



ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN THE ASSESSMENT OF LEARNING OUTCOMES IN PUBLIC SECONDARY SCHOOLS IN BENUE STATE, NIGERIA

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Abstract

The study investigated the role of Artificial Intelligence (AI) in the assessment of learning outcomes in public secondary schools in Benue State, Nigeria. Two research questions were answered in the study. The research adopted a descriptive survey design. A sample of 450 teachers and administrators was drawn through a multi-stage sampling procedure. A structured questionnaire titled 'Role of Artificial Intelligence in Assessment of Learning Outcomes Questionnaire (RAIAQ)' was used to collect data. To ensure content and face validity, the instrument was reviewed by three research experts. The data was analyzed using the Cronbach's Alpha reliability coefficient, and with a reliability coefficient of 0.78, the instrument was considered acceptable for internal consistency. The researcher, together with seven research assistants collected relevant data for the study. The data were analyzed using descriptive statistics, including mean ratings and tables. The findings revealed that AI enhances assessment practices by providing real-time feedback, automating grading processes, personalizing learning interventions, and improving the objectivity and efficiency of assessments. The study also identified several challenges inhibiting effective AI integration, including: infrastructural deficiencies, limited technological skills among teachers, high costs of AI technologies, and ethical concerns regarding data privacy and fairness. The study concluded that while AI holds great promise for revolutionizing learning assessment in public secondary schools, careful planning and investment are essential to realize its full potential. It was recommended that the Benue State Ministry of



Education promote the integration of AI technologies into assessment practices through targeted training and structured programs.

Keywords: Artificial Intelligence, Learning Outcomes, Assessment, Public Secondary Schools.

Introduction

The rapid proliferation of Artificial Intelligence (AI) technologies is reshaping educational practices across the globe, introducing new paradigms for teaching, learning, and assessment. Luckin, et al. (2016) posited that the growing interest in AI stems from its capacity to process large volumes of data efficiently and to provide tailored feedback, thereby fostering individualized learning experiences. This makes AI important for understanding learning outcomes better and faster. AI constitutes a group of technologies that are programmed to know, understand and interpret data and information by modeling human intelligence. Similarly, Russell and Norvig (2021), described artificial intelligence as the development of computer systems capable of performing tasks traditionally requiring human intelligence, such as problem-solving, decision-making, language understanding, and pattern recognition. This means such technologies make use of intelligence, similar to those of human beings to perform a variety of tasks that human beings are known to carry out, one of which is assessment of learning outcomes. In this regard, it is understandable that in the education sector, AI has been deployed in various capacities, including personalized learning, intelligent tutoring, and predictive analytics, and different aspects of learning evaluation. Given these potentials, the application of AI in the assessment of learning outcomes has emerged as an area warranting comprehensive exploration.

Assessment of learning outcomes constitutes a critical component of the educational process. Black and Wiliam (2018), described

assessment of learning as involving the systematic evaluation of students' knowledge, skills, attitudes, and competencies acquired over a period of instruction. Effective assessment practices are essential for informing instructional decisions, identifying learning gaps, and ensuring accountability in educational systems. Traditionally, assessment in Nigerian secondary schools has been dominated by summative approaches, often relying on paper-based examinations that may not fully capture the complexity of student learning (Okebukola, 2015). Contemporary discourse advocates for more dynamic assessment practices that not only evaluate final learning but also support the learning process itself. AI offers innovative tools for achieving these goals by facilitating real-time, adaptive, and comprehensive assessments.

Public secondary schools in Benue State, Nigeria, face numerous challenges that impede effective teaching and learning. These schools, funded and administered by government authorities, often grapple with issues such as overcrowded classrooms, limited instructional materials, inadequate infrastructure, and teacher shortages. Such constraints negatively impact the quality of education and hinder the effective assessment of learning outcomes. In this context, traditional methods of assessment may be insufficient in meeting the diverse needs of students. To this end, Ajayi and Ekundayo (2010) stressed that the integration of AI technologies presents an opportunity to overcome some of these limitations by enabling more efficient, individualized, and scalable assessment processes that could significantly enhance educational quality in



public secondary schools. This is a demonstration of the reality of the place of AI, not only for educational purposes but for almost every sphere of man's endeavours.

The role of AI in formative and summative assessment is particularly significant. In describe learning assessment, Sadler (2019), posited that while formative assessment describes ongoing and interactive evaluations which is intended to inform instructional adjustments and support student learning, summative assessment pertains to the evaluation of students' achievement at the conclusion of an instructional period. In similar view, Williamson and Eynon (2020), asserted that with learning assessments being central issues in ascertaining whether or not learning has taken place, especially in the digital era, AI-powered tools, such as intelligent tutoring systems, automated essay scoring engines, and learning analytics platforms, have become relevant, providing immediate, personalized feedback that supports formative assessment. This points to the fact that AI can enhance the objectivity, efficiency, and comprehensiveness of summative assessments by making presenting valuable supportive insights into students' learning stage in the formative evaluation. Hence, for overburdened teachers in Benue State's public secondary schools, AI could serve as a vital support mechanism by automating routine assessment tasks, analyzing student performance data, and generating insights for instructional improvement.

Nevertheless, the implementation of AI for the assessment of learning outcomes is fraught with challenges. Key among these are infrastructural deficiencies, including unreliable electricity supply, poor internet connectivity, and inadequate technological devices in school. This was corroborated by Afolabi, Oladipo and Ojo (2021), who observed that issues such as the lack of

technical expertise among teachers, concerns over data privacy and security, and potential algorithmic biases in AI systems present significant barriers to adoption. In addition to this, Makinde and Ogunlade (2020), argued that in resource-constrained environments such as Benue State, these challenges are compounded by financial limitations and disparities in digital literacy among stakeholders, which may hinder the effective deployment and utilization of AI for educational assessment.

The foregoing highlights a critical gap in the existing body of knowledge and underscores the necessity for this study. While considerable research has been conducted on the use of AI in education within developed contexts, there is a paucity of empirical studies examining its role in the assessment of learning outcomes in Benue State public secondary schools, particularly in states like Benue. Understanding how AI can be effectively integrated into assessment practices in this context is essential for informing policy formulation, teacher professional development, and resource allocation. This study, therefore, seeks to investigate the role of AI in the assessment of learning outcomes in public secondary schools in Benue State, with the aim of contributing to the broader discourse on leveraging technological innovations to enhance educational quality and equity in Nigeria.

Statement of the Problem

The assessment of learning outcomes remains a critical challenge in Nigerian public secondary schools, particularly in Benue State. Traditional methods of assessment, which predominantly rely on periodic examinations and standardized tests, have often been criticized for their inability to capture the breadth and depth of student learning. These methods frequently fail to provide timely and actionable feedback



necessary for improving teaching strategies and supporting diverse learner needs. In the context of Benue State, public secondary schools are further constrained by large class sizes, inadequate instructional resources, infrastructural deficiencies, and limited teacher capacity, all of which contribute to ineffective assessment practices and poor learning outcomes.

In recent years, AI has emerged globally as a transformative tool for enhancing educational assessment through the provision of personalized feedback, predictive analytics, and real-time evaluation mechanisms. AI technologies offer significant potential to address some of the persistent challenges faced by public secondary schools by improving the efficiency, accuracy, and scalability of both formative and summative assessments. However, the application of AI in the educational assessment landscape in Nigeria remains largely underexplored. Most existing studies focus on developed countries, with little empirical evidence available on how AI can be effectively deployed to support assessment practices in resource-constrained environments like Benue State.

Moreover, challenges related to infrastructural inadequacies, limited technological literacy, ethical concerns regarding data privacy, and the potential biases embedded in AI algorithms pose significant barriers to the adoption of AI-based assessment systems in Nigerian public secondary schools. These factors raise critical questions about the feasibility, effectiveness, and sustainability of leveraging AI to enhance the assessment of learning outcomes in this context.

Given the urgent need to improve assessment practices in Benue State's public secondary schools and the potential of AI to offer innovative solutions, there is a pressing need

to systematically investigate the role that AI can play in the assessment of learning outcomes. Addressing this gap is essential for informing educational policy, teacher training programs, and technology integration strategies aimed at improving educational quality and equity. Therefore, this study seeks to examine the role of AI in the assessment of learning outcomes in public secondary schools in Benue State, Nigeria.

Research Questions

In the study, the following research questions were provided answers to:

1. What is the role of artificial intelligence in the formative and summative assessment of learning outcomes in public secondary schools in Benue State?
2. What challenges affect the application of artificial intelligence for the assessment of learning outcomes in public secondary schools in Benue State?

Methodology

This study adopted a descriptive survey research design. The descriptive survey method is appropriate because it allows the researchers to collect and analyze data from a large group of respondents in order to describe and interpret existing conditions, opinions, and practices regarding the use of AI in the assessment of learning outcomes. The survey approach enabled the researchers to obtain quantitative data that reflect the views and experiences of teachers and administrators in public secondary schools in Benue State.

The population of the study comprised all teachers and school administrators (principals and vice principals) in public secondary schools in Benue State. Benue



State Ministry of Education (2024), revealed that there are approximately 2,500 teachers and 250 administrators across the public secondary schools in the state. The study employed multi-stage sampling technique to draw a sample of 450 respondents (400 teachers and 50 administrators). Firstly, simple random sampling was used to draw three Local Government Areas (LGAs) from each of the three senatorial zones of Benue State (Benue North-East, Benue North-West, and Benue South), making a total of nine LGAs. Secondly, from each selected LGA, five public secondary schools were randomly drawn, totaling 45 schools. Finally, proportionate stratified sampling was used to draw a sample of 450 respondents (400 teachers and 50 administrators) based on the staff population ratio, ensuring fair representation across schools and roles.

The primary instrument for data collection was a structured questionnaire titled "Role of Artificial Intelligence in Assessment of Learning Outcomes Questionnaire (RAIAQ)". The questionnaire consisted of three sections, namely: Section A: Demographic information; Section B: Role of AI in formative and summative assessment, and Section C: Challenges in using AI for assessment. Items were formatted using a 4-Point Likert scale ranging from "Strongly Agree" to "Strongly Disagree."

To ensure content and face validity, the draft questionnaire was reviewed by three experts: one in Educational Measurement and Evaluation, one in Educational Technology, and one in Curriculum and Instruction. Their corrections and suggestions were incorporated into the final version of the

instrument. For reliability testing, a pilot study was conducted involving 30 teachers and administrators from public secondary schools in a neighbouring state (e.g., Nasarawa State) that were not be part of the main study. The data from the pilot test was analyzed using the Cronbach's Alpha reliability coefficient. A reliability coefficient of 0.78 was considered acceptable for internal consistency.

Data collection involved the personal administration of questionnaires with the assistance of four trained research assistants. Respondents were given sufficient time to complete the questionnaire to ensure thoughtful and accurate responses. Efforts were made to retrieve all administered questionnaires to maximize the return rate. The collected data was analyzed using descriptive statistical methods. Specifically, mean scores and frequency tables were used to summarize and present the data. For the remarks and interpretation of each tabulated item, the following benchmarks were used:

1.0	–	1.49	=Strongly Disagree (SD)
1.50	–	2.49	= Disagree (D)
2.50	–	3.49	= Agree (A)
3.50	–	4.00	=Strongly Agree (SA)

Results

This section presents and interprets the results obtained from the study, providing a detailed analysis of the data in relation to the purpose of the research questions. The results are presented on tables, and interpreted accordingly.

Research Question 1: What is the role of Artificial Intelligence in the formative and summative assessment of learning outcomes in public secondary schools in Benue State?



Table 1: Mean ratings of respondents regarding the role of artificial intelligence in the formative and summative assessment of learning outcomes in public secondary schools in Benue State.

S/N	Items	ΣF	ΣFX	$\bar{X}$	Remark
1.	AI enables the automatic scoring of multiple-choice tests, short answers, and even essays, thereby reducing teachers' workload and ensuring consistent grading	450	1,170	2.60	HE
2.	It helps to analyze students' performance and provide individualized feedback to help learners understand their strengths and weaknesses	450	1,188	2.64	HE
3.	It adapts the difficulty level of questions in real-time based on students' responses, thus ensuring more accurate measurement of learning outcomes	450	1,157	2.57	HE
4.	It helps analyze data from students' interactions to predict academic success, identify at-risk learners, and suggest interventions	450	1,260	2.80	HE
5.	It aligns students' performance with curricular goals and competencies, allowing educators to assess whether learning outcomes are being achieved	450	1,211	2.69	HE
6.	It identifies consistent errors in students' work, helping educators target specific misconceptions	450	1,193	2.65	HE
7.	AI systems such as chatbots and intelligent tutoring systems assess learning in real time, offering immediate guidance and feedback	450	1,188	2.64	HE
8.	Unlike human evaluators, it can minimize grading bias if well-trained, ensuring fairness in assessments	450	1,206	2.68	HE
9.	It facilitates evidence-based planning by providing insights into student performance trends and assessment gaps	450	1,215	2.70	HE
10.	It allows for mass assessments with minimal resource input, making it suitable for large classes in Nigerian institutions	450	1,193	2.65	HE

Table 1 presents the findings on the role of AI in assessment of learning outcomes in secondary schools in Benue State. As can be seen from table 1, the mean rating for each item falls within the range 2.5 to 3.49, which are classified as high extent (HE). This implies that to a high extent, teachers and administrators affirmed that the role of AI in assessing learning outcomes in secondary schools in Benue State, include: automatic scoring of multiple-choice tests, analyzing of students' performance with individualized feedback, to help learners understand their strengths and weaknesses, adapts to the

difficulty level of questions in real-time based on students' responses, aligns students' performance with curricular goals and competencies, identifies consistent errors in students' work, minimize grading bias if well-trained, facilitates evidence-based planning by providing insights into student performance trends and assessment gaps, and mass assessments with minimal resource input, making it suitable for large classes in the State.



Research Question 2: What challenges affect the application of Artificial Intelligence for the assessment of learning outcomes in public secondary schools in Benue State?

Table 2: Mean ratings of respondents regarding the challenges that affect the application of artificial intelligence for the assessment of learning outcomes in public secondary schools in Benue State.

S/N	Items	ΣF	ΣFX	$\bar{X}$	Remark
11.	Most Nigerian educational institutions lack the necessary infrastructure such as stable electricity, internet connectivity, and advanced computing systems required to support AI	450	1,148	2.55	HE
12.	A significant proportion of Nigerian teachers lack the technical skills and training needed to utilize AI tools for assessment purposes	450	1,202	2.67	HE
13.	The financial burden of acquiring and maintaining AI systems, including hardware, software, and training, poses a major challenge for schools and government agencies	450	1,184	2.63	HE
14.	Most available AI tools are designed in foreign contexts and do not adequately reflect local curriculum, language, or cultural nuances in Nigeria	450	1,175	2.61	HE
15.	AI systems collect large amounts of student data, raising concerns about how such data is stored, shared, and protected, especially in the absence of strong legal frameworks	450	1,179	2.62	HE
16.	AI algorithms may inadvertently reproduce or amplify biases if not carefully designed, tested, and monitored for fairness in diverse Nigerian contexts	450	1,202	2.67	HE
17.	Educators, administrators, and even students may be reluctant to trust or adopt AI due to fear of job loss, unfamiliarity, or skepticism of technology	450	1,197	2.66	HE
18.	Nigeria currently lacks comprehensive policies to guide the ethical and effective integration of AI in education and assessment	450	1,220	2.71	HE
19.	Many schools lack access to trained technicians and support personnel to manage AI systems and troubleshoot problems when they arise	450	1,170	2.60	HE
20.	Most AI tools operate in English and may not effectively accommodate learners with disabilities or those who use indigenous languages, limiting their inclusivity	450	1,215	2.70	HE

Result on table 2 pointed out that individual items, ranging from 11 to 20 attracted a range of mean ratings (2.5 to 3.49), which is considered to be high extent (HE). This

implies that to a high extent, majority of the respondents (teachers and administrators) consider every item of the research instrument to be the extent to which



identified challenges do limit the application of AI for the assessment of learning outcomes in secondary schools in Benue State. This means that challenges encountered in the course of applying AI in the public secondary schools in Benue State include, but are not limited to: a significant proportion of Nigerian teachers lacking the technical skills and training needed to utilize AI tools for assessment purposes, and lack the necessary infrastructure such as stable electricity, internet connectivity, and advanced computing systems required to support AI.

Discussion of Findings

The study reported that AI technologies offer several benefits for enhancing assessment practices, including automatic scoring of multiple-choice tests, analyzing of students' performance with individualized feedback, to help learners understand their strengths and weaknesses, adapts to the difficulty level of questions in real-time based on students' responses, aligns students' performance with curricular goals and competencies, identifies consistent errors in students' work, minimize grading bias if well-trained, facilitates evidence-based planning by providing insights into student performance trends and assessment gaps, and mass assessments with minimal resource input, making it suitable for large classes in the State. These findings align with those of Holmes et al. (2019), who emphasized that AI can transform traditional assessment by offering immediate, scalable, and adaptive evaluations that cater to diverse learner needs. In Nigeria, the role of AI in assessment is increasingly recognized in pilot initiatives within higher education institutions. For example, AI-driven learning management systems (LMS) are being integrated to track student performance, generate predictive analytics, and suggest remedial content. This corroborates the work of Luckin et al. (2016), who noted that AI enables real-time monitoring of students' cognitive and behavioural patterns, thereby

supporting formative assessment and promoting data-driven instructional decision-making. Moreover, AI can help bridge the gap between curriculum intent and actual learning outcomes by providing insights into students' progression and competence levels, a point supported by (Ifenthaler & Yau, 2020).

The study also reported significant challenges impeding the widespread application of AI in assessment in Benue State, State include, but are not limited to: a significant proportion of Nigerian teachers lacking the technical skills and training needed to utilize AI tools for assessment purposes, and lack the necessary infrastructure such as stable electricity, internet connectivity, and advanced computing systems required to support AI, etc. This mirrors the findings of Afolabi et al. (2021), who highlighted infrastructural deficits and limited technical capacity of educators to design, manage, and interpret AI-driven assessments emerged as critical barriers in the integration of educational technologies in Sub-Saharan Africa. Similar concerns were raised by Makinde and Ogunlade (2020), who emphasized the urgent need for upskilling teachers and educational administrators in AI literacy. Furthermore, ethical concerns such as data privacy, algorithmic bias, and the accountability of AI decisions were identified as deterrents to AI deployment in assessments. These concerns echo the arguments of Williamson and Eynon (2020), who warned that the increasing reliance on AI in education must be matched with robust ethical frameworks to safeguard learners' rights and ensure transparency. In Nigeria, and Benue State in particular, the regulatory and policy environment is still evolving, leaving many institutions without clear guidelines for AI adoption in assessment, thereby exacerbating fears and hesitancy among stakeholders.



Conclusion

The study found that Artificial Intelligence (AI) plays an increasingly vital role in enhancing the assessment of learning outcomes in public secondary schools in Benue State. AI has improved both formative and summative assessments by providing real-time feedback, enabling personalized learning interventions, automating grading processes, and offering data-driven insights to teachers. These developments can significantly raise the quality and effectiveness of assessment practices, supporting improved educational outcomes. However, the study also revealed substantial challenges limiting the effective use of AI in assessment. Major barriers identified include poor infrastructural facilities, limited teacher digital skills, concerns about data privacy and fairness, and the high financial cost of adopting AI tools. These challenges indicate that without targeted interventions, the benefits of AI may not be fully realized in the public secondary school context, potentially widening existing educational inequalities. Thus, while AI holds transformative potential for assessment practices, its successful deployment requires a deliberate focus on both leveraging its strengths and addressing the systemic challenges that undermine its adoption.

Recommendations

In line with findings of the study, the following recommendations are put forward:

1. Benue State Ministry of Education should design and implement structured programs that promote the integration of AI technologies in school assessment processes. This could include training teachers on how to use AI tools for personalized feedback, formative assessments, and predictive analytics to better monitor student progress. Additionally, adopting adaptive testing platforms and AI-based grading systems will

not only streamline teachers' workload but also enhance the objectivity, reliability, and responsiveness of learning outcome assessments.

2. Given the major challenges identified, especially infrastructural deficits and teachers' low technological competencies that substantial investments be made in upgrading the technological infrastructure of public secondary schools. This should be complemented with continuous professional development programs focusing on building teachers' digital literacy and competence in using AI-driven assessment tools. Furthermore, the government should establish clear ethical guidelines and data protection policies to address concerns over AI bias and data privacy, ensuring that AI adoption supports equity and fairness in educational assessment.

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