

ENGINEERING ARTIFICIAL INTELLIGENCE TO REDEFINING EDUCATION DELIVERY IN NIGERIAN INSTITUTIONS

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Abstract

Pedagogy is the backbone of the education. When pedagogy is removed from the teaching and learning process the purpose of education cannot be achieve. This makes annexing AI pedagogy to education paramount. This led to the investigating on the engineering of Artificial Intelligence (AI) pedagogy to redefining education delivery in Nigeria institutions. The paper consider the concept of pedagogy, AI tools for educators to enrich pedagogy. The study also combined current literatures to access the advantages of AI pedagogy such as students learning on their own pace, personalized learning immediate feedback, and reduce teacher's workloads. While its raises concerns on digital divide, technology, friendly, high cost of implementation inadequate infrastructure and others. As AI become more integrated in education and when its challenges are sub-mounted it will lead to redefining of our education system to tailor students' engagement, academic success and well-being.

Keywords: Artificial Intelligent, Education, Pedagogy

Introduction

Profession all over the world as procedures or approaches in conducting their affairs. In the education industry the system teaching and learning is conducted by educators is known as pedagogy. Therefore, pedagogy is the methodological approaches educators apply in teaching and learning to

impact knowledge to beneficiaries using curriculum content to achieve learning goals. Pedagogy shapes how knowledge is transferred from the educator and absorbed by students. It influences the interactions within the classroom from the way the curriculum is designed (Kayode-Sanni, 2025). It would be appropriate to say that pedagogy in education is the art and science of teaching and learning. UNESCO (2025) referred to it has the art and science of teaching, encompassing various methods and strategies educators use to facilitate learning. In the same vein, Teach Lambeth (2026) ascertained that pedagogy is the art and science of teaching. It's how you, as a teacher, engage with your students, the strategies you employ to facilitate learning, and the underlying theory that informs these strategies.

The acquisition of knowledge and the application of pedagogy in education is undergoing transformative process in this Artificial Intelligence (AI) age. AI is the use machines to carry out human functions (intelligence). According to Gilbert (2021) AI is the intelligence exhibited by machines particularly computers systems. It is a field of science concerned with building computers and machines that can reason, learn and act such a way that would normally require human intelligence or that involves data whose scale exceeds what human can analyze. The term AI according to Copeland (2026) is frequently applied to the projects developing systems endowed with the intellectual processes, characteristics of humans, such as the ability to reason, discover meaning, neutralize or learn from past experience. AI transformative potential is reshaping the landscape of almost every sector globally. The education sector would not be exception. For education and educators to be very effective in pedagogy educational policy and educators must welcome the application or integration of AI on a serious note. Federal University Otueke (2025) conceived that to remain relevant and effective, educational policy and pedagogy must embrace. AI not merely as a tool but as a dynamic partner in redefining the frontiers of learning, communication and innovation. In addition, to resist this tide is to risk obsolescence in an increasingly stratified digital world. AI will be acting as a transformative tool in education sector when it is integrated appropriately. Levi (2023) contended that the dawn of Generating AI era has created a paradigm shift, redefining education by changing the relationship between all education players, teachers, students, parents', the local and global community, and hopefully policy makers and ministries of education. This implies that all education stakeholders have something to benefit from AI.

It is a known fact that education is the bedrock of progressive development in any nation. When our pedagogy is not redefined in this AI driven age our educational system will be lopsided and not be abreast with other nations of the world. Based on this, our educational pedagogy should integrate. AI tools into our curriculum in our educational institutions. Today, our pedagogical approach to learning has not address the diverse needs of our students as a result of the complexness of their needs that need more engagement and practical learning system. Combining AI pedagogy would be

beneficial to both students and educators. It has the potentials to reduce the workload of educators, it involves planning of curriculum, scoring of test, critical thinking, monitoring of students' progress and increasing digital literacy. Language magazine (2024) stated that AI is important because it is essential for digital literacy, critical thinking skills.

It has the potentials to revolutionize education in this digital age to meet the needs of the students who are incessantly online. Holmes et al (2019) submitted that AI has the potentials to revolutionize education to address the diverse needs of learners.

The laudable increase of AI activities in education, it is not without challenges. Accessing AI materials, can be problematic due to the fact that not everyone has the resources to purchase them for use, power failure, high cost of data to access internet, teachers inability to access AI tools due to lack of knowledge of its application to pedagogy and others. Micah and Zenetubor (2025) in summary of their work concluded that challenges to AI pedagogy are inadequate infrastructure, unreliable power supply, low digital literacy among teachers and students, urban and rural disparities and cultural and attitudinal resistance to change. The benefit of AI pedagogy integration to education in this 21st century far outweighs its challenges this is why this research is of great significant because it has the potential not only to inform but also influence our future education system in terms of pedagogy.

Theoretical Foundation of AI Pedagogy

AI pedagogy is drawn from theories in education which firmly stands on how technology can be integrated into the teaching and learning process. These theories support the design, implementation and evaluation it carried out in pedagogy process. The most available theories for the study are:

Constructivist Learning Theory: The proponents of this theory are Jean Piaget and Lev Vygotsky in 1893. The theorist argued that learners actively construct knowledge through experiences, interactions and reflections rather than passively receiving information. Constructivist advocate AI pedagogy such as interactive, student – centered learning where student engage with materials, collaborate with peers, and participate in several activities allowing them build on their past experience. The theory advocates for a pedagogical approach that leverages AI to create dynamic interactive and personalized learning experiences, preparing students for complexities of modern education landscape. Hence, AI pedagogy is in line with education theory. This approach align with the transformative learning and embracing technology. Constructivist argument advocated for the necessity for higher education to go beyond impacting knowledge (Crittenden & Peterson, 2019).

Constructivism Learning Theory: This theory is a modern theory that was developed by George Siemens and Stephen Downes in (2005). This theory was developed to address the learning needs in the digital (AI) age. It emphasized the importance of networks, connectivity, and the flow of information in the learning process. The theory highlighted how information is distributed across a network of connections and how learning can be achieved by navigating and nurturing these connections. The theorist recognized the evolving nature of knowledge, driven by the rapid advancements in technology and the vast accessibility of information. This make it more relevant in today interconnected world where students rely on digital tools and online platforms.

These theoretical frameworks provide strong foundations on how education can effectively integrate AI pedagogy into learning on their own, collaboratively, enhance their critical thinking and solve problems.

Concept of Pedagogy

Pedagogy is the teaching practices in education. It puts together both the act and science of teaching for effective and efficient instruction to learners. Educators an effectively pass knowledge to their recipients only when they apply the right pedagogy. Pedagogy is the study of teaching practices, blending the art and science of effective instruction. It encompasses the diverse methods and strategies educators use to facilitate learning (Kapur, 2019). Again, TeachLambert (2026) considered pedagogy as the art and science of teaching encompassing the strategies and methods educator employs to foster learning and facilitate student's engagement in the educational process. Pedagogy remains the framework that guides the educator in designing and implementing teaching. Pedagogy is regarded as an art simply because it dived into personal strategies applied by the educator, encouraging and engaging students in supporting and taking into cognizance the emotional and social needs of student. On the other hand, it is a science because it is embedded in educational psychology, theories of learning and research in education.

In education pedagogy is divided into two – teacher-centered and learners-centered pedagogies.

Teacher – Centered Pedagogy: Teacher – centered pedagogy, the teacher is the central figure. He is in control of every activity in the classroom. He disseminate information (knowledge) to students as the sole expert while the students view as passive listeners making no input. The method is also known as the traditional pedagogy. Teacher – centered pedagogy is a form of pedagogy where the instructor holds the main role in disseminating knowledge, controlling classroom activities, and assessing students through structured evaluations (Johnson, 2021). In teacher – centered pedagogy students listen to educators instructions primarily without any contribution in the learning process.

According to the study.com (2026) teacher – centered pedagogy is defined as a pedagogic strategy where the teacher is the primary holder of knowledge and it is their primary responsibility to transmit their knowledge to their students. Furthermore, in teacher-center pedagogy the hierarchy of a classroom is extremely simple; teacher is master, students are subordinates. The classroom system is simple because it is only the teacher who is active and the students are passive recipients. This pedagogy is not completely out of place because there are some topics it can be useful, but it only limits students critical thinking.

Learner – Centered Pedagogy: The learner – centered pedagogy is exact opposite of teacher – centered pedagogy. It takes into cognizance the students’ whom the educator’s lesson is meant for. Students enjoy lessons when the educator have them in mind. When lessons are taught this way students feel motivated to learn and enjoy the learning because they have the feeling of been respected because they have a say in what they learn. According to Walsh and Vandiver (2007) learner – centered pedagogy contributed to the construction of educational activities and provided for a greater student learning and a more authentic student assessment. More so, as they have a say in what they learn, and the teacher only acted as facilitator. The approach contributed to students feeling respected as they learner, develop their critical thinking skills, and encourage their self-directedness. This pedagogy is also known as active based learning process. Activities carried out enable students work cooperatively and collaboratively. Learner – centered pedagogy is actively based learning. It stress participatory, cooperative, collaborative learning strategies (Faraida, 2019). This class is not simple like the teacher – centered classroom, students are active recipients while the educators act as facilitators.

AI has virtually taken over all facet of life, hence its pedagogical application to education will redefine our educational system. Its pedagogies are interactive, personalized tutoring, that leads to critical thinking and problem solving. It encourages students to explore topics independently. Its pedagogy is based on learner – centered pedagogy. A learner centered approach is an educational approach that emphasizes the learner’s role in actively construction knowledge, supported by instructional methods that adapt to individual needs, interests, and learning paces (Brown & Lambert, 2023).

Concept of Artificial Intelligence

AI is the capability of machines or computer power robots to perform tasks that are associated with human intelligence. According to Copeland (2026) AI is the ability of a digital computer or computer – controlled robot to perform task that commonly associated with human intelligence beings. Moreover, the term is frequently applied to the project of developing systems endowed with

intellectual processes characteristics of humans, such as the ability to reason, discover meaning, generalize or learn from past experience. Yuval (2014) referred to AI as the stimulation of human intelligent by machines while Fredrick (2014) in Dunu and Koroye (2025) saw AI as machines or software's that can perform task typically requiring human intelligence. Application of AI pedagogy in education means machines performing functions such as learning, planning, reasoning and problem solving. According to Crompton and Burke (2023) AI is the branch of computer science that focuses on treating systems capable of carrying out activities that usually requires intelligence. These tasks include acquiring knowledge, logically thinking solutions, interpreting information, comprehending language and making choices.

The application of AI pedagogy in teaching and learning process is making it easy for both educators and students. Students can learn in their own pace and at their convenience. This has made learning and carrying out research very easy and stress free. The application of AI pedagogy in education can redefine the system. Hence, the integration of AI pedagogy will redesign traditional classroom dynamics and preparing it for the AI era, where the need for critical thinking, problem solving and digital literacy is preeminent.

AI Tools for Educators to Enrich Pedagogy

S/no.	Category	AI Tools	How AI Enriches Pedagogy
1.	General A	Chat GPT	Facilitate personalized tutoring, automates explanations, and enhance reflective mating and analysis (Williamson & Esynon, 2020).
		Gemini	
		Claude	
2.	Writing Assistance	Grammarly	Support academic writing, improve clarity and enable, interactive feedback (Svoboda, 2024).
		Quibot	
3.	Voice, Video	Otterai,	Create accessible content, transcribe lecture and support multilingual learning environments (Huang et al, 2021).
	Speech Translation	Synthesia	
		Speechify	
4.	Image Creation	DALL-E	Enable students to visualize concepts support design based learning, and foster creativity (Bennett, 2023).
		Mid journey	

5.	Literature	Sciteai	Streamlines literature searches, support evidence based learning, and facilities critical analysis (Rangel-cl Leizaro & Duart 2024)
	Review and Research	Connected papers	
6.	Content	Carva	Creative interactive learning materials, quizzes and presentation to enhance engagement (Sivoboda, 2024).
	Creation	Eduaideai,	
		Nearpod	
7.	Assessment and Feedback	Gradescope	Automatic grading, provide immediate feedback and uphold academic integrity (Zhai et al., 2021).
		Turnitin	
8.	Classroom	Google	Organize learning pathways, track progress and support adaptive learning environments (Cropton& Burke, 2023).
	Management	Classroom	
		Magic School	

Adopted from Nayem and Halawi, 2025

The table above showed the diverse AI tools that can be applied in education that will enrich the teaching and learning process moving it from the older pedagogies to give meaning to students and educators effectiveness.

Importance of AI Pedagogy

The importance of AI pedagogy cannot be overemphasized because its impact are seen in education when it is applied. It impacts can be felt:

1. **Students learn on their own pace:** The AI pedagogy give room to students to study on their own pace when they have the means to access AI tools. AI programmes are created to meet individuals need. They can access AI tools on their own at their convenience. Students can now access up – to – date research, educational videos and open educational resources from anywhere. This wealth of reality available information empowers students to engage in self-directed learning and improve their academic performance (Chaudhary & Dey, 2021).
2. **Personalized learning:** AI pedagogy contributes to the achievement of personalized learning. AI does not apply the same pedagogy for everyone, it is designed to give each individual different pedagogy based on the individual learning style, and progress. One of

the key contributions of AI to academic achievement is the introduction of personalized learning (Fenesai, 2025). AI has customized educational content and resources based on individual student learning styles, preferences and progress. According to Zanaiki-Richer et al., (2019), this personalization helps students to learn at their pace, address learning gaps, and build their strengths, ultimately improving academic outcomes. Additionally, AI based platforms can adjust the difficulty of tests in real time providing targeted support necessary.

3. **Grading of Scores:** Sometimes grading students score after assignment or examination can be cumbersome when the number is large. With the application of AI tools scores can be automated and feedback received immediately and accurately. When this is done biases of educators and computation errors are completely rules out. AI application in pedagogy understands the essence of accuracy non-biasness scores and marks that are accurately assigned devoid of mistakes and arbitrates (Dunu & Koroye, 2025).
4. **Immediate feedback:** AI pedagogy gives immediate feedback to students and anyone who accesses it that guide them on what to do next. It does not just give solution, it enables them apply their thinking skills. AI pedagogy offers immediate directed feedback that aims to guide students towards answer rather than solving problems for them (Chatfield, 2025).
5. **Tracks student progress:** AI adaptive learning platforms help to track students' progress by displaying their strengths and weaknesses which they need to work on. Adaptive learning platforms powered by AI tracks students' progress and figures out what they need to work on, for example, if you keep getting questions about fractions wrong the platform will give you more practices on the topic until you get better (Vieriu & Petrea, 2025). Adaptive learning platforms like Knewton adjust content based on real assessment of each student's needs, helping them to master difficult topics before moving forward (Derri & Pauley, 2025).
6. **Support students learning:** AI offers interactive way to engage students with their course materials through direct conversation. It enable students have deeper understanding of the course as they receive support from AI. It enables them apply their critical thinking skills. Students advocated for a balanced approach, where AI support learning without replacing human interaction or critical thinking. In addition, applications such as intelligent tutoring system, educational robots, learning analytics dashboards, adaptive learning platforms, and human – computer interactions have demonstrated significant potential for enhancing pedagogy (Chen et al., 2020). This support system foster students engagement effectively and deepens their knowledge in their course of studies as they converse with the AI tool.
7. **Collaborative learning:** AI pedagogy integrate into learning via platforms such as Google classroom, magic school, zoom and others facilitating collaborative learning that enable students to work collaboratively in projects and assignments despite their location. AI tools like Google Workplace, Padlet and Microsoft Teams facilitate collaborative learning

enabling students to work together on projects, share resources, and engage in peer feedback regardless of location. This approach promotes interpersonal skills, which are crucial in the professional world (Derri & Pauley). Moreover, Salmon (2019) research highlighted how AI collaboration fosters a supportive learning environment encouraging how students acquire knowledge during learning and the development of complex analytical skills.

8. **Reduce teachers workload and assistance to students:** AI tools such as ChatGPT (Generative Pre – Trained Transformer) is transforming education through different activities acting very fast and effectively fostering less workload for teachers and assistance to students in their academic work. ChatGPT provides the opportunities for teachers and students to do so the following task/assignments said Erbas and Maksuti (2024).

“ChatGPT is a versatile tool that can assist both teachers and students in a wide range of tasks and assignments. Its capabilities include summarizing and outlining articles, generating multiple choice, true/false/fill in the blank questions with answers and explanations, checking grammar mistakes, building vocabulary lists, creating dialogues, defining words, translating languages, preparing survey/interviews questions according to the articles/writings, writing codes, drafting book reviews, writing story and video scripts, preparing lesson plans, syllabuses, course objectives, activities (according to the students level), writing emails messages, preparing references letters and CVs, and providing reading recommendations. It can analyze data, get writing assistance, and use it as a calculator for math problems. It can also help write songs and poems, create codes, offer advice, compare answer, define words, prepare presentation slides, and convert styles from one to another (such as APA to MLA). Additionally, it can compare your own answers or solutions with the AI’s answer and solutions, making it an invaluable tool for learning and academic success.”

It is incontrovertible that AI is involved in a thong of activities that transcend existed pedagogies in education. It would be a welcome development if it is annexed into the education system of the 21st century because it has the capacity to redefine education to meet with technological and AI driven world.

Challenges of AI

Despite the advancement of AI in virtually all fields of life. It is not without challenges. AI machines and software are created by human and operated by them. Hence, for AI to be effective solemnly depends on human. It should be noted that no matter how powerful AI system become, they will only ever be part of a learning process components within a large system whose ultimate measures of failure or success remain wholly human (Chatfield, 2025). Some of its challenges are:

1. **Non-technology Friendly:** Some teachers are still not technology friendly in this 21st century. They are not conversant with the operation and application of gadgets use for AI pedagogy, they always switch to the old outdated pedagogies that is convenient to them in classroom. They would not want to integrate and encourage with their students to use it. According to Clemens and Sarana (2016) teachers understanding of both hardware and software, alongside their attitudes towards technology, significantly influence their ability to integrate it effectively. Again, there is also some resistance to the adoption of new technologies among practitioners in Nigeria's education system, stemming from a preference for traditional teaching methods and cultural values (Fanesai, 2025).
2. **Digital divide:** One of the primary challenges faced in the implication of AI pedagogy is the digital divide. Digital divide is the gap between those who have access to AI tools and those who do not. Those who live in urban areas have access to AI tools such as computers and internet connectivity, rural students do not have such opportunities. This create disparity among students from wealthy family whom their parents can afford materials for accessing AI tools, benefits from AI tools. While students in rural areas whom their parents cannot afford materials to access AI tools do not benefit from it. The ones who are opportune will be left behind. The unequal distribution of digital resources across Nigeria could widen the educational gap between urban and rural students (Matthew & Isaac, 2025).
3. **Inadequate infrastructure:** Many Nigeria institutions has deficit in infrastructure. The schools, mostly those in rural area lack the necessary infrastructure to support AI pedagogy. Infrastructure may include computers, electricity, internet connectivity and high cost of internet data. According to Sambo–Mogagi et al. (2025) infrastructure deficits, including unreliable electricity limited internet connectivity and sufficient digital infrastructure remain some of the pressing barriers. More so, many educational institutions, particularly in rural areas, struggle with access to basic technological resources, making AI implementation difficult. In research carried out by Jesam et al (2025) revealed that the most prominent challenges in adopting AI content is the absence of adequate institutional infrastructure to support AI use. Again, the study showed that even in an urban Nigerian University setting, infrastructural deficiencies remains critical challenge.
4. **High cost of implementation of AI tools:** The implementation of AI tools is highly expensive and the inadequate funding of education by the Federal Government of Nigeria is a challenge to the implementation of AI tools. Ogunode and Abah (2020) noted that inadequate funding is major problem facing the implementation of educational policies in Nigeria. The budgetary allocation for education is so poor that it is not enough to implement the various education policies in the country. Finance is the prime mover of education, when

education is poorly funded the implementation AI pedagogy in our institutions will not be possible.

5. **Misinformation:** AI can give out inappropriate or incorrect information and omit information that can mislead users who are not careful and use AI as the final authority. Giaria (2024) reiterated that AI is not always correct. People make the mistake of thinking AI knows everything. It does not know a lot, but it knows as much as it knows if that make sense, and what it knows is not always correct. Even at the bottom of a ChatGPT conversation, it says, ChatGPT can make mistakes. Check important info.
6. **Loneliness of students:** Excessive use of AI tools can make students lack social support which can eventually lead to loneliness because they get clue to their AI tools and not considering the importance of face – face contact with others. Crawford et al. (2024) performed a study among 387 University students and discover that social support mediated the relationship between loneliness and AI usage, suggesting that AI might increase loneliness when students perceive it as a primary source of support. In the same vein Xie et al., (2023) found that a connection between increased AI use and loneliness. In addition, over reliance on AI for communication, especially in recreational contexts, may reduce face-to-face social interactions, negatively impacting interpersonal skills and emotional intelligence (Cambra-Fierro, et al., 2024). Again, students may become more isolated and less adept at real – world social interaction and team work, which are critical to their overall social well-being and development when they are over-reliance on AI.
7. **AI lack empathy:** It has been found that AI tools has influenced mental health and emotional well-being of students by increasing their happiness, resulting to positive emotional impact. But AI pedagogies cannot express empathy. They cannot emphasize with their users like humans. As Rodway and Schepman (2023) expanded, engaging with a technology lacks empathy might be seen as an insufficient form of support, even though it has a capacity to offer helpful advice. AI can do quite a lot of activities but it does not possess feeling (empathy). AI cannot be compassionate like humans. Unlike humans, AI lacks subjective experience, emotions and genuine concern for others well-being. While AI can simulate cognitive empathy – understanding the predicting emotions based on data – it cannot experience emotions or compassionate empathy. (Rubinet et al., 2025). Furthermore, AI generated responses may be highly sophisticated, but they remain formulaic and lack authentic emotional resonance. Rubinet went ahead to say that AI's lack of ethical judgment and contextual understanding presents risks in sensitive scenarios, or harmful intuition due to its reliance on programmed algorithms rather than human intuition. Therefore, in education, educators have real empathy and feel the pains of their students and show concern for them genuinely.

Seeing that engineering AI pedagogy would redefine education addressing its challenges is crucial for its successful implementation in our institutions.

Conclusion

AI pedagogy is not just passing trend but serves as transformative tool to redefining our educational system in our institutions. It has reaped an earthshaking advancement in teaching and learning and preparing students to match the complexities of our time. Leveraging AI pedagogy would heighten the quality of education by making it more relevant, engaging, interactive, and collaborative and problem solving. AI pedagogy is not meant to replace human intelligence but to support existing pedagogies. Engineering AI pedagogy are not without challenges. When the challenges are taking care of it will be beneficial in education in our institutions.

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