggests a pragmatic route to operationalizing micro-behavioral insights, which Narimani and Barberà could further explore to bridge the gap in their work.

Learning Analytics and Learner Profiling

Barthakur et al. (2023) highlight learning analytics as a pivotal tool for advancing learner profiling, suggesting that cognitive, skill-based, and behavioral patterns can together create robust learner models. Benchikha (2022), however, critiques traditional profiling methods for their lack of semantic depth and argues for the use of ontologies in defining learner profiles. Benchikha further demonstrates the potential of machine learning to predict learning styles, offering an alternative, more dynamic perspective to the static profiles discussed by Barthakur et al. The implicit disagreement lies in the approach—while Barthakur et al. advocate a combined use of profiling methods, Benchikha suggests that ontologies and machine learning could redefine these profiles altogether. These complementary perspectives could be synthesized to develop a framework that combines the robustness of profiling methods with the flexibility of semantic and machine learning-based modelling.

Ontology and Machine Learning in Learner Profiling

Benchikha (2022) argues for a semantic approach to learner profiling, demonstrating that machine learning can predict learning styles effectively. Assami (2022) agrees on the use of ontologies but extends the argument to include external data sources, such as LinkedIn, to enrich learner profiles. This addition of external data introduces a layer of real-world relevance, enhancing the applicability of profiling systems to align more closely with learners' professional goals. Benchikha's narrower focus on learning styles could benefit from the broader contextualization provided by Assami. Together, these perspectives suggest that combining internal learning behaviors with external data sources could lead to a more holistic approach to learner profiling.

Digital User-Learner Profiles

Kordahi (2022) presents OntoULP as a tool that personalizes learning by structuring digital user-learner profiles. This aligns with Assami's (2022) view that ontology-based methods are critical for tailoring educational experiences. However, while Kordahi's work focuses on user behaviors and preferences in digital environments, it lacks the emphasis on integrating external data sources, as advocated by Assami. This divergence suggests a limitation in Kordahi's framework, which could be addressed by incorporating Assami's approach to external data integration. Together, these authors support the notion that ontologies are powerful tools for personalization but highlight different aspects of their application, suggesting complementary rather than conflicting approaches.

AI-Driven Personalization in Education

AI-driven personalization in education leverages advanced technologies to tailor learning pathways that align with individual learner needs, preferences, and goals. Personalized learning pathways, enabled by AI, dynamically adjust the curriculum, pedagogy, and

assessments to create customized educational experiences (Elazab, 2024). These pathways not only enhance student engagement but also improve retention rates and academic performance by addressing the specific strengths and weaknesses of each learner. For instance, adaptive learning systems, such as intelligent tutoring systems, play a pivotal role in personalizing education. These systems utilize machine learning algorithms and data analytics to analyze learner behavior, preferences, and performance data, which allows them to recommend personalized content and refine learning paths over time (Murthy et al., 2024). Various AI techniques and technologies are employed to achieve these personalized learning experiences. Natural language processing (NLP) is one such technique that enables the analysis of textual data, such as student interactions and written assignments, to understand learner needs better. Machine learning algorithms are used to identify patterns in learning behaviors, predict outcomes, and suggest tailored interventions (Chen et al., 2021). Knowledge representation techniques further facilitate the organization and customization of educational content, ensuring that it aligns with the cognitive and emotional needs of learners. These technologies collectively provide the foundation for developing adaptive learning platforms that cater to diverse learning styles and goals.

Moreover, AI-driven personalization extends beyond academic content to include real-time feedback and assessments. This capability enables educators to track learner progress continuously and offer timely interventions to address knowledge gaps or misconceptions (Murthy et al., 2024). The adaptability of AI-driven systems also supports differentiated instruction, where learners can progress at their own pace and receive support tailored to their unique learning trajectories. For instance, by analyzing real-time data on student performance, AI systems can adjust the difficulty level of tasks or suggest alternative learning resources to ensure optimal engagement and comprehension (Elazab, 2024).

AI-driven personalization is not limited to individual learner benefits; it also has broader implications for the educational system. By streamlining administrative tasks, such as curriculum design and assessment generation, AI systems allow educators to focus more on instruction and learner interaction (Montebello, 2021). Additionally, these systems can analyze large-scale data to identify trends and inform policy decisions, fostering an evidence-based approach to educational management (Chen et al., 2021). However, realizing the full potential of AI-driven personalization requires ongoing collaboration among educators, researchers, and technologists to address challenges and ensure ethical implementation.

In summary, AI-driven personalization in education transforms traditional learning paradigms by creating adaptive, engaging, and effective educational experiences. Through advanced techniques like machine learning and NLP, AI enables the development of systems that dynamically respond to learner needs, ultimately fostering more inclusive and impactful education (Murthy et al., 2024; Elazab, 2024; Chen et al., 2021).

ProblemStatement

Open and Distance Learning (ODL) has significantly widened educational access by removing geographical and financial barriers (Espín, 2023; Tiwari, 2023), yet high dropout rates and low learner engagement continue to challenge its effectiveness due to the diverse needs, backgrounds, and digital literacies of learners (Nguyen et al., 2021; Vieira et al., 2024). While advances in Artificial Intelligence (AI)—particularly adaptive learning and intelligent

tutoring—show promise in enhancing learner engagement, inclusivity, and equitable access (Sayed et al., 2020; Tapalova et al., 2022), critical gaps persist regarding effective AI-driven learner profiling, ethical and infrastructural constraints, and the need to ensure that personalization efforts address the complex socio-economic, cultural, and linguistic contexts of ODL populations. Prior studies have highlighted AI's capacity to analyze large datasets, deliver tailored content, and provide adaptive feedback (Holmes et al., 2022; Mishra, 2024), but deeper qualitative insights from learners and instructors are necessary to develop robust, context-sensitive AI systems that can mitigate ethical concerns such as bias and data privacy (Smith & Jones, 2023). Hence, this study seeks to explore—through comprehensive qualitative analysis—how AI can be harnessed to personalize ODL for diverse learners, while simultaneously identifying practical barriers and proposing sustainable, equitable solutions for AI adoption.

Research Questions

1. How do learners and instructors perceive the benefits and challenges of AI-driven personalization in ODL?
2. What learner profiling strategies (cognitive, behavioral, competency-based) are most effective in enhancing engagement and reducing dropout in AI-powered ODL platforms?
3. How do inclusivity and equitable access manifest in AI-driven ODL contexts from learners' and instructors' perspectives?
4. What ethical, infrastructural, and pedagogical considerations do stakeholders identify as crucial for sustainable and equitable AI integration in ODL?

Conceptual Framework

The conceptual framework guiding this study emphasizes AI-driven personalization mechanisms as the central component linking learner characteristics, institutional readiness, and learning outcomes in the context of Open and Distance Learning (ODL). Learner characteristics are redefined to focus on cognitive and motivational factors, highlighting the importance of individual readiness and digital literacy (Tiwari, 2023). Institutional readiness encompasses infrastructure, instructor training, and policy, underscoring the role of organizational capacity in enabling AI adoption (Nguyen et al., 2021). AI-driven personalization mechanisms, such as real-time feedback and tailored content, serve as mediating factors that adapt instructional approaches to meet learners' needs while addressing equity and ethical considerations (Holmes et al., 2022; Mishra, 2024).

These mechanisms aim to enhance learning outcomes, including academic performance and retention, as well as engagement and inclusivity, fostering equitable access for diverse learner populations (Sayed et al., 2020; Tapalova et al., 2022). By integrating these components, the framework provides a structured approach for leveraging AI in ODL to create personalized, ethical, and inclusive learning environments.

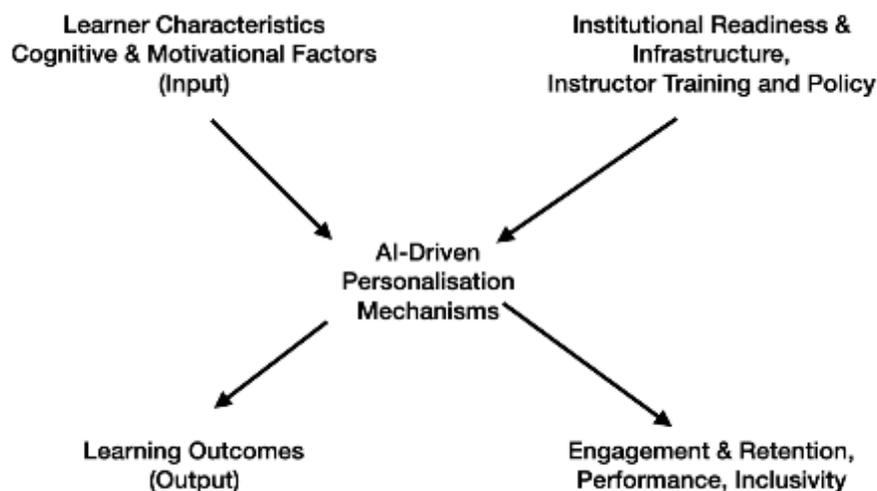


Figure 1. Conceptual Framework

Participants and Methods

Case Studies

This study utilized a case study approach to examine three AI-powered open and distance learning (ODL) platforms renowned for their implementation of personalized learning strategies. Data collection focused on evaluating platform features, analyzing learner interactions, and reviewing performance analytics. These platforms were selected based on their advanced capabilities in adaptive learning and their integration of AI-driven personalization tools. The case studies provided contextual insights into the practical applications of AI in ODL environments, illustrating how these systems enhance engagement, tailor learning pathways, and address diverse learner needs.

Interviews

Qualitative interviews were conducted with 20 learners and 4 instructors to capture a broad spectrum of experiences and perceptions regarding AI-driven personalization in ODL. All 20 learners had participated in an AI generative workshop prior to the interviews, ensuring that participants had firsthand exposure to AI-driven tools and their applications in educational settings. Following the workshop, focus group interviews were conducted with the learners to facilitate a dynamic exchange of ideas, reflections, and collaborative insights. This approach provided rich qualitative data on the relevance, effectiveness, and challenges of AI in ODL contexts, including the benefits of personalized learning pathways, the role of real-time feedback, and concerns such as data privacy and algorithmic bias. The focus group setting encouraged interactive discussions, enhancing the depth and diversity of perspectives captured during the interviews.

Data Analysis

Thematic analysis was employed to identify recurring themes in the qualitative data collected from interviews and case studies. This method enabled a systematic exploration of participants' experiences and perceptions, uncovering patterns in the relevance, effectiveness, and challenges associated with AI-driven personalization. To ensure validity

and reliability, the findings from the focus group interviews were triangulated with insights from the case studies. This approach facilitated a comprehensive and nuanced understanding of the transformative potential of AI in ODL, providing actionable insights into its implementation and areas for improvement.

Data Analysis

Thematic analysis was employed to systematically identify recurring themes in the qualitative data collected from interviews and case studies. This process included categorizing participant responses into major themes, sub-categories, and specific codes, supported by direct quotes. A summary of the qualitative data is presented in the table below, illustrating key insights derived from the interviews.

Table

M. Qualitative Coding Framework for AI Adoption: Categories, Sub-Categories, Codes, and Supporting Quotes

Category	Sub-category	Code	Supporting Quotes
Awareness and Familiarity with AI	Limited Knowledge	LACK_AWARENESS	R1: "I have never used AI-related tools."
			R2: "I only use regular programs."
	Initial Exposure	FIRST_EXPOSURE	R5: "I thought it was complicated, but after the class, I found it educative."
			R1: "When I came here, I felt outdated."
Perceived Benefits of AI	Efficiency in Learning and Work	EFFICIENCY	R8: "AI makes it much easier for us to complete assignments."
			R4: "It is easier to get new ideas and present them."
	Access to Information	INFO_ACCESS	R4: "Using AI makes it easier to search for and retrieve information."
			R5: "Google AI makes it easier to find information."
	Inclusivity	INCLUSIVITY	R13: "AI benefits all demographic groups, including special needs individuals."
			R13: "It provides equal opportunities and eliminates discrimination."
Challenges of AI Adoption	Time Constraints	TIME_ISSUE	R6: "Time is the main challenge."
	Ethical Concerns	PRIVACY_ISSUES	R7: "Uploading pictures, I don't see major issues, but maybe for organizations or individuals."
	Skill Gap	LACK_TRAINING	R9: "Support from OUM is there, but more training or workshops are needed."
Future of AI Adoption	Necessity of AI Advancement	MOVE_FORWARD	R17: "We need to move forward with AI. Otherwise, we will lag behind."
			R10: "Universities are heading towards AI technology."
	Cautious Implementation	PRIVACY_CONCERN	R10: "Some aspects, like privacy, need attention."

Results of Study and Discussion

Awareness and Familiarity with AI

Awareness and familiarity with AI play a crucial role in shaping participants' perceptions and engagement with AI tools. The sub-category of limited knowledge, as evidenced by statements such as "I have never used AI-related tools" and "I only use regular programs," reveals a foundational challenge rooted in a lack of exposure and familiarity. This lack of awareness serves as an initial barrier to recognizing AI's benefits or understanding its challenges, aligning with RQ1, which focuses on perceptions of benefits and challenges. Furthermore, it emphasizes the need for targeted training strategies and institutional policies to address knowledge gaps and ensure equitable access to AI tools, aligning with RQ4's ethical, infrastructural, and pedagogical considerations. From a conceptual framework perspective, this challenge falls under learner characteristics, specifically "motivational factors" and "demographic/cognitive readiness" (Tiwari, 2023). Conversely, the sub-category of initial exposure highlights a turning point for participants, as reflected in quotes like "I thought it was complicated, but after the class, I found it educative." This shift from viewing AI as intimidating to finding it beneficial underscores the importance of early, hands-on exposure. This aligns with RQ1 and RQ2, suggesting that structured onboarding or introductory modules tailored to learners' cognitive and competency-based needs can foster positive engagement and reduce intimidation. Institutional readiness, supported by training sessions and introductory classes, facilitates this transformation and underscores the role of instructor training in promoting effective use of AI tools (Nguyen et al., 2021).

Perceived Benefits of AI

The perceived benefits of AI, as articulated by participants, emphasize its potential to enhance efficiency, provide broad access to information, and promote inclusivity. In the sub-category of efficiency in learning and work, participants noted that "AI makes it much easier for us to complete assignments" and "It is easier to get new ideas and present them." These observations underscore efficiency as a key benefit, with learners and instructors recognizing AI's ability to save time and inspire creativity, aligning with RQ1's focus on perceptions of benefits and challenges. Additionally, enhanced efficiency is linked to RQ2, suggesting that AI-driven cognitive and behavioral profiling can streamline learning by adjusting content delivery and scaffolding processes. These findings align with AI-driven personalization mechanisms, such as real-time feedback and tailored content, which contribute to improved learning outcomes (Holmes et al., 2022; Mishra, 2024; Sayed et al., 2020).

Access to information emerged as another significant benefit, with participants stating, "Using AI makes it easier to search for and retrieve information" and "Google AI makes it easier to find information." These comments highlight the utility of AI in providing immediate and comprehensive access to information, supporting academic and personal development goals. This aligns with RQ1 by demonstrating how access to vast information repositories enhances perceptions of AI utility, and RQ3 by showing how well-designed AI-driven ODL platforms can promote inclusivity for geographically dispersed or resource-limited learners. Conceptually, this links to learning outcomes, as easy information retrieval fosters deeper learning and retention, and to institutional infrastructure, which must integrate advanced search and recommendation algorithms (Barthakur et al., 2023).

Inclusivity, as a perceived benefit, reflects AI's capacity to serve diverse demographic groups, including individuals with special needs. Statements like "AI benefits all demographic groups, including special needs individuals" and "It provides equal opportunities and eliminates discrimination" directly address RQ3's focus on inclusivity and equitable access. Furthermore, these insights align with RQ4, emphasizing the ethical and infrastructural considerations required to design AI systems that accommodate all learners equitably. This aligns with the institutional readiness and policy frameworks within the conceptual model, ensuring AI tools are accessible and support broader goals of engagement, retention, and performance (Smith & Jones, 2023). Collectively, these findings highlight AI's transformative potential in education while underscoring the importance of strategic implementation and ethical design.

Challenges of AI Adoption

The challenges of AI adoption, as identified by participants, include time constraints, ethical concerns, and skill gaps, each posing distinct barriers to effective implementation. Time constraints, highlighted by the statement "Time is the main challenge," point to a practical hurdle in learning, adopting, or effectively using AI tools. This aligns with RQ1, emphasizing the challenges learners face despite recognizing AI's benefits. Furthermore, RQ4 highlights the need for organizational policies, course design adjustments, and instructor support to address these constraints. From a conceptual framework perspective, institutional capacity and instructor readiness play a mediating role, where insufficient training or policy support exacerbates time-related barriers (Nguyen et al., 2021).

Ethical concerns, particularly regarding privacy, were noted with comments such as "Uploading pictures, I don't see major issues, but maybe for organizations or individuals." This underscores privacy as a significant challenge, aligning with RQ1 and RQ4 by addressing potential barriers to AI adoption at both individual and institutional levels. The emphasis on ethical considerations connects to the need for robust policies ensuring data security and compliance with ethical standards, critical for fostering trust and openness in using AI tools (Smith & Jones, 2023).

Skill gaps also emerged as a challenge, as indicated by the statement "Support from OUM is there, but more training or workshops are needed." This reflects a need for formal training and workshops to address pedagogical planning and infrastructural readiness, aligning with RQ4. Additionally, it ties to RQ2 by highlighting how skill deficiencies among instructors can hinder the effective use of learner profiling strategies and personalization tools. This aligns with the conceptual framework's emphasis on continuous professional development and institutional support, which are essential mediators for enabling instructors to utilize AI-driven interventions effectively (Benchikha, 2022). Collectively, these challenges illustrate the need for strategic, policy-driven solutions to ensure the successful adoption of AI in education.

Future of AI Adoption

The future of AI adoption in education is marked by both enthusiasm for advancement and a cautious approach to implementation, reflecting a balanced outlook among participants. The necessity of AI advancement, captured in statements like "We need to move forward with AI. Otherwise, we will lag behind" and "Universities are heading towards AI technology," underscores the inevitability of AI integration for the modernization of open and distance

learning (ODL). This aligns with RQ1 by highlighting participants' forward-looking stance on AI's role in maintaining institutional competitiveness and relevance. RQ4 further emphasizes the need for strategic, forward-thinking policies to support sustainable AI adoption. Conceptually, this aligns with the macro-level policy and infrastructure dimension, as institutions must address global trends and sustainability concerns by scaling AI solutions across diverse learner populations (Sayed et al., 2020; Tapalova et al., 2022).

At the same time, participants express concerns over the ethical implications of AI adoption, as reflected in the statement "Some aspects, like privacy, need attention." This cautious stance underscores the importance of robust planning to address privacy, data protection, and ethical use, aligning with RQ4's focus on infrastructural and ethical considerations. From a conceptual framework perspective, this connects to ethical and policy dimensions, emphasizing the need for AI tools to comply with data protection standards and ensure equitable access without disadvantaging any group (Nguyen et al., 2021). Together, these insights reveal a dual perspective: while participants recognize AI's transformative potential, they also advocate for careful and ethically sound implementation to maximize its benefits while minimizing potential risks.

Conclusion

The overall synthesis of findings highlights key themes aligned with the research questions, emphasizing both the potential benefits and challenges of AI adoption in education. Regarding RQ1, the themes of efficiency and access to information illustrate the perceived advantages of AI, while practical barriers such as time constraints, ethical/privacy concerns, and skill gaps present significant challenges. These insights reflect a nuanced understanding of AI's potential and limitations. For RQ2, observations of limited knowledge and initial exposure underscore the importance of learner profiling strategies, particularly cognitive and competency-based approaches, to tailor onboarding experiences. The efficiency benefits further validate the role of advanced learner analytics in enhancing engagement and streamlining learning processes.

For RQ3, the theme of inclusivity emphasizes AI's capacity to serve diverse learner demographics equitably, including those with special needs. This aligns with the framework's focus on creating inclusive educational environments that cater to all learners. Lastly, RQ4 is addressed through recurring mentions of privacy concerns, time constraints, and the need for additional training, highlighting the necessity for clear guidelines, robust infrastructure, and faculty development. Furthermore, themes of cautious implementation and the drive to advance AI adoption underscore the importance of strategic planning to balance innovation with ethical and infrastructural considerations.

According to the conceptual framework (Tiwari, 2023; Holmes et al., 2022; Mishra, 2024; Nguyen et al., 2021; Smith & Jones, 2023), successful AI-driven ODL implementation depends on four critical pillars: learner readiness, institutional support, AI-driven personalization, and ethical and equity considerations. Bridging knowledge gaps and fostering digital literacy enhance learner readiness, while institutional support addresses time, privacy, and inclusivity concerns. AI-driven personalization through mechanisms like real-time feedback and adaptive analytics supports engagement and retention. Ethical and equity considerations ensure that

AI tools serve all learners without bias or data infringement, creating a sustainable and inclusive ecosystem for AI in education.

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