TRANSFORMING THE CLASSROOM WITH ARTIFICIAL INTELLIGENCE: OPPORTUNITIES, CHALLENGES AND FUTURE DIRECTIONS FOR CLASSROOM INSTRUCTION IN THE DIGITAL-AGE

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Introduction

We are at an important time in human history, the era where technology and education are converging. This is not an idea for the future, it is something that is happening right now and is continuously developing. The technology of Artificial Intelligence is fast advancing. It is changing the way we teach and learn. Artificial Intelligence is changing how we create knowledge, how we access knowledge, how we deliver knowledge and how we experience knowledge. Formal education, which used to be confined to physical classrooms, with rigid curricula, the teacher and a set of standardized plan, is now being reinvigorated by Artificial Intelligence and is helping to improve education. Artificial Intelligence systems can be adapted to meet the needs of individual learner. Education is now being reinvigorated with the help of Artificial Intelligence systems.

These new systems are changing the way we think about education. They are making education a shift from the traditional teacher-centered approaches toward more dynamic, learner-centered approaches. The systems can recognize the uniqueness of each learner, their pace, preferences, strengths, and weaknesses. They can then give the student the necessary help needed. This is a change from the way things used to be (the one-size-fits-all instruction mode) toward inclusive, equitable, and differentiated learning experiences.

In the digital age, the role of the teacher is undergoing profound change. Teachers are no longer merely transmitters of knowledge; they are facilitators, designers of the learning environment, data interpreters and mentors who guide students through complex cognitive and social scenes. Artificial Intelligence is making education more fun and interesting. It is helping teachers to be more effective and helpful to their students.

AI-powered tools are changing the way we teach and learn. They give immediate feedback and help to identify learning gaps and support mastery learning and understanding. AI-powered tools also help in deep learning and sustain learners' engagement. AI-powered tools however, raise important issues like ethics, data privacy and bias. We need also to think about digital divide. These are all issues that demand critical attention when it comes to AI-powered tools.

Introduction to Artificial Intelligence

Artificial Intelligence is a branch of computer science that deals with creating systems capable of performing tasks that typically require human intelligence such as learning, thinking, solving problems and understanding language. Artificial Intelligence is applied in virtually all areas of human life, such as healthcare, finance, transportation, communication, entertainment and education. It is changing the way we live. It is one of the most transformative technologies of the 21st century (Karjian, 2024; Russell & Norvig, 2021).

The idea of Artificial Intelligence has been thought of even before we had modern computers. The idea started with philosophical thoughts about machines that can think. The modern version of Artificial Intelligence began in the middle of the 20th century. The evolution of AI occurred in distinct phases over the years characterized by technological advancements, challenges, and model shifts with technologies and new challenges. There was a time when people made a model of artificial neurons (in 1943) and then there came the Turing Test era (of Alan Turing in 1956), when machines were made to think like humans (Wikipedia, 2025).

There was also the era of introduction of the field and concept of Artificial Intelligence, as well as "AI winters" era (1970s to 1980s) characterized by decreased funding and skepticism about AI.

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Then came the Machine Learning era (between the 1990s to 2010s), a time when machines could learn from data and get better at doing things. Then there was the deep learning era (around 2012), which was an era of a big breakthrough that allowed machines to process large data and understand speech, images and language. This led to the rise of "big data," that aided aggressive Artificial Intelligence development (Wikipedia, 2025).

Now Artificial Intelligence can perform virtually, all what humans can like generating texts, images and videos that look real. Artificial Intelligence systems can even converse with people, drive cars and diagnose diseases. The use of Artificial Intelligence is growing fast. It is becoming a part of our daily lives (Coursera, 2025).

Some key factors have helped Artificial Intelligence get to where it is today. These include enhanced computational power, availability of large data to learn from, new algorithms and interdisciplinary research which encouraged people from different fields to work together, like mathematics, neuroscience and computer science. Artificial Intelligence technology is improving and it will be interesting to see what it can do in the nearest future.

Applications of Artificial Intelligence

AI is being applied virtually in all sectors and is even transforming them. In healthcare, AI is used for disease diagnosis and drug discovery, in finance, it is used for fraud detection and systematic trading, in transportation, self-driving cars are being produced, in business, AI is used for automation and decision-making and in education (our domain), AI encourages personalised learning systems and research. In fact, AI is a general-purpose technology with wide-ranging economic and societal impacts (Audibert et al., 2022).

Introduction of AI into Modern Education

Artificial Intelligence application in education is about using technologies like machine learning, natural language processing and data analytics to improve teaching, learning and administrative tasks. These technologies help automate tasks, provide adaptive learning and give real-time feedback. For example, AI-powered systems can adjust to students learning speeds and provide tailored feedback (Agbarakwe & Chibueze 2024). AI has become a force in modern education. It is changing how teaching and learning occur across the world.

The integration of AI into education is the result of a long time development that began with early mechanical teaching tools and gradually advanced into today's intelligent and adaptive learning systems. The foundation for AI in education started between the 1940s and 1950s. During this time psychologists like B. F. Skinner developed "teaching machines." These machines presented instructional materials in a structured format and gave immediate feedback to learners. They were based on behaviorist learning theory, which emphasizes repetition and reinforcement (Holmes et al., 2019). This idea showed that machines could help with the learning process.

The 1960s and 1970s marked the formal beginning of AI-related applications in education. One of the systems was PLATO (Programmed Logic for Automated Teaching Operations). It enabled learning and immediate feedback (Woolf, 2010). PLATO also introduced early forms of online communication. During the 1970s, Intelligent Tutoring Systems (ITS) were developed. These systems simulated tutoring by adapting instruction based on students' responses, making learning to become interactive and personalized (Nkambou et al., 2010).

In the 1980s and 1990s personal computers became widely available. This brought AI closer to the classrooms. Educational software became more common. Schools started using computer-based instruction. Intelligent Tutoring Systems became more advanced. They could adjust to individual's learning speeds and provide tailored feedback. Multimedia elements like audio, video and graphics made students more engaged (Russell & Norvig, 2021; Selwyn, 2016).

The advent of the internet changed AI application in education in the 1990s and early 2000s. Online learning platforms and Learning Management Systems enabled access to education. They also improved communication between teachers and students. AI technologies started to support

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automated grading and adaptive learning systems. This period marked the transition from isolated computer-based learning to interconnected educational environments (Anderson & Dron, 2011).

From the 2010s to the present, AI has become deeply integrated into modern education system. Today AI in education is about personalization, automation, interactivity and data-driven decision-making (Holmes et al. 2019). These features have changed the role of teachers. They now act more as facilitators than sole knowledge providers.

The introduction of AI into education is the result of decades of development and innovation. From early teaching machines to advanced intelligent systems each stage has contributed to transforming educational practices. AI will continue to play a role in shaping the future of education. It offers both opportunities and challenges that must be carefully managed.

Where are we? AI in the Nigerian Education System

The use of AI in Nigerian schools is still generally new and developing. AI tools are currently used in well-resourced private schools and universities. Unfortunately, majority of Nigerian schools, especially rural schools still grapple with the traditional face-to-face teacher dominated approaches.

The introduction of AI into Nigerian schools is a gradual phenomenon. It started with the use of computers and digital technologies in the 20th and early 21st centuries. Before then, the Nigerian schools are known for the traditional teaching methods of the face-to-face instruction, textbooks and then to ICT-based learning and later gradually to AI (Kwashabawa et al., 2025).

In the 2000s, more Nigerians got access to the internet and mobile technology. This made it easier for schools to use digital tools. Nigerian universities and research institutions started exploring AI to improve teaching, learning and administrative efficiency in the 2010s. AI tools were later introduced in areas like automated grading, personalized learning and intelligent tutoring systems in some cases. However the adoption was slow (Kwashabawa et al., 2025).

Recently, the Nigerian government and the private sector have taken steps to promote AI education and innovation. Initiatives aimed at developing digital skills, integrating AI into school curricula and supporting research and development are emerging.

As a move towards AI integration, the Federal Government of Nigeria has taken major steps to computerise education. These initiatives aim to modernize teaching and learning nationwide and prepare students for the digital economy.

Key federal initiatives include the formulation of the National Policy on Information and Communication Technologies (ICT) in Education (which was approved in 2010); the development of the National Implementation Guidelines for ICT in Education to translate the ICT policy into practical programmes and activities and the development of eLearn, a centralised digital platform for curriculum-alignment. The federal government also launched the Digital National Education Management Information System (DNEMIS) in 2026 to unify fragmented education data to capture every learner, teacher, and school in a national database. The National EdTech Strategy (2025–2030), a digital education ecosystem with six pillars was also established. The Smart Learning Initiative was flagged off in October 2025 to distribute interactive smart boards to public schools nationwide and to extend digital tools to basic and secondary schools. The Nigeria Education Data Initiative (NEDI) and the Nigeria Education Repository and Databank (NERD) were also established. All these were climaxed with the $40 million ICT-Development Project to modernize Nigerian universities.

The reforms were implemented differently at the basic education, secondary and at the higher education levels of education in Nigeria. At the Basic Education level (Primary Schools), the implementation took the form of distribution of interactive smart boards by the Universal Basic Education Commission (UBEC) and digital learning kits to public primary schools aimed at improving digital literacy; integrating ICT into the basic education curriculum where pupils are introduced to computer skills early; providing digital competency training for primary school teachers; providing rural schools with solar-powered ICT labs and offline digital and capturing enrollment and performance data from primary schools by DNEMIS to track literacy rates and resource allocation.

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At the higher education (University) level, the reforms include initiating a $40 million ICT Development Project (supported by AFD) to modernize Nigerian universities with high-speed internet, digital libraries, and e-learning platforms; adoption of platforms like Moodle and portals for Virtual Learning Environments (VLEs) by Universities (such as online lectures, assignments, and examinations); provision of centralized system by the Nigeria Education Repository and Databank (NERD) for certificate authentication, for reducing fraud and streamlining graduate verification; supporting universities to establish EdTech innovation hubs to foster research and collaboration between academia and startups and introducing ICT trainings for university lecturers for capacity building on AI-assisted teaching, digital pedagogy and blended learning methods.

These measures are intended to transform the Nigerian education system from a predominantly traditional, teacher-centred system into a more technology-supported and digitally oriented system. These initiatives show Nigeria's commitment to jumping out of traditional education systems through embedding AI literacy and digital tools directly into classrooms.

Towards AI adoption, a number of Nigerian states have formally introduced technology into their school systems, with Jigawa, Bayelsa, and five southwestern states (Lagos, Ogun, Oyo, Ondo, and Ekiti) leading the way through AI-driven education initiatives, "Experience AI", and teacher training programmes. These efforts focus on integrating Artificial Intelligence into classrooms, improving teaching capacity and to enable real-time monitoring of school performance.

These efforts however, vary widely across states and educational levels. Universities nationwide are experimenting with AI-driven e-learning, research hubs, and certificate authentication systems. Northern and rural states however, show slower adoption due to infrastructure gaps. The table below gives State by State efforts at digitalization of education and AI adoption in education.

State-by-State breakdown of Technology and AI Introduction into Education

While some states, (e.g. Ogun and Cross River) currently have clear documented state-level AI-in-education initiatives, some (like Kaduna and Abuja) are at the awareness/policy-development

S/N	State	Digitalization Programme Name	Year Launched	Current Stage
1	Lagos	Eko Digital/ (Eko Excel)	2020	Advanced Digital-learning; First state to digitalize during COVID-19; Expanded 2026; Trained 3,150 teachers,; Reached 157,000+ students Tablets for teachers Digital Education Quality Assurance Reform in 2026
		AI	2025/2026	AI adoption in Teacher training; AI introduced in classrooms (Early Stage); Smart boards in UBEC schools; AI-Driven School Monitoring & Registration AI-Integrated Instruction in Technical Colleges
2	Ogun	OGSERA	2024	OGSERA= Ogun State Education Digital Transformation Agenda Active integrated digital transformation agenda.
		AI OgunLearn	January 22, 2026	OgunLearn = AI-Powered Teaching & Learning Platform AI-powered instruction in schools; Launched January 2026; AI Teachers training
3	Oyo	UBE Smart Schools/ Oyo Digital Education Reform	2024	Oyo Digital Education Reform Expanded to all 33 LGAs by 2025; Tablets for teachers; Teacher training;/Teachers cascading AI to students
		AI	2025	AI-Powered Pedagogy Partnership with EIDU *(a german Edtech Firm); AI-Backed Basic Education Reform initiated* *Smart classrooms in Ibadan; AI* Teacher training;.
4	Cross River	STEAM Clubs/Quizarly Digital Learning	2024	Statewide secondary schools implementation in November 2025. Digital-learning/ICT stage
		AI	2025	Teachers training on AI UBEC-supported smart classroom projects in select primary schools; AI in Pilot-to-early implementation / June 2026, teacher training in ICT and AI across the three senatorial districts
5	Edo	*EdoBEST*	2018	*EdoBEST = Basic Education Sector Transformation* Digital-learning/ICT stage; Fully operational; 16,000+ teachers trained, 380,000+ students reached; tablets for teachers

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S/N	State	Digitalization Programme Name	Year Launched	Current Stage
		AI	2025	After-school AI tutoring with ChatGPT; RCT AI at Pilot stage and growing at Higher Education
6	Jigawa	J-COMPETE	2024	J-COMPETE (JIGAWA COMPETE): Comprehensive Mastery, Proficiency, Excellence, and Technological Empowerment
		AI JigawaUNITE AI Deployment	2026	AI platform to track performance across schools Early stage: AI in public schools for instructional support, home- lessons, and instant education data for policymakers.
7	Bayelsa	Digital/ICT/ BayelsaPRIME	2023	Active Digital-learning/ICT Bayelsa PRIME =Promoting Reforms to Improve and Modernize Education
		AI	2026	AI for Mentors/AI Pilot training for ICT mentors in classrooms; AI platform to track performance across schools
8	Kaduna	UBE Smart Schools	2020–2024	Kaduna Basic Education Digitalization Initiative UBE Smart Schools/ blended-learning programme/ implementation phase/
		AI	2025	Kaduna AI-Powered Learning Partnership AI Exploratory/ awareness stage/ AI at Pilot stage in Basic Education; Growing at Higher Education
9	Kano	UBE Smart Schools/ Digital Initiative	2021	UBE Smart Schools / blended-learning programme/Digital-learning/ICT implementation phase, Kano Basic Education Digitalization Initiative
		AI	2025	Limited AI integration; focus remains on ICT Kano AI-Powered Learning Pilot
10	Katsina	UBE Smart Schools	2022–2024	UBE Smart Schools/blended-learning programme/Digital-learning/ICT implementation phase; Katsina Basic Education Digitalization Initiative
		AI	2025	Katsina AI Learning Platform at Pilot Stage
11	Borno	UBE Smart Schools	2022	UBE Smart Schools / blended-learning programme/Digital-learning/ICT implementation phase; Borno Education Digitalization Initiative
		AI	2025	Borno AI Learning Platform at Pilot Stage
12	Kebbi	UBE Smart Schools / (KSEDP)	2022	Kebbi State Education Digitalization Programme (KSEDP)/Digital-learning/ICT stage; Kebbi Education Digitalization Initiative
		AI	2025	Kebbi AI Learning Platform at Pilot Stage
13	Sokoto	UBE Smart Schools	20224	UBE Smart Schools / blended-learning programme/Digital-learning/ICT implementation phase; Sokoto Education Digitalization Initiative-Implementation Stage
		AI	2025	Sokoto AI Learning Platform in at Pilot Stage in Pilot Schools
14	Bauchi	UBE Smart Schools	2022	UBE Smart Schools / blended-learning programme/Digital-learning/ICT implementation phase; Bauchi Education Digitalization Initiative
		AI	2025	Bauchi AI Learning Platform
15	Adamawa	UBE Smart Schools	2022	UBE Smart Schools / blended-learning programme/Digital-learning/ICT implementation phase; Adamawa Education Digitalization Initiative
		AI	2025	Adamawa AI Learning Platform
16	Rivers	UBE Smart Schools	2023–2024	UBE Smart Schools/ blended-learning/ICT facilities, computer-based learning and digital resources introduced in schools
		AI		AI at Pilot stage in Basic Education/AI Developing at Higher Education
17	Akwa Ibom	Digital/ICT	2023	Digital-learning/ICT stage; Akwa Ibom Education Digitalization Initiative
		AI	2025	Akwa Ibom AI Learning Platform Pilot Stage
18	Enugu	Digital/ICT	2023	Digital-learning/ICT stage; Enugu Education Digitalization Initiative
		AI	2025	AI adoption not clearly documented /Enugu AI Learning Platform
19	Anambra	High Digital/ICT (ASEDP)/	2023	ASEDP: Anambra State Education Digitalization Programme /Digital-learning/ICT stage;/Anambra Education Digitalization Initiative
		AI	2025	AI adoption undocumented /Anambra AI Learning Platform
20	Abia	Digital/ICT	2023	Digital-learning/ICT stage; Abia Education Digitalization Initiative
		AI	2025/2026	AI adoption undocumented Abia TechRise AI-First Programme
21	Delta	Digital/ICT.		Digital teaching and learning initiatives /ICT stage;
		AI		AI adoption undocumented
22	Kwara	UBE Smart		Digital- blended-learning/ICT stage;
		AI		AI adoption undocumented
23	Ondo	Digital/ICT	2025/2026	Active Digital-learning/ICT
		AI		AI *Civil Service* Pilot Training (for 50)/ AI Teacher training;/AI curriculum introduced/Rural schools supported with blended learning.
		High Digital/ICT	2025	Active teachers training,

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S/N	State	Digitalization Programme Name	Year Launched	Current Stage
24	Ekiti	AI		*Experience AI /ICT Experience Centre (EKSU)* AI-driven learning infrastructure/ AI Teacher training;
		Nigeria Learning Passport (NLP)	2026	Active rollout in 100+ schools; online/offline access, zero-rated Airtel data, curriculum-aligned digital library Pilot training for 200 teachers/principals; free internet routers deployed to schools
		AI	2025	Imo AI Learning Platform
25	Imo	UBEC Smart/ Learning Initiative	October 2025	UBEC Pilot smart classrooms;
26	Abuja	AI		AI literacy embedded in policy frameworks.
		NSEDP	2025	NSEDP: Niger State Education Digitalisation Programme Smart classrooms, ICT curriculum, teacher training
27	Niger	AI		Early-stage of AI literacy/Rural schools lagging
		Opón Ìmò (Tablet of Knowledge)	2013-2017	E-learning tablets containing e-textbooks, tutorials, past examination questions, virtual classroom resources for public secondary students and teachers.
28	Osun	MultiChoice Digital Learning Resource Centres	2013	DStv educational channels, television sets, UPS, generators and other ICT equipment for Selected public schools; teacher training
		Imole Wi-Fi	2025	Free public internet connectivity for Students and schools, communities
		Imole EduPod	2026	Solar-powered, containerized digital learning hub
		AI	2026	Early/ experimentation and early adoption stage (not full statewide classroom deployment)

While some states, (e.g. Ogun and Cross River) currently have clear documented state-level AI-in-education initiatives, some (like Kaduna and Abuja) are at the awareness/policy-development stage. For some others, available evidences established technology or digital-learning adoption but do not adequately commence formal, state-wide AI adoption in classroom teaching. Majority of these initiatives are in pilot schools while a large population still grapple with the traditional face-to-face instruction modes.

These efforts however, reflect a growing recognition of AI as a tool for national development and global competitiveness. As Nigeria continues to embrace transformation, AI is expected to play an increasingly important role in shaping the future of education, but, we are still far from the desired end because of some existing significant challenges. (FME, 2026).

Challenges and Barriers to Effective Artificial Intelligence Adoption in the Nigerian Education System

The Nigerian 21st century classroom is faced with numerous challenges and barriers that hinder the effective adoption and utilization of AI technologies in educational settings; this is because there are problems that make it hard to use Artificial Intelligence tools in our schools. Some of these problems include:

1. Inadequate infrastructure and technological limitations e.g. poor internet connectivity supply, outdated hardware and software, limited access to digital devices etc. These make it difficult to deploy and sustain AI technologies in classrooms.

2. Lack of or insufficient training, digital and AI illiteracy and lack of technical expertise on the part of teachers and students. Teachers play a critical role in AI adoption to teaching; however, they may struggle to understand AI functionalities, to integrate AI into their lesson plans and to interpret AI-generated data. Low digital literacy among students is also a barrier.

3. Resistance from educators and institutions. Some teachers may perceive AI as a threat to their professional roles, as difficult to use or unnecessary or as being misaligned with traditional teaching practices. Resistance to adopt new technologies may make them believe in the statusquo.

4. High cost of implementation. Adopting AI technologies can be expensive. It may involve high costs related of software and hardware acquisition, maintenance and updates, training programs etc. These financial constraints limit the ability of many schools to adopt AI solutions.

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5. Ethical and privacy concerns. AI systems rely heavily on data and this may raise concerns about students' data privacy, surveillance and monitoring, and algorithmic bias. Such ethical issues can discourage adoption and create distrust among educators, students, and parents.

6. Lack of pedagogical alignment. AI tools are not always aligned with curriculum goals or teaching methodologies. Educators may find it difficult to integrate AI in ways that support learning objectives.

7. Unequal access to technology (digital divides and inequality) that widen existing educational inequalities. Schools in rural or disadvantaged areas may lack the resources needed to benefit from AI tools. This digital divide limits inclusivity and equitable access to AI-enhanced education.

8. Doubted reliability and accuracy of AI information. AI systems are not always accurate or reliable. Errors in AI-generated content or recommendations can negatively affect learning outcomes. This may make teachers and students lose trust in AI tools if they produce incorrect or misleading information.

9. Overdependence on AI. Excessive reliance on AI tools by students can reduce their critical thinking and problem-solving skills. AI may encourage "digital dependency," where students rely on AI instead of engaging deeply with learning materials. This may lead to mediocrity and academic dishonesty.

10. Institutional and policy barriers. This involves poor policy frameworks on AI use in education, particularly around data privacy, ethical use, and quality standards. The absence of clear policies and regulatory frameworks for AI use in education creates uncertainty. Institutions may lack guidelines for ethical AI use, standards for implementation or support systems for teachers. This barrier also slows down AI adoption and integration (Bhattacharya, 2025; Mehdaoui, 2024; Ahmed et al., 2025; Bhattacharya, 2025; Eusebio et al., 2025; Garzón et al., 2025; and Li et al., 2024).

Despite all these problems, AI integration in classrooms is expected to grow as technology becomes more accessible and affordable.

AI in the classroom: The ideal in the digital age

AI adoption in an ideal classroom is now a reality. Teachers have to adapt to this reality. They have to learn how to use tools to help students learn. This however, will take time and effort. The digital age has opened up new opportunities for teachers and students. With AI, education is now more accessible and fun. Teachers and students will have to adapt to technologies and new ways of learning. It will make education more flexible and more accessible to everyone.

There are now many AI tools students and teachers can use for classroom instructions. Free general AI tools available include ChatGPT, Google Gemini, Microsoft Copilot, Perplexity AI, etc. For Academic papers or research, free usable tools are Perplexity AI, Semantic Scholar, Elicit, Research Rabbit, Connected Papers, SciSpace etc. For free writing and project presentation, tools like Grammarly, QuillBot, Notion AI, Canva, etc. are available. Free study, revision, and learning tools adoptable are Quizlet, Duolingo, Brilliant, etc. For free referencing and content organization, tools such as Zotero, Mendeley, etc. are helpful. All these tools possess the potentials of transforming classroom instruction.

Pedagogy in the Digital Age

Pedagogy, the art and science of teaching, has changed a lot in the digital age ideal classroom. This is due to the rapid advancement in Information and Communication Technologies (ICT), the proliferation of the internet, and the increasing integration of digital tools into the educational systems. This has changed the way students learn. The teaching and learning processes have moved from teacher-centered approaches to more learner-centered, flexible, and technology-enhanced models (Anderson & Dron, 2011). Now students are more involved in their learning.

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In the past teachers were like bosses in the classroom. They would tell students what to do and how to do it (the behaviorists' teacher-centered models). Students learn better when they are involved. They learn by doing (constructivism) and collaborate with each other. The internet has made it possible for students to learn from anywhere. They use the internet to get information and talk to co-students.

One of the notable changes in the digital age is online learning (e-learning and online education**)**. The widespread availability of the internet has made it possible for learners to access educational content anytime and anywhere. This has made knowledge more accessible. Students can learn at their pace and talk to their teachers in real time.

The digital age has also changed the way students learn in an ideal landscape. They use the internet to get information and talk to co-students. This is called connectivism. Connectivism highlights the importance of digital literacy and easy access to information. It is a way of learning that uses the internet to connect people. Students can learn from anyone anywhere in the world. They can access, navigate, and evaluate information across digital networks (Siemens, 2005). They can use media and other online tools to get information.

Teachers are now expected to use a mix of traditional teaching approaches and online learning. This is the blended learning model, which combines traditional face-to-face instruction with online learning components (Graham, 2013). It is a good way to learn because it uses the best of both worlds. Students can learn from their teachers and as well use online tools. This has become very popular in schools and universities following the global disruptions caused by the COVID-19 pandemic.

Pedagogy in the digital age emphasizes collaborative and interactive learning. Teachers should use digital tools to help students learn. These tools include discussion forums, video conferencing and collaborative software which enable students to work together regardless of geographical location. Students can work together on projects and learn from each other. This helps them develop critical thinking and problem solving skills (Laurillard, 2012). Multimedia resources, simulations, and gamified learning also enhance students' engagement and motivation.

The role of the teacher in the digital age should also change too. They could no longer be the primary sources of information. They are now facilitators or guides**.** Now they help students learn how to use the internet and other digital tools. They teach students how to think and learn independently.

So pedagogy in an ideal situation is more flexible and learner-centered. Teachers in these areas now use tools to help students learn. This has made learning more accessible and fun. The digital age has opened up many new opportunities for teachers and students.

The potentials of AI-driven pedagogy

AI-driven pedagogy is about using Artificial Intelligence technologies to design, deliver, and evaluate instruction. This means using things like machine learning and natural language processing to create lessons and evaluate how well students are doing. It also involves using computer systems that can adjust to each students needs and provide personalized learning experiences. These systems analyze students' data, provide personalized learning experiences and optimize teaching (Muhammad, 2026).

AI-driven pedagogy is a change in the way we teach. It uses technology to make learning better and to improve students learning. This is different from the traditional way of teaching, which often used same methods for different students and different topics. AI-driven pedagogy is about personalization and adaptability of learning.

AI can really change the way we perceive education. It helps teachers create lessons, makes learning fun and promotes smooth schools administration (Alashwal, 2024). This is a shift towards student centred education and technology enhanced. AI-driven pedagogy is the future of education.

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Benefits of AI-driven Pedagogy

The benefits of AI-driven pedagogy are clear. It helps students learn better by tailoring lessons to their needs, which improves their understanding. This personalized approach makes learning more effective. AI-driven pedagogy also makes students more engaged in the learning process. Interactive tools make learning fun and hands-on. It reduces the tasks of teachers allowing them to focus on teaching. AI helps deliver education to people easily. It supports students with needs and makes it easier for them to access information. This ensures everyone has a chance to learn regardless of their background or abilities. AI empowers teachers to try creative ways of teaching. These benefits make AI a powerful tool for improving the quality of education and making it more accessible to everyone. The use of AI, in education brings benefits including AI-driven pedagogy, which is a key part of this change. AI-driven pedagogy is changing education.

Role of AI in teacher support in the digital age

There are many ways in which AI can support teachers professionally, these include:

1. Assisting teachers in lesson planning, generating teaching materials, creating assessments and also in adapting lesson contents to different learning levels to address diverse classroom needs.
2. Supporting instructional delivery by answering students' queries and facilitating learning activities.
3. Supporting classroom management and helping teachers make informed instructional decisions and improving teaching strategies.
4. Reducing teachers' administrative burdens by automating tasks such as grading, attendance tracking, and record management thereby improving efficiency and reducing stress associated with repetitive tasks.
5. Analyzing classroom interactions, teaching methods, and students' responses to provide real-time feedback to teachers.
6. Promoting effective teaching by identifying areas of strengths in the teaching and learning processes and areas for improvement.

These various benefits of AI make its adoption into the education system unavoidable. As both government and the private sector improve investment in required infrastructure and AI technology, AI adoption in the Nigerian education system will become wide spread

Future Challenges against AI Adoption in Education

With the identified benefits of AI adoption, its integration in Nigerian classrooms is expected to grow as technology becomes more accessible and affordable. The future of the integration of Artificial Intelligence into our education system is bright. However, there may be more problems than currently experienced. In our attempt future improvement in adopting AI in education generally, educators should watch out for:

1. More overdependence on technology which may lead to producing academic mediocre, researchers who do not really research, thoughtless thinkers and assumed knowledgeable people that lack knowledge.
2. Computerized examination malpractices involving use of ear pods in exams, use of AI glasses, use of smart watches and more sophisticated methods of malpractices.
3. Employing AI systems to solve mathematical, scientific, or analytical problems during tests.
4. Submitting AI-generated essays, reports, projects, and assignments as original work.
5. Employing AI tools to solve complex calculations, programming tasks, and case studies that students are expected to complete independently.
6. Utilizing AI translation tools to answer language examination questions without demonstrating actual language proficiency.
7. Fabricating academic references, citations, and bibliographies to support assignments or research projects.
8. Using AI-powered tools during remote or online examinations to obtain explanations, hints, or complete solutions.

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9. Generating experimental results, analyses, and laboratory reports without conducting the actual experiments.
10. Answering take-home examination questions that are intended to assess individual understanding.
11. Fabricating survey responses, interview transcripts, statistical data, or research findings.
12. Generating computer programs or software solutions through AI rather than writing the code independently.
13. Using AI to analyze past examination questions and predict likely examination content in ways that may violate examination regulations.
14. Using AI systems to rapidly answer multiple-choice or objective questions during online assessments.

All these will undermine the credibility of our educational system and lead to producing graduates who may lack the competencies required in the workplace.

Strategies for Future Maximization of AI benefits

To maximization the benefits of Artificial Intelligence and to protect the education system from perceived problems we need the following:

1. Artificial Intelligence must be able to provide solutions to computer or AI induced problems.
2. Developing hybrid Artificial Intelligence models that integrate human and Artificial Intelligence instructional and invigilation modes.
3. Alignment of AI tools with teaching objectives and curriculum content.
4. Aggressive teacher training on AI application to instruction. Educators must be equipped with skills to effectively use AI technologies for teaching. Teachers should also be trained on combined use of AI tools with traditional teaching methods.
5. Producing tools that will assist in lesson planning, classroom management, assessment and reflective practice.
6. Teachers' adoption of comprehensive strategies that align technology with pedagogical goals, ethical principles, and societal values.
7. Teachers must learn to combine AI tools with traditional teaching methods (i.e. blended learning).
8. Improved teachers' encouragement and surveillance on students' responsible use of AI.
9. Aggressive investment in AI related infrastructure to ensure access to reliable digital tools and internet connectivity.
10. Hybrid invigilation system (computerized invigilation and/or integrating AI-detection tools with human evaluation).
11. Setting guidelines for both students and teachers on ethical use of AI by institutions.
12. Promote AI literacy among students and equitable accessibility to AI technologies among rural less privileged and urban privileged areas.

Future AI roles in ethical considerations and data privacy in AI-driven education

Ethical considerations in AI-driven education are important to protect students' rights, to promote fairness and ensure responsible use of technology. The use of AI in education requires consideration of ethics and data privacy. While AI offers benefits, it also presents risks related to privacy, bias and accountability (Russell, 2025; Mishara, 2024). To address these challenges we need ethical frameworks and robust data protection measures. This will ensure that AI technologies are used responsibly, fairly and transparently. By prioritizing ethical principles, AI can improve education while safeguarding the rights and well-being of teachers and learners.

Some key ethical principles on the part of AI systems in education include:

1. Fairness and non-discrimination for individuals and groups using AI tools.

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2. AI systems should be transparent and easy to understand for users and stakeholders.
3. Organizations and AI developers should be accountable for AI outcomes.
4. AI systems should respect individual's personal data privacy by collecting only necessary data, keeping it secure and using it in ways that align with user consent and legal standards.

Currently Artificial Intelligence is changing the way we learn by creating next-generation learning environments that are more adaptive, personalized and technology-driven. These environments will be different from traditional classrooms. The focus will be on learner-centered approaches, human and AI collaboration and lifelong learning. Some characteristics of these learning environments should include:

1. Improved adaptive and personalized learning systems.
2. Integration of digital and physical learning processes.
3. Real-time data generation and feedback.
4. Collaborative and immersive learning experiences.
5. Self-directed and lifelong learning.
6. Smart classrooms with systems, robotics and connected devices.
7. Generative AI and content creation technologies that enable the generation of learning materials, assessments and simulations (Shailendra et al., 2026).

These developments will support both teachers and students by enhancing creativity and productivity, collaborative knowledge creation and innovation in learning environments. AI should enable sophisticated learning environments that integrate cognitive, emotional and social aspects of learning. Trends like multimodal AI, intelligent agents and collaborative learning systems are expected to transform education making it more responsive to learners and society's needs. These environments represent a shift toward learner-centered, flexible and technology-enhanced education systems. The future of AI in our education system looks promising, with increasing government and private sector involvement. With investment in infrastructure, teacher training and policy development AI has the potential to revolutionize Nigeria's education system and align it with global standards.

Conclusion

AI tools are changing education for the better. They help make learning personal, efficient and data based. These technologies help teachers understand students' needs, give them timely supports and improve learning results. They also help teachers do their job better, reduce their workload and promote continuous professional growth.

To make sure AI in the Nigerian education system is meaningful and to have functional widespread adoption; we need a combination of effective practices and good policies. Governments must establish clear guidelines, governance structures and ethical standards to ensure responsible AI use. The goal is to create an education system where AI helps learning without losing our values, fairness and freedom.

New trends in AI show that it is moving towards integrated human-AI learning environments, immersive technologies and generative content creation. Examples show how AI helps with assessments, suggestions, participation, tracking and teacher support. So the future of AI in our education system should focus on explainability, human-AI collaboration, lifelong learning and ethical governance, in attempts to prepare the education system for a more responsive and inclusive future.

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However, to make it work we need to solve problems like training gaps, ethical concerns, and infrastructure limitations. If done right, AI can really help our teachers do their jobs better and change the education systems to make them better and more effective.

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