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Artificial Intelligence and the Implementation of Economics Education in Tertiary Institutions in Nigeria: Challenges and Solutions

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Abstract: Artificial intelligence (AI) has emerged as an important technological innovation with significant implications for teaching, learning, assessment and research in tertiary institutions. Economics Education, which combines economic knowledge with pedagogical skills, requires continuous adaptation to technological developments in order to prepare students for contemporary economic and labour-market realities. This paper examined the role of artificial intelligence in the implementation of Economics Education in tertiary institutions in Nigeria. The paper focused on five major areas: integration of AI into the Economics Education curriculum, capacity building of Economics educators, improvement of teaching and personalised learning, AI-supported assessment and academic research, and provision of digital infrastructure and equitable access. The review established that AI-supported teaching and learning outcomes in economics education, economics education curriculum integration, implementation and supported by institutional infrastructure and an enabling policy framework, capacity building and training of economics educators, assessment and research in economics education, teaching, learning and personalised instruction, assessment, feedback and academic research and provided digital infrastructure and equitable access. The paper concludes that AI should complement rather than replace Economics educators. It recommends systematic integration of AI competencies into Economics Education curricula, continuous training and retraining of lecturers, improvement of electricity and internet infrastructure, development of institutional AI-use policies, and increased government and institutional investment in digital education.

Keywords: Artificial intelligence, Economics Education, tertiary institutions, curriculum implementation.

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1. Introduction

The rapid development of artificial intelligence (AI) is transforming different sectors of society, including education. Artificial intelligence refers broadly to computer-based systems capable of performing tasks that normally require aspects of human intelligence, such as learning, reasoning, prediction, language processing and decision-making. In education, AI is increasingly being applied in areas such as personalised learning, intelligent tutoring, automated assessment, learning analytics, content generation and research. UNESCO observes that generative AI has considerable potential to support education and research but stresses the importance of human-centred and ethically responsible implementation. Tertiary education is particularly important to the

development of human capital because universities, polytechnics and colleges of education prepare graduates with the knowledge and competencies required for national development. In Nigeria, Economics Education occupies an important position because it prepares students to understand economic principles and also equips prospective teachers with the knowledge and pedagogical skills required to teach economics effectively at different levels of education [1]. The changing nature of the economy, increasing availability of digital information and emergence of data-driven decision-making have made technological competence increasingly relevant to Economics Education.

The integration of AI into Economics Education can provide opportunities for lecturers and students to analyse large economic datasets, simulate economic situations, develop forecasts and obtain immediate learning feedback. AI-supported platforms can also facilitate personalised learning by helping students identify areas of weakness and providing additional learning resources. However, the existence of AI tools does not automatically guarantee improved educational outcomes. Recent evidence in economics education indicates that AI-supported learning can increase students' engagement with problem-solving while its effect on academic achievement may depend on how the technology is integrated into classroom instruction [2]. In Nigeria, effective AI implementation is constrained by challenges including inadequate digital infrastructure, unstable electricity supply, limited technological competencies among educators, unequal access to digital devices and concerns about academic integrity. The National Artificial Intelligence Strategy identifies inadequate infrastructure and shortages of relevant AI skills as important issues requiring attention in the development of AI capacity in Nigeria. Similarly, UNESCO's AI Competency Framework for Teachers emphasises the importance of developing teachers' competencies in AI pedagogy, ethics and professional learning.

The implementation of AI in Economics Education therefore requires more than simply providing AI applications to lecturers and students. It requires curriculum reform, professional development, adequate infrastructure, institutional policies and ethical guidelines. Economics educators must be able to determine when AI can improve learning and when conventional pedagogical approaches remain more appropriate. Students must equally be trained to use AI critically, responsibly and ethically rather than relying on it as a substitute for independent thinking [3]. It is against this background that this paper examines artificial intelligence and the implementation of Economics Education in tertiary institutions in Nigeria. Specifically, the paper considers the integration of AI into the Economics Education curriculum, capacity building of Economics educators, improvement of teaching and personalised learning, AI-supported assessment and research, and provision of digital infrastructure and equitable access [4], [5].

2. Materials and Methods

2.1 Concept of Economics Education

Economics education as a field concerned with the scholarship of teaching economics, including the content to be taught, methods of teaching, evaluation of teaching methods, and information relevant to economics teachers from elementary through graduate education. Economics education as a field concerned with developing teaching and research techniques that make economics more accessible, relevant and applicable to students and educators. It covers issues relating to economics content, teaching methods and assessment. Van Wyk views economic education as the study of how economics can be effectively taught and learned, encompassing what is taught, how it is taught and why it is taught, together with appropriate assessment practices. The purpose extends beyond knowledge of economic concepts to helping learners understand and respond to economic issues. For the purpose of this study, Economics Education refers to the systematic process of teaching and learning economic concepts, principles, theories and applications, together with the pedagogical knowledge and skills required to effectively teach economics and

develop learners' ability to understand and make informed decisions about economic issues.

2.2 Concept of Artificial Intelligence

An AI system as a machine-based system that, for explicit or implicit objectives, infers from the inputs it receives how to generate outputs such as predictions, content, recommendations or decisions that can influence physical or virtual environments. Artificial intelligence broadly as the capability of a device to perform functions normally associated with human intelligence, including areas such as expert systems and pattern recognition. Copeland defined Artificial Intelligence as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Ogunode viewed Artificial Intelligence (AI) as programs designed with human-like intelligence and structured in forms of computer, robot, or other machines to aid in provision of any kind of service or tasks to improve social economic and political development of the society. AI is an application or program constructed to carry out tasks with human like intelligence. Artificial Intelligence (AI) is collections system, packages and application designed into digital computer or computer-controlled robot to carry out assignments and tasks with human-like intelligence.

Alagbe viewed Artificial Intelligence (AI) as the ability of a computer or machine to mimic the capabilities of the human mind – learning from examples and experience, recognising objects, understanding and responding to language, making decisions, solving problems – and combining these and other capabilities to perform functions a human might perform, such as greeting a hotel guest or driving a car. UNESCO presents generative AI as a group of rapidly developing technologies and emphasises its capacity for applications in curriculum design, teaching, learning and research, while stressing that its educational use should be human-centred, ethical, safe and equitable. For the purpose of this study, Artificial Intelligence (AI) refers to computer-based systems capable of processing inputs and using learned or programmed capabilities to generate outputs such as predictions, recommendations, content, feedback or decisions, which can be applied to improve teaching, learning, assessment and research in Economics Education.

Ogunode, Agbade & Bassey defined AI as programs designed with human-like intelligence and structured in forms of computer, robot, or other machines to aid in provision of any kind of service or tasks to improve social economic and political development of the society. Artificial Intelligence is an application or program constructed to carry out tasks with human like intelligence. Ogunode also viewed Artificial Intelligence as collections system, packages and application designed into digital computer or computer-controlled robot to carry out assignments and tasks with human-like intelligence. Artificial intelligence (AI), according to Copeland is the ability of a digital computer or computer controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience. Frankenfield (2023) defined Artificial intelligence (AI) as simulation of human intelligence by software-coded heuristics. Artificial Intelligence is a branch of science producing and studying the machines aimed at the stimulation of human intelligence processes. Artificial intelligence (AI) are machines programme forms with capacities and abilities to execute tasks and responsibilities that human beings are performing with the assistance of human-like intelligence.

3. Result and Discussion

Artificial intelligence (AI) is increasingly influencing teaching, learning, assessment and research in higher education. In Economics Education, AI can support data analysis, personalised learning, economic modelling, feedback and access to current economic information. However, its effective implementation in Nigerian tertiary institutions depends on infrastructure, lecturer competence, curriculum adaptation, ethical regulation and institutional support. Recent Nigerian evidence indicates that the application of AI in course delivery by Economics educators remains relatively low, highlighting the need for deliberate implementation strategies [6].

3.1 AI-supported teaching can improve students' understanding and learning outcomes in Economics Education

One important justification for implementing AI in Economics Education is its potential to improve students' academic achievement and engagement. Economics contains abstract and quantitative concepts such as demand and supply, elasticity, national income determination, econometrics, inflation, unemployment, and monetary policy that can be difficult for students to understand through conventional lecture methods alone. AI applications can provide explanations, simulations, examples, immediate feedback, and personalised learning experiences. Recent empirical evidence from Nigeria supports this position [7]. Anikoh investigated the effect of AI applications on the learning outcomes of NCE II Economics Education students at the FCT College of Education, Abuja. Using a quasi-experimental pretest-posttest control-group design, the study involved 120 students selected from a population of 420 Economics Education students. The experimental group received AI-supported instruction while the control group was taught conventionally. The findings showed that students exposed to AI-supported instruction achieved significantly better outcomes in conceptual understanding, problem-solving ability, and academic engagement than students who received conventional instruction. Similarly, research among NCE Economics students at the College of Education, Akwanga, Nasarawa State, examined the relationship between AI usage and academic achievement, indicating growing empirical interest in the relationship between students' AI use and academic performance in Nigerian Economics Education. Evidence outside Nigeria also reinforces this argument. A 2026 experimental study involving undergraduate macroeconomics students found that students receiving AI-generated individual feedback demonstrated greater continuous participation and produced longer responses than students receiving lecturer-only feedback [8]. The AI-feedback group also recorded the strongest improvement in content-related learning outcomes. These findings are consistent with Zawacki-Richter et al. whose systematic review of 146 empirical studies identified adaptive learning, personalised learning, intelligent tutoring systems, assessment, and feedback as major applications of AI in higher education. The authors, however, stressed that AI should be connected to sound pedagogical principles rather than being adopted merely because the technology is available.

3.2 Integration of AI into Economics Education Curriculum

AI should be deliberately integrated into the Economics Education curriculum of Nigerian tertiary institutions. Economics students need exposure to AI-supported economic modelling, data analytics, forecasting, econometrics, intelligent tutoring systems and generative AI applications. This would enable students to develop competencies relevant to contemporary economic analysis and the changing labour market [9]. The National Information Technology Development Agency (NITDA) has also advocated that AI education should extend beyond computer science and be integrated across disciplines in tertiary institutions, alongside continuous curriculum review. For Economics Education specifically, curriculum integration could involve teaching students how to use AI to analyse inflation, unemployment, exchange rates, poverty, GDP and other economic

indicators. AI should therefore not be treated as a separate technological subject alone but as a tool that can enhance the teaching and learning of economics [10].

3.3 AI implementation should be supported by institutional infrastructure and an enabling policy framework

Another major issue is the availability of infrastructure. Effective AI-supported Economics Education requires reliable internet connectivity, electricity, appropriate digital devices, institutional learning-management systems, access to relevant software, and affordable connectivity for students. Without these conditions, AI implementation may increase rather than reduce educational inequality. The Nigerian context makes this concern particularly important. Evidence from research on AI adoption in Nigerian tertiary institutions shows that awareness and use are accompanied by implementation challenges. For example, a study involving 400 lecturers and students in tertiary institutions in Rivers State investigated AI awareness, usage, and challenges, demonstrating the need to consider institutional and contextual factors rather than treating AI adoption simply as an individual student's decision. Similarly, research on Economics educators in Abia State examined the application of intelligent tutoring systems and adaptive learning platforms in course delivery, indicating that AI implementation is beginning to extend specifically into Economics teaching practice in Nigerian tertiary institutions [11], [12]. At the broader theoretical level, Zawacki-Richter et al. found that AI applications in higher education extend beyond classroom instruction to assessment, prediction, personalisation, tutoring, and institutional services. Their review also warned that AI research has often developed faster than educators' engagement with its pedagogical and ethical implications. For Nigeria, therefore, AI implementation should be embedded within institutional policy. Universities and colleges should develop clear guidelines addressing acceptable AI use in assignments, examinations, research, assessment, data privacy, intellectual property, and academic misconduct [13]. Rather than banning generative AI completely, institutions should distinguish between productive AI use and inappropriate substitution of students' intellectual work. This position agrees with UNESCO's human-centred approach, which recommends institutional policies that address privacy, ethical use, equity, pedagogical suitability, and human capacity development.

3.4 Capacity Building and Training of Economics Educators

The successful implementation of AI in Economics Education requires lecturers who possess adequate technological, pedagogical and ethical competencies. Lecturers need continuous professional development on the appropriate use of generative AI, intelligent tutoring systems, learning analytics, automated feedback and AI-supported research. UNESCO identifies AI foundations, AI pedagogy, ethics, human-centred thinking and professional learning as important dimensions of teachers' AI competencies [14]. This is particularly important in Nigeria because recent evidence from public tertiary institutions in Abia State found that the application of intelligent tutoring systems and adaptive learning platforms by Economics educators was still at a low level and recommended regular training and retraining of Economics educators. Universities, colleges of education and polytechnics should therefore organise workshops, seminars, certification programmes and practical training to improve lecturers' ability to integrate AI into Economics Education [15].

3.5 AI should transform assessment and research in Economics Education while protecting academic integrity

A fourth important area is assessment. Traditional take-home assignments may become less effective indicators of students' independent knowledge when students can easily obtain AI-generated responses. Nigerian tertiary institutions need to rethink how Economics Education students are assessed. Instead of relying exclusively on conventional essays and assignments, lecturers can use AI to support formative assessment,

personalised feedback, economic simulations, data analysis, problem-based learning, and interactive questioning [16]. At the same time, students can be required to demonstrate how they arrived at an answer, interpret economic data independently, critique AI-generated responses, and defend their conclusions orally. This approach is supported by empirical evidence. The macroeconomics experiment discussed earlier found that AI-generated individual feedback increased student activation and improved content-related learning outcomes. Thus, AI can be used not merely to generate students' answers but to provide feedback that helps them improve their economic reasoning. However, the Nigerian study of university lecturers found considerable concern about academic integrity, student overreliance, and reduced critical thinking. This suggests that implementation without assessment reform could create a situation in which students become proficient at generating answers without necessarily developing economic reasoning. The issue is also highlighted by UNESCO, which argues for a human-centred approach to generative AI in education and emphasises ethical, safe, equitable, and meaningful use. Likewise, Ng et al. argue that AI literacy must include the ability to evaluate AI outputs and understand ethical implications, rather than merely knowing how to use AI tools [17]. For Economics Education, this means that lecturers should increasingly assess critical thinking, interpretation, application, economic reasoning, oral defence, data analysis, and problem-solving. Students could, for example, be asked to submit an AI-generated explanation of inflation and then identify its inaccuracies, improve it using authoritative economic sources, and defend their revised explanation. Such an approach converts AI from a threat to academic integrity into an instrument for developing higher-order thinking.

3.6 Improvement of Teaching, Learning and Personalised Instruction

AI can support the implementation of Economics Education by providing personalised learning experiences. AI-powered systems can analyse students' responses, identify areas of difficulty and provide explanations or feedback according to individual learning needs [18]. This can complement lecturers' efforts in large classes where providing individualised attention to every student is difficult. Evidence from economics education, however, suggests that AI should be used carefully rather than assumed to automatically improve learning. For example, Mask found in a classroom study of economics students that an AI tutor increased students' problem-solving attempts but did not produce statistically evident improvements in homework, examination or final course grades. This suggests that Nigerian tertiary institutions should implement AI as a pedagogical support tool, with lecturers maintaining responsibility for instructional decisions, rather than allowing AI to replace conventional teaching [19].

3.7 AI-Supported Assessment, Feedback and Academic Research

AI can improve assessment and feedback within Economics Education. Lecturers can employ AI-assisted systems to generate practice questions, provide preliminary feedback, identify common misconceptions and support formative assessment. Students can also use AI tools to explore economic datasets, formulate hypotheses and conduct preliminary analyses. Nevertheless, AI-generated responses can contain errors and may encourage academic dishonesty if students simply submit AI-generated assignments as their own work. UNESCO (2023) therefore emphasises the need for human-centred approaches, ethical validation, data privacy, institutional policies and appropriate regulation when generative AI is used in education and research. Consequently, Nigerian tertiary institutions should establish clear guidelines on acceptable AI use in examinations, assignments, projects and research [20]. Assessment should increasingly emphasise critical thinking, interpretation of economic evidence, oral defence, problem-solving and application of concepts rather than tasks that can easily be completed by AI.

3.8 Provision of Digital Infrastructure and Equitable Access

Effective AI implementation in Economics Education requires reliable digital infrastructure. Tertiary institutions need adequate internet connectivity, electricity, computers and smart devices, appropriate software, digital learning platforms and access to relevant datasets. Without these facilities, AI integration may remain largely theoretical and benefit only students and lecturers who have personal access to technology. Nigeria's National Artificial Intelligence Strategy identifies inadequate educational infrastructure, limited AI skills and shortages of trained educators as obstacles to widespread AI education [21]. Therefore, government and tertiary institution administrators should invest in campus-wide digital infrastructure and ensure that AI-enabled learning does not widen existing inequalities between students from different socioeconomic backgrounds or between well-resourced and poorly resourced institutions. Effective implementation requires AI literacy and professional development for Economics lecturers and students [22]. The availability of AI tools does not automatically result in effective educational implementation. Lecturers need the knowledge and skills to select appropriate AI applications, formulate effective prompts, evaluate AI-generated information, identify inaccuracies, protect student data, and integrate AI into lesson objectives and assessment. Students equally require AI literacy so that they can use AI critically rather than simply copying AI-generated answers. This is particularly important in Nigeria because empirical evidence indicates that lecturers are interested in AI but require institutional support and training. For example, a recent study of 64 lecturers at Nnamdi Azikiwe University, Awka, found moderate concern about AI integration, with a mean concern score of 3.62, while perceived effectiveness of AI tools had a mean of 3.05. The major concerns included academic integrity, student overdependence on AI, and possible deterioration of critical-thinking skills. Importantly, the lecturers expressed a need for further training and institutional support for effective AI integration. Research on Nigerian pre-service teachers also demonstrates the importance of AI literacy. A study involving 529 Nigerian pre-service teachers found that deeper understanding of AI significantly predicted positive outcomes relating to AI use, detection, ethics, creation, and problem-solving. This finding is especially relevant to Economics Education because today's Economics Education students are tomorrow's teachers and educational practitioners. The contribution of Ng et al. is useful here. They conceptualised AI literacy around four broad competencies: knowing and understanding AI, using AI, evaluating AI, and understanding ethical issues surrounding AI. Thus, AI literacy in Economics Education should not be limited to knowing how to operate ChatGPT. Students should be able to determine whether an AI-generated explanation of inflation, fiscal policy, unemployment, or exchange-rate theory is economically accurate and supported by credible evidence [23], [24]. Tertiary institutions in Nigeria should establish continuous professional development programmes for Economics lecturers, while AI literacy should be incorporated into Economics Education programmes. Such training should cover prompt engineering, AI-assisted research, data analysis, fact-checking, ethical use, citation, academic integrity, and the limitations of generative AI.

4. Conclusion

Artificial intelligence presents significant opportunities for improving the implementation of Economics Education in Nigerian tertiary institutions. Its application can enhance teaching and learning outcomes in economics education, economics education curriculum integration, implementation and supported by institutional infrastructure and an enabling policy framework, capacity building and training of economics educators, assessment and research in economics education, teaching, learning and personalised instruction, assessment, feedback and academic research and provided digital infrastructure and equitable access, curriculum delivery, personalised learning, economic data analysis, assessment, feedback and academic research. AI can also help

Economics Education students acquire technological and analytical competencies that are increasingly important in contemporary economic and employment environments.

The effective implementation of AI cannot be achieved through the provision of AI applications alone. Inadequate infrastructure, limited digital competencies among lecturers, unequal access to technology, ethical concerns and the possibility of academic dishonesty can undermine its educational benefits. Furthermore, AI should not be viewed as a replacement for Economics educators because effective Economics Education requires human judgement, explanation, mentoring, critical thinking and contextual understanding. Based on the discussion, the following recommendations are made: AI should be integrated into Economics Education curricula: Nigerian universities, polytechnics and colleges of education should incorporate relevant AI competencies into Economics Education programmes. Students should be exposed to AI-supported economic analysis, data analytics, forecasting, simulation and responsible use of generative AI. Economics educators should receive continuous training: Tertiary institutions should organise regular workshops, seminars and professional-development programmes to equip Economics educators with the knowledge and skills required to use AI effectively for teaching, assessment and research. Government should improve digital infrastructure: The Federal and State Governments, together with tertiary institution management, should invest in reliable electricity, high-speed internet, computers, digital learning platforms and other infrastructure required for effective AI-supported education. Institutions should develop clear AI-use policies: Universities, polytechnics and colleges of education should establish guidelines specifying acceptable and unacceptable uses of AI in assignments, examinations, projects, dissertations and research. Such policies should protect academic integrity while encouraging responsible innovation. Equitable access to AI technologies should be promoted: Institutions should ensure that students from disadvantaged socioeconomic backgrounds are not excluded from AI-supported learning. Computer laboratories, institutional subscriptions and accessible digital learning facilities should be provided to reduce the digital divide. AI should complement rather than replace lecturers: Economics educators should remain responsible for instructional decisions, evaluation and academic guidance. AI should be employed as a supporting technology for improving teaching and learning rather than as a substitute for professional educators. AI-supported assessment should emphasise critical thinking: Tertiary institutions should redesign Economics Education assessments to focus more strongly on interpretation, application, problem-solving, oral presentations and independent analysis. This will reduce excessive dependence on AI-generated answers. Research on AI and Economics Education should be encouraged: TETFund, universities and other relevant agencies should support empirical research examining the effectiveness, challenges and educational outcomes of AI applications in Economics Education across Nigerian tertiary institutions.

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