

## EFFECTIVE USE OF ARTIFICIAL INTELLIGENCE TO DEVELOP AND IMPLEMENT ADAPTIVE LEARNING SYSTEM AMONG MUSLIM STUDENTS IN SENIOR SECONDARY SCHOOLS IN KWARA STATE, NIGERIA

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### Abstract

*Artificial Intelligence (AI) is reshaping global education by enabling adaptive, data-driven, and personalized learning systems. This review explores the effective use of AI-powered adaptive learning among Muslim students in senior secondary schools in Kwara State, Nigeria, highlighting its potential, challenges, and ethical dimensions. Drawing on recent literature, the paper examines how AI technologies such as intelligent tutoring systems, natural language processing, and automated assessment can personalize instruction, enhance engagement, and support diverse learners. Adaptive learning platforms dynamically adjust content complexity, pace, and feedback to align with students' individual needs, offering benefits such as improved efficiency, motivation, and scalability. For Muslim students, these systems also provide culturally responsive opportunities by accommodating religious values and learning flexibility, especially during periods like Ramadan. Despite these advantages, the review identifies challenges including infrastructural gaps, teacher readiness, data privacy concerns, and algorithmic bias, which may hinder equitable implementation. Importantly, the discussion emphasizes Islamic ethical principles amanah (trustworthiness) in safeguarding student data and 'adl (justice) in ensuring fairness in algorithmic decision-making. These values frame AI adoption as not merely a technological shift but also a moral responsibility to preserve dignity, inclusivity, and cultural identity. Comparative analysis of conventional and AI-driven approaches reveals that while AI enhances personalization and real-time feedback, it cannot fully substitute the emotional, spiritual, and moral guidance traditionally provided by teachers. The study concludes with recommendations for infrastructural investment, teacher professional development, ethical safeguards, and curriculum alignment to ensure AI is integrated responsibly. Ultimately, AI-driven adaptive learning, when harmonized with Islamic pedagogy, offers a promising pathway for equitable, inclusive, and value-driven education in Nigeria.*

**Keywords:** Adaptive learning system, Artificial intelligence, Islamic Education, Muslim student, secondary school, Nigeria.

## Introduction to AI in Education

Artificial Intelligence (AI) is a rapidly expanding field within computer science that focuses on creating systems capable of reasoning, learning, and problem-solving. AI plays a transformative role in education by offering personalized learning experiences, intelligent tutoring, automated grading, and adaptive content delivery (Farahani & Ghasm, 2024). The AI in Education (AIED) community seeks to develop systems that are as effective as one-on-one human tutoring (Baker, 2021). AI systems are made to perform tasks that normally require human intelligence, such as language comprehension, pattern recognition, and problem-solving. These AI-driven platforms are transforming secondary education by creating personalized learning experiences tailored to individual student needs.

These innovations drive advancements such as virtual assistants, autonomous vehicles, and sophisticated healthcare diagnostics. While AI possesses significant potential, it also presents challenges, including ethical dilemmas, decision-making biases, and the risk of job displacement due to automation. (Dwivedi et al., 2021). In the realm of education, AI systems can evaluate student data to deliver personalized learning trajectories, ensuring that students receive suitable support and challenges. Intelligent tutoring systems offer customized instruction, feedback, and guidance, adapting to the learner's pace and specific requirements. Furthermore, AI can streamline grading and assessment processes, allowing educators more time for substantive students' engagement (Almusaed et al., 2023).

Islamic education for Nigerian Muslim students, particularly in secondary schools, is undergoing significant change with the introduction of artificial intelligence (AI) in adaptive learning environments. This shift is especially visible in Nigeria, where AI-driven tools are used to tailor learning experiences to each student's pace and abilities. By adjusting curriculum complexity and providing immediate feedback, AI not only boosts academic achievement but also aligns with the religious and cultural values embedded in Islamic education. (Mustapa et al., 2023).

The advantages of adaptive AI tools in learning include fostering greater student engagement through interactive, customized content and giving teachers valuable insights into students' progress. This helps educators support students who may require additional guidance. AI's data analysis capabilities also allow it to detect learning patterns at both individual and group levels, making personalized learning a reality while honoring cultural and religious sensitivities particularly relevant for Muslim students in Ilorin (Elugbaju, & Fagunwa, 2023). AI-driven natural language processing tools augment student engagement with instructional resources via voice-activated learning and sophisticated search capabilities, rendering the learning experience more intuitive.

## Overview of Adaptive Learning

According to Srinivasaetal, (2022) define adaptive learning as an educational method that personalize teaching by adjusting content and strategies based on individual student needs, learning pace, and abilities. The basic idea is that traditional, uniform teaching approaches frequently fail to effectively address the diverse range of learners in a classroom. Adaptive learning systems use continuous data analysis to modify content delivery and provide targeted support, leading. In recent years, the integration of adaptive learning with artificial intelligence (AI) has gained substantial traction. AI technologies like machine learning and natural language processing

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allow adaptive learning platforms to provide extremely responsive, individualized learning experiences. These platforms use enormous volumes of data, such as student performance and engagement patterns, to alter the content in real time. This enables students to engage with information that is appropriate for their needs and skills, enhancing learning retention and motivation (Malmberg, J., et al.2021).

AI-powered adaptive learning systems do more than merely customize content; they also give educators with crucial information about student progress. By identifying learning gaps and areas for development, these systems enable teachers to tailor their education accordingly. With respect to, (Porayska-Pomsta, et al, 2023).AI can provide prediction models to identify kids at risk of falling behind, allowing for prompt interventions.

Research has shown that AI-enhanced adaptive learning systems can provide tailored training and feedback akin to one-on-one tutoring, resulting in superior learning results (Baker, 2021). Furthermore, incorporating AI into adaptive learning enhances educational equity by meeting the varying demands of students from various backgrounds and providing tailored support (Farahani & Ghasm, 2024).

### **How Does these Works on an Adaptive Learning**

AI-driven adaptive learning enhances personalized education by customizing learning experiences to each student's unique needs and learning preferences Repo, (2023). These systems use AI algorithms to adjust the difficulty, pace, and content of lessons in real-time, allowing students to learn at their own speed. This is done through continuous assessment and feedback loops, where AI evaluates performance and adapts future lessons accordingly. This dynamic approach increases engagement and makes learning more efficient.

AI systems also improve cognitive retention by identifying and focusing on areas where students may struggle, while offering content in various formats—such as videos or quizzes—based on the student's preferred learning style. This helps create more engaging and effective learning environments

In the same way, AI-powered learning platforms are particularly beneficial in lifelong learning and adult education, offering flexibility for individuals who need to balance learning with other commitments. Khamis, (2024).

### **Adaptive Learning's Potential Impact on Muslim Students**

Adaptive learning offers substantial advantages by customizing content delivery to match each student's pace, skill level, and learning preferences. increasingly acknowledged as a critical component of education, particularly for students from diverse cultural backgrounds (Howe & Lisi, 2023). This is achieved through AI algorithms that analyze students' responses in real time, enabling the system to modify content to help with areas where they may be struggling or to speed up learning when they demonstrate mastery (Zhang,2022). This tailored approach is especially beneficial for Muslim students, who often have specific cultural or religious requirements, such as the need for flexibility in their learning schedule, particularly during times like Ramadan when their study routines may need to change. such flexibility aligns with the Islamic ethic of tazkiyah (self-purification) and continuous self-betterment, allowing students to pursue knowledge within a framework that respects their religious identity (Rahman, .2024). The culturally responsive

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design of adaptive learning platforms improves student engagement by weaving Islamic principles into educational content, making it more relatable for Muslim students and boosting their intrinsic motivation (Khan, 2024). Research shows that culturally sensitive adaptations enhance academic engagement and satisfaction in diverse student groups (Olagunju et al., 2024). Adaptive learning promotes well-rounded development, supporting both academic success and moral growth while encouraging critical thinking and ethical behavior in line with Islamic teachings (Moslimany, et al 2024). Furthermore, this model fosters a lifelong learning commitment, echoing the Islamic value of Ihsan (excellence) and nurturing a mindset of continuous self-improvement (Kabba, 2024). Beyond academics, adaptive learning creates emotional and social benefits by nurturing a sense of belonging and confidence especially important for Muslim students who may feel isolated in conventional settings. This inclusivity fosters positive emotional experiences and collaborative environments where students feel valued and understood (Miller, 2024). Overall, the personalized and adaptable nature of adaptive learning aligns closely with Islamic educational values, addressing Muslim students' specific needs and creating a supportive environment for both academic and religious growth, making it a promising path for inclusive education

The benefits of adaptive learning are:

#### 1. Personalization of the Learning Experience

Adaptive learning, powered by AI, is a personalized learning approach that tailor's educational content to each student's needs. By analyzing real-time performance data, AI algorithms adjust the difficulty of material to ensure students receive content that optimizes their learning experience. This prevents students from feeling overwhelmed or bored, enhancing their motivation and improving learning outcomes.

#### 2. Efficiency in Learning

By focusing on areas in which learners require improvement, letting them advance at their velocity, and minimizing cognitive overload through strategically timed, bite-sized content delivery, AI-powered adaptive learning systems improve the efficiency of the learning process and ultimately help students master material more quickly and efficiently.

#### 3. Enhanced Student Engagement and Motivation

Offering individualized, interactive experiences through quizzes and simulations, prompt feedback and guidance, and timely support keeps students inspired, involved, and dedicated to succeeding in encouraging educational settings.

#### 4. Scalability and Accessibility

By offering scalable, personalized learning solutions that are available to all students, regardless of location or socioeconomic background, AI-driven adaptive learning systems democratize. They also break down barriers for diverse learners, such as those from underserved communities or those with disabilities, by providing specialized support like translations or simplified explanations.

#### 5. Teacher Support and Workload Reduction

Minimizing administrative duties like grading and progress tracking and freeing up time for student interaction, it also gives teachers thorough performance insights that enable them to provide more individualized and focused instruction where it's most needed.

#### 6. Continuous Improvement and Lifelong Learning

Providing flexible, self-paced educational experiences that modify individual needs and enable students to pursue personal or professional growth at their convenience, AI-powered adaptive learning fosters lifelong learning. It also keeps updating curricula to reflect the most recent developments and guarantees that students have access to pertinent, up-to-date information for continuous skill development.

Notwithstanding the advantages, issues like fairness and bias in AI algorithms need to be resolved to guarantee that all students receive individualized instruction equally. (Chinta et al, .2024)

### **Comparing Conventional and AI-enhanced Adaptive Learning Systems: Human-guided vs. AI-driven Approaches**

The integration of AI in Islamic education has brought a comparison between conventional human-guided instruction and AI-driven adaptive learning systems. Both approaches have unique advantages and challenges in supporting personalized and culturally sensitive learning (Nowrozy & Jam, 2024; Kurniawan et al., 2024).

#### **1. Personalization of Learning**

In traditional Islamic pedagogy, teachers identify students' needs through observation, discussion, and mentorship, which ensures learning aligns with moral and spiritual development. However, this process can be subjective and time-consuming. AI-enhanced adaptive systems analyze student data, such as past performance and learning preferences, to dynamically adjust content and difficulty, offering a personalized learning pathway while respecting Islamic ethical principles (Giwa, 2025).

#### **2. Feedback Mechanisms**

Conventional methods rely on periodic assessments and teacher feedback, which may not always be immediate. AI-driven systems provide instant, individualized feedback, supporting students in mastering concepts more efficiently. In Islamic studies, this can include tailored guidance on Qur'anic memorization, jurisprudence exercises, or Arabic language proficiency, complementing the teacher's role (Kurniawan et al., 2024).

#### **3. Scalability**

Human-guided learning can be limited by class size and teacher availability, making it challenging to provide individual attention to all students. AI platforms can scale effectively, supporting large numbers of learners without diminishing quality. This ensures that Islamic education resources, such as interactive Qur'anic lessons or multimedia content, are accessible to more students simultaneously (Nowrozy & Jam, 2024).

#### **4. Emotional and Social Learning**

Traditional classrooms foster emotional intelligence, empathy, and social interaction, which are crucial for holistic development in Islamic pedagogy. Teachers provide encouragement, spiritual guidance, and mentorship that AI cannot replicate. These human aspects help build character and community—core values emphasized in Islamic education (Giwa, 2025).

#### **5. Adaptability to Diverse Needs**

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Conventional methods may struggle to accommodate diverse learning paces and styles due to rigid curricula. AI-driven systems can continuously assess individual progress and adjust content in real time, supporting learners with varied abilities and learning preferences while maintaining cultural and religious appropriateness (Kurniawan et al., 2024).

### **The Role of AI and Adaptive Learning in Shaping Future Learning in Classroom Practices**

By providing individualized learning experiences that adjust to the demands of each student, artificial intelligence (AI) and adaptive learning technologies are revolutionizing classroom procedures in the future. By utilizing data analytics to modify lessons according to a student's pace, abilities, and areas for growth, these systems personalize learning something that conventional approaches frequently fall short of (Egielewa et al., 2022). Comparative research shows that this targeted approach improves learning outcomes, particularly for kids who gain from receiving more specialized attention. Students to instantly modify their learning tactics, is another benefit of AI in education.

Considering Chanda, (2023) AI simplifies tasks like grading and managing coursework, giving them more time to focus on higher-order teaching responsibilities, such as fostering critical thinking. Comparative research shows that while AI enhances teaching practices, it works best as a supportive tool, not a replacement for human teachers. In terms of student engagement, adaptive learning systems integrate gamification and interactive content, making lessons more engaging and motivating for students (Bouchrika et al 2021). Studies show that these features often lead to higher levels of student interest compared to conventional, lecture-based, or textbook-driven methods.

AI and adaptive learning can help close educational gaps by offering personalized support, but equitable access remains a challenge, especially for schools in low-income areas that may struggle to implement these technologies (Adeyemi & Oni, 2021). While AI has the potential to transform education by making it more personalized and engaging, addressing accessibility and equity issues is essential to ensure all students benefit.

### **Challenges in AI Integration for Adaptive Learning**

#### **1. Equitable access to technology**

One major challenge is providing equal access to AI tools, particularly in schools located in low-income areas. These schools often lack the necessary infrastructure, such as reliable internet and up-to-date hardware, to implement AI-based learning systems. If these inequalities are not addressed, AI could deepen the educational divide, with wealthier schools benefiting more from advanced technologies.

#### **2. Data privacy and security concerned**

AI systems heavily rely on collecting and analyzing student data to deliver customized learning experiences, which raises concerns about how the data is stored, who can access it, and whether it is properly safeguarded. Without robust privacy regulations and clear guidelines, the risk of data breaches or misuse could diminish trust in AI-based solutions. Additionally, there is unease about sharing sensitive student information with external vendors that offer these technologies.

### 3. Teacher Training and Preparedness

Integrating AI into the classroom necessitates that teachers know how to effectively utilize these tools. However, many educators lack the essential skills to incorporate AI into their teaching practices. Without sufficient professional development and training, teachers may find it difficult to analyze AI-generated data or may be hesitant to adopt the technology, particularly if they feel it might jeopardize their position in the classroom.

### 4. Algorithmic Bias

AI systems are only as fair as the data used to train them. If the algorithms are developed using data that embodies societal biases such as those related to socioeconomic status, race, or gender these biases can be integrated into the AI, which may reinforce current educational inequalities. For example, if AI systems prioritize high-achieving students or those from specific backgrounds, they might overlook the needs of underserved groups.

### 5. High cost of implementation

The cost of implementing AI systems can be a significant barrier for many schools. Expenses related to buying software, upgrading infrastructure, and ensuring ongoing maintenance and support can be substantial. For public schools or those in low-income areas, these financial demands may render AI integration impractical, thereby deepening existing educational inequities.

### 6. Integration with existing curriculum

Educational systems differ significantly in curriculum design, teaching approaches, and learning objectives. AI systems must be adaptable to various educational contexts, which can be difficult to achieve. Ensuring that these technologies improve rather than disrupt existing learning models requires careful planning and coordination.

Even with these challenges, interest in improving educational outcomes and aligning them with religious and cultural needs continues to grow. Consequently, AI holds promise for advancing Islamic education across Nigeria

## **Islamic Ethics in AI Use for Adaptive Learning**

From an Islamic perspective, the adoption of AI in education must align with values rooted in the Qur'an and Sunnah. Ethical considerations extend beyond technical efficiency to moral responsibility, fairness, and the preservation of human dignity. Two key concepts in Islamic ethics Amanah (trustworthiness) and 'Adl (justice) offer guidance for the ethical design and implementation of AI systems.

### 1. Amanah (Trustworthiness):

In Islam, amanah refers to being trustworthy and accountable in handling responsibilities. Applying this to AI, the collection, management, and use of students' data must be treated as a trust (amanah) entrusted by parents, students, and society. This means data must not be misused, manipulated, or exposed to unauthorized parties. AI developers, educators, and policymakers are ethically obliged to maintain transparency and safeguard the confidentiality of all educational records, ensuring that the trust placed in them is not violated.

## 2. ‘Adl (Justice):

Justice is a core Islamic principle that emphasizes fairness, equity, and the avoidance of bias. In the context of AI algorithms, ‘adl requires that decision-making processes be free from discrimination, whether based on gender, socio-economic background, or religious identity. AI systems should provide equal opportunities for all learners, promoting inclusivity and ensuring that no student is disadvantaged due to hidden algorithmic bias. Implementing justice also means continuously auditing and improving AI tools to detect and eliminate unfair patterns in data usage and recommendations.

## 3. Balance Between Technology and Human Values:

Islam advocates for the balanced use of worldly knowledge and technology in a way that does not undermine spiritual and moral development. Adaptive learning systems should therefore complement Islamic pedagogy by respecting cultural sensitivities, encouraging ethical conduct, and reinforcing both academic excellence and spiritual growth.

## 4. Responsibility and Accountability (Mas’uliyah):

Those who design and implement AI systems in education bear responsibility before both society and God. The ethical principle of accountability ensures that decisions made by AI are overseen by qualified human educators who can intervene where necessary, preventing harm and maintaining alignment with Islamic values.

## **Empirical Studies on Artificial Intelligence to Develop and Implement Adaptive Learning System among Muslim Students**

Giwa (2025) examined the integration of AI in Islamic Studies education, highlighting opportunities alongside concerns about cultural sensitivity, authenticity of religious texts, and data privacy. Using surveys, tests, interviews, and focus groups, the study found that AI tools such as chatbots, quizzes, and multilingual content enhanced engagement and short-term learning outcomes, particularly with teacher facilitation, while stressing the need for training, policies, and infrastructure. Similarly, Kurniawan et al. (2024) explored AI use in Islamic primary schools, showing that intelligent platforms supported academic, moral, and spiritual development by fostering engagement, personalized instruction, and critical thinking without undermining religious values. However, both studies emphasized challenges including infrastructure gaps, limited professional development, and the need for ethical safeguards, concluding that AI adoption in Islamic education must balance technological innovation with faith-based and cultural identity.

## **Discussion, Conclusion and Recommendation.**

### **Discussion**

The integration of AI into education brings both promising opportunities and significant challenges. AI systems, such as intelligent tutoring and adaptive learning, offer personalized learning experiences similar to one-on-one tutoring, as noted by Farahani & Ghasm (2024) and Baker (2021). This shift allows for a more student-focused approach, improving engagement and learning outcomes. However, the rise of AI in education also raises concerns, such as biases in decision-making and ethical considerations around fairness and job displacement. These



challenges must be addressed, especially when relying on student data to ensure fair and equitable outcomes.

AI-powered adaptive learning systems stand out for their ability to adjust learning content in real time, which enhances educational results (Fischer & Wild, 2020; Malmberg et al., 2021). By tailoring instruction to each student's unique strengths and needs, these systems promote equity by providing personalized support, particularly for students from diverse backgrounds. A notable benefit is that adaptive learning scales effectively, addressing the challenge of providing individualized attention in large classrooms. Additionally, these systems are valuable for lifelong learners and adult education, offering flexibility and personalized paths that evolve with the learner (Khamis, 2024).

When comparing conventional education with AI-driven adaptive learning, it becomes clear that conventional methods depend heavily on teachers' observations and assessments, which are often subjective and slow. AI, on the other hand, delivers instant feedback and real-time adjustments to learning, making the process more efficient and enhancing knowledge retention. However, conventional education's strength lies in its ability to foster emotional and social skills through human interaction, which AI cannot fully replicate.

This raises important questions about the future role of educators. While AI can significantly reduce the time teachers spend on administrative tasks, allowing them to focus more on critical student interactions, the human element remains essential for developing emotional intelligence and social skills in students.

The challenges of integrating AI into education are significant and include issues of equal access, privacy, and bias. Schools in underfunded areas may struggle to adopt AI due to financial constraints, potentially widening the educational gap. The heavy reliance on student data for personalized learning also raises privacy concerns, particularly when sensitive information is shared with third-party vendors.

Another key concern is algorithmic bias. AI systems that are trained on biased data risk perpetuating existing inequalities, making it essential to develop models that use diverse, unbiased data to prevent reinforcing educational disparities.

Looking ahead, AI is set to reshape classroom practices by making lessons more personalized and engaging, with real-time feedback and interactive content. However, ensuring that these technologies are accessible to all students, particularly those from underserved communities, remains a critical challenge. While AI has the potential to create more inclusive and effective education systems, addressing issues of access, bias, and privacy is essential for a successful and equitable future in education.

## Conclusion

This study highlights the transformative impact of AI in education, especially through adaptive learning systems that provide tailored experiences for individual among Muslim students. By utilizing data analytics, these systems improve personalization, efficiency, and engagement, leading to significantly better learning outcomes compared to conventional methods. In spite of this, the effective integration of AI in education faces several challenges that need to be addressed, such as unequal access to technology, concerns about data security, and the necessity for sufficient

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teacher training. Likewise, algorithmic bias and the high costs of implementing these technologies present substantial obstacles. To fully harness the benefits of AI in education, stakeholders must work together to create strategies that address these challenges while ensuring equitable access for all learners.

### **Recommendations**

1. Governments and educational institutions should invest in essential infrastructure to ensure that all schools, especially those in low-income regions, have access to reliable internet and modernized equipment for successful AI integration. This investment could significantly enhance academic achievement and engagement for Muslim students.
2. Clear guidelines and robust data privacy regulations must be established to protect Muslim student information and build trust in AI systems among educators and parents.
3. Professional development programs should be designed to equip teachers with the skills necessary to effectively use AI tools among Muslim students in the classroom, enabling them to interpret data and integrate these technologies into their teaching practices confidently.
4. Continuous monitoring and evaluation of AI algorithms should be implemented among Muslim students to identify and mitigate any biases that may reinforce educational inequalities, ensuring that all Muslim students receive the support they need.
5. Financial models and grants should be developed to assist schools in implementing AI technologies, particularly those with limited budgets, ensuring that AI integration is feasible for all educational institutions.
6. Collaborative efforts should be made among Muslim students to align AI technologies with existing curricula, allowing for flexibility and adaptability in educational approaches that cater to diverse learning need

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