

Application of Artificial Intelligence in Assessment of Academic Achievement of Students of Private Universities in the South East Zone of Nigeria



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ABSTRACT: Assessment is a crucial aspect of educational development. There are growing concerns among the academia that the traditional assessment is not holistic and may not reflect students' academic achievement. Artificial intelligence (AI) which can capture students' backgrounds and activities is being used in assessing their academic achievement in some universities across the globe. However, there are arguments that the use of artificial intelligence (AI) in assessing students' academic achievement may be novel to lecturers in Nigerian universities. The paper examined the application of AI in the assessment of student's academic achievement in the private university system in the Southeast Zone of Nigeria. Three research questions guided the study. A mixed methods research design was adopted for the study. The sample constituted 72 lecturers from eight (8) private universities in the southeastern states of Nigeria. Two instruments: Questionnaire on the Application of AI in Assessment (QAAIA) and Smartphone Audio Recorder (SAR) were used for data collection. The QAAIA was validated by experts and a Cronbach Alpha reliability coefficient of 0.79 was established. Quantitative data were analysed using descriptive statistics of mean and standard deviation while qualitative data were analysed thematically. It was found that the AI facilitates holistic assessment of students' academic achievement. The result also revealed that the level of awareness of lecturers on the application of AI in assessment is high. However, most lecturers do not apply AI in the assessment of their students. It is recommended among others, that universities in the South East zone of Nigeria should train a critical mass of staff on applications of AI in solving educational assessment issues.

KEYWORDS: Artificial intelligence, assessment, private universities,

INTRODUCTION

Assessment is a crucial aspect of educational development. There are insinuations among academia that the traditional assessment of a single examination is not holistic and may not reflect students' academic achievement. Artificial intelligence (AI) which can capture students' backgrounds and activities is being used in assessing their academic achievement in some universities across the globe. The Coronavirus disease (COVID-19) pandemic which reared its ugly head in 2019 prompted authorities of universities to adopt innovative assessment strategies to sustain delivery of educational programmes even outside the walls of lecture rooms. The innovative assessments became expedient during and after the pandemic to facilitate effective teaching and learning in universities. Generally, assessment is the process of gathering information, in numerical terms, to ascertain what students know, understand, and can do with their educational experiences (Anigbo, 2014; Ugwoke, 2021). It can be used to improve subsequent learning. Tests, such as multiple choice, essays and practicals are the most commonly used instruments for assessment by lecturers of Nigerian universities (Ugwoke, 2021).

Assessments of learning in Nigerian universities are mostly teacher-centred. The COVID-19 Pandemic is prompting a paradigm shift from traditional physical lecturing/assessment to virtual classroom lecturing/assessment. Universities in many countries have devised disruptive strategies in the delivery of assessment programmes. The introduction of Artificial Intelligence (AI) in educational activities has opened up new vistas for lecturers and students of higher education. The concept of AI is interpreted differently by authors. Pelletie et al. (2022) opined that AI is a software employed by computers to imitate facets of human intelligence. In other words, AI is a machine that displays attributes akin to human capabilities, such as the capacity to

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reason, learn, and address problems. In the study by Leslie et al. (2021), it was explained that AI systems consist of algorithmic models created to perform cognitive or perceptual tasks in the real world, tasks that were once solely the domain of human cognitive processes like thinking, evaluating, and reasoning. In addition, UNICEF (2021) explained that AI is a machine-driven system capable of making forecasts, offering suggestions, or arriving at choices that impact tangible or digital surroundings, based on predetermined human objectives. Artificial intelligence (AI) operates by autonomously acquiring the knowledge to perform tasks. These AI systems engage with us and exert their influence on our surroundings, whether through direct or indirect means. Therefore, AI functions independently and has the ability to adjust their actions by acquiring knowledge about the prevailing circumstances.

Numerous AI tools are in educational practices. Chatbots, chatGPT, virtual tutors, and educational gaming applications offer substantial benefits in fostering self-directed and tailored learning experiences (Zirawaga et al., 2017). AI chatbots and chatGPT are revolutionising the manner in which students gain knowledge. Specifically, Holmes et al. (2022) remarked that chatbots constitute AI systems strategically designed to autonomously interpret natural language and provide responses to inquiries. The chatbots provide instantaneous and personalised guidance to students, addressing their queries and steering them through the learning experiences. The Artificial Intelligent Index Report [AIIR] (2023) asserted that chatGPT is capable of generating text responses akin to human writing, addressing questions, prompts, and even crafting university-level essays. In the same vein, Javaid et al. (2023) remarked that chatGPT created by OpenAI can generate assessment content, automate processes like test and assignment grading, while also customizing and tailoring assessments based on individual student competencies and inclinations.

In technologically advanced countries, some universities are adopting digital assistants to evaluate student achievements thus, eliminating the need for human involvement. To this effect, UNESCO (2021) asserted that AI should be considered for integration in psychometrics but cautioned against relying solely on AI to predict students' future educational and career paths. AI-driven systems facilitate detection of fraudulent activities and cheating, creation of adaptable and tailored learning environments based on students' individual learning profiles, encompassing adaptive assessment methods (Holmes et al., 2022; Wang et al., 2014). AI simulates lecturers' knowledge and experience to provide personalised, teaching, learning, assessment and targeted feedback to students and has therefore, opened up new possibilities for both the lecturer and students (Gupta, 2023; Mallika, 2021; Pai et al., 2021; Chatterjee & Bhattacharya, 2020)..

In this era, there are large data on students' activities in and outside universities. The substantial volumes of intricate, often unstructured data (Big Data) on students' activities can be transformed into logical and actionable information (Isiugo-Abanihe & Ugwoke, 2018). The students' socioeconomic backgrounds, study routines, past examination performances, interests, utilization of digital tools, and more can be mined on, harnessed, refined and used to furnish accurate insights into educational endeavours encompassing both formative and summative assessments (Chen et al., 2020). Educational data mining (EDM) software, can be employed to assess students' academic accomplishments including academic backgrounds, grades, accomplishments, communication, behaviour, attitudes, interests, et cetera thus, refines this information into valuable insights for assessment objectives (Bouchet et al., 2013; Shahiri et al., 2015). Moreover, EDM contributes to enrollment management by extracting data from students' prior enrollment records and prior knowledge as well as data on students' examination syllabi, enabling a comprehensive assessment of students' overall performance (Aulck et al., 2020). AI streamlines assessment procedures, encompassing examination scheduling and grading as well as possesses the capability to deliver automated repetitive assessments, thus improving the reliability and quality of tests Gonzalez-Calatayud et al., 2021). AI also extends the benefits of accessible, equitable, and inclusive educational assessments by establishing conducive and uniform assessment environments through online or remote assessment methods (Gonzalez-Calatayud et al., 2021).

Some studies on AI-aided educational assessment have been reported in the literature. Hameed (2016) demonstrated the effectiveness of utilizing AI in assessment by employing it in the context of multiple-choice tests to enhance the fairness of the grading process. In the same vein, the impact of AI in grading students' achievement was reported by Gonzalez-Calatayud et al. (2021) who stated that AI is used in the automatic grading of students. The effectiveness of AI-aided assessment in tailor-made testing was established through the introduction of an adaptive testing system where questions were customized based on a student's responses to previous ones (Wang et al., 2014). In the realm of assessment feedback, Afzaal et al (2021) established that AI provides automated feedback derived from performance metrics. However, Saplacan et al. (2018) is of the opinion suggest that AI-aided feedback in assessment situations elicit negative emotions such as neglect, frustration, uncertainty and discomfort experienced by students in higher education. While comparing AI-aided assessment and non AI-aided assessment Samarakou et al. (2016) found that AI-aided assessment is better in completion type of a written test. Similarly, the study by Janpla and Piriyasurawong (2020) established that AI facilitates test production.

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Adopting AI in assessment of students' academic achievement requires development of implementation guidelines and frameworks for the lecturers and students. To this effect, Samarakou et al. (2014) provided a set of guidelines and recommendations regarding successful integration of AI-driven assessment methods in the assessment of students' academic achievement which for the lecturers, the guidelines emphasised various aspects, such as creating educational material, using the system interface, protecting data, and sharing educational content including texts, questions, and more, without any restrictions on the quantity or length of the content as well as selection of questions randomly or forcibly chosen from the pre-inserted question bank. On the other hand the students should be able to register into the AI-driven assessment system using their name, surname, and ID number; request additional assistance or feedback on specific questions or texts, promoting personalized learning experiences and view the results of the tests they have taken, allowing them to track their progress and identify areas for improvement (Samarakou et al., 2014). These guidelines highlighted the importance of flexibility, personalization, collaboration, and effective use of AI-driven systems in assessment.

The application of AI in assessment can be influenced by the perceptions of lecturers. Araujo, et al., (2020) in a study on the perceived usefulness of artificial intelligence to mankind reported that participants raised concerns about the risks, fairness and usefulness associated with the adoption of AI in solving societal and assessment issues. To this effect, Brauner, et al., (2023) remarked that widespread adoption of AI technology depends on the end-user's perception of AI usefulness Philipsen, et al., (2022) opined that some individuals would not want to use AI for any activity while others preferred AI to play subordinate roles as servant to them due to the belief that we are living in a dangerous world.

Policies supporting the application of AIs in various sectors seem to be more pronounced in the developed world than what is obtained in developing nations. Despite the increase in awareness of the benefits of AI to mankind in critical sectors including education, most countries in Africa may be lacking comprehensive policy frameworks to motivate the applications of AI to solve societal needs. The Artificial Intelligence Index Report [AIIR] (2023) indicated that AI Journal publication by region had South East Asia and Pacific (47%), Europe and Central Asia – (17%), and Sun-Saharan Africa (0.77%). On the number of authors of significant machine learning by country, the Report indicated that the USA had 285, the UK - 139, and China - 49 while Sub-Saharan Africa including Nigeria had zero (no single author). More worrisome is Omorogiuwa et al. (2023) assertion that most of the 79 private universities in Nigeria are not offering AI as a course at the undergraduate level. Out of 174 (43 federal, 52 State and 79 Private) universities in Nigeria, 13 private universities operate in South East States of Abia, Anambra, Ebonyi, Enugu and Imo (National Universities Commission [NUC], 2021). The Private universities are owned by non-governmental organisations (mostly religious organisations) and individuals. They are fully funded and managed by the respective organisations and individuals with little or no assistance from the government. However, approval and accreditation of programmes in private universities are conducted by the organ of government mandated by law (NUC's Act) to do so. The level of application of AI in the assessment of students' academic achievement by lecturers in the zone may be low and this may be an issue to the overall academic accomplishment of the students.

Statement of the Problem

Educational assessment is crucial in every aspect of pedagogical activities. It gives information necessary for decision-making. However, there are growing concerns among the academia that the traditional assessment in the form of an examination is not adequate to measure all the changes in the behaviour of students throughout schooling while AI-aided assessment may give holistic information on their academic achievement. Unfortunately, the level of awareness of lecturers at the universities on the application of AI in assessing students' academic performance is uncertain. In the same vein, all publications in conferences and journals known to the researchers lack studies focused on the use of AIs for the assessment of the student's academic achievement in the universities. This paper, therefore, studied the application of AI in the assessment of academic achievement of students in private universities in the South East Zone of Nigeria.

Objectives of the study

The main objective of the study was the application of artificial intelligence in the assessment of academic achievement of students in private universities in the South East Zone of Nigeria. Specifically, the study was to determine the:

1. level of awareness of lecturers on the application of AI in assessing students' academic achievement.
2. extent lecturers of the universities are applying AI in assessing students' academic achievement.
3. perception of lecturers on the application of AI in assessing students' academic achievements.

Research questions.

The following research questions guided the study:

1. To what extent are lecturers aware of the application of AI in assessing students' academic achievement?

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2. To what extent are lecturers applying AI in assessing students' academic achievement?
3. What are the perceptions of lecturers on the application of AI in assessing students' academic achievements?

METHODS

A mixed methods research design of qualitative and quantitative was adopted for the study. The mixed methods approach is considered appropriate as it combines qualitative findings and quantitative results thus leading to additional insights not gleaned from the qualitative or quantitative findings alone (Creswell, 2015). All lecturers from the Faculty of Education and lecturers from the Computer Science Department of 13 private universities in the South East zone of Nigeria formed the study population. The multistage sampling technique was used to select two private universities from Abia State, two from Anambra State, two from Enugu State, one from Imo State and one from Ebonyi State totalling eight (8) private universities. Also, 72 lecturers comprising 24 from the Faculty of Education and 48 from the Computer Science Department from the eight (8) private universities in Zone were selected as respondents/interviewees. Two instruments: Questionnaire on Application of Artificial intelligence in Assessment (QAAIA) and Smartphone Audio Recorder (SAR) were used for data collection. The QAAIA was used to collect quantitative data while the Smartphone Audio Recorder (SAR) was used to obtain qualitative data (oral interview). The questionnaire constituted of five sections: Sections A, B, C, D, and E. Section A contains the instructions while Section B consists of the bio-data of each respondent. The Sections C, and D, consist of structured items to be responded to using a four-point Likert scale of Very Great Extent (VGE) (4), Great Extent (GE) (3), Little Extent (LE) (2), Very Little Extent (VLE) (1) while Section E consists of structured items to be responded to using a four-point Likert scale of Strongly Agreed (SA) (4), Agreed (A) (3), Disagreed (D) (2), Strongly Disagreed (SD) (1). The Section C is on the extent of awareness of lecturers on the application of AI in assessing students' academic achievement while Section D is on the extent of application of AI in assessing students' academic achievement. The items on Section E are on perception of lecturers on application of AI in assessing students' academic achievements. The questionnaire was validated by experts and Cronbach Alpha reliability index of 0.79 was established. The copies of the questionnaire were administered to respondents and retrieved by the researchers. The oral interview was conducted through personal communication with the interviewees (who were also respondents to the questionnaire). Mean and standard deviation were used to analyse quantitative data while the qualitative data were analysed thematically. The decision rule of high or low was set using a bench mark of mean (μ) equal to or greater than 2.5 ($\mu \geq 2.5$) while qualitative data were analysed thematically.

RESULTS

Research question one

To what extent are lecturers of the universities aware of the application of AI in assessing students' academic achievement?

Table 1. Mean and standard deviation of responses on extent of awareness of AI's usage in assessment activities

S/N	Items	N	Mean	SD
1	Artificial Intelligence (AI) can be used for test construction to enhance assessment of students' academic achievement.	72	2.97	.804
2	Artificial Intelligence (AI) is helpful in test administration processes.	72	3.26	.839
3	Artificial Intelligence (AI) facilitates fair assessment of students' academic achievement.	72	2.96	1.067
4	Artificial Intelligence (AI) is efficient in grading of students' academic achievement.	72	2.74	1.021
5	Artificial Intelligence (AI) integrates students' background and activities into their overall academic achievement.	72	2.53	1.074

An item with mean value (μ) ($\mu \geq 2.5$) is considered high while ($\mu < 2.5$) is considered low.

Research question two

To what extent are lecturers of the universities applying AI in assessing students' academic achievement?

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Table 2: Mean and standard deviation of responses on the extent of application of AI in assessment activities

S/N	Items	N	Mean	SD
1	Administration of examinations.	72	1.43	.688
2	Grading of examination scores	72	1.38	.680
3	Monitoring of examinations (visual or physical).	72	1.28	.562
4	Formative and summative assessment	72	1.22	.587
5	Construction of examination questions	72	1.22	.481

Item with mean value (μ) ($\mu \geq 2.5$) is considered high while ($\mu < 2.5$) is considered low.

Research question three

What are the perceptions of lecturers on the application AI in assessing students' academic achievements?

Table 3: Mean and standard deviation of responses on the perceptions of lecturers on application of AI in assessment activities

S/N	Items	N	Mean	SD
1	Deploying artificial Intelligence in assessment has the potential to improve students' academic achievement.	72	3.08	.550
2	There are inherent challenges in applying artificial intelligence in assessing students' academic achievements.	72	3.15	.573
3	There is a paradigm shift from traditional assessment practices of a single examination to AI-aided holistic assessment.	72	3.21	.409
4	Assessment using AI promotes effective feedback on level of academic achievement to students, teachers and parents.	72	3.01	.517
5	Artificial intelligence facilitates individualised examinations for students.	72	3.17	.375

Item with mean value (μ) ($\mu \geq 2.5$) is considered high while ($\mu < 2.5$) is considered low.

DISCUSSION

Awareness of lecturers on the application of artificial intelligence is essential towards its adoption in the assessment activities. The study revealed that lectures are highly aware that AI has the potential of facilitating effective test construction, test administration, fair assessment, grading and integration of students' background into their overall academic achievement. The high level of awareness of lectures in the South East Zone on the application of AI in assessment practices is obvious as all the private universities used for this study offer AI as an undergraduate course for students in computer science and computer science education programmes. This result was corroborated with the remark of Javaid et al. (2023) that the creation of ChatGPT by OpenAI represents an important contribution to educational activities due to its capacity to generating assessment content including the automation of processes like test and assignment grading, while also customizing and tailoring assessments based on individual student competencies and inclinations. This result was supported by Samarakou et al. (2016), who discovered that artificial intelligence serves as a valuable tool for delivering individualised feedback and assessing performance which is in contrast to the report of AIIR (2023) who indicated that AI Journal publication by region had Sub-Saharan Africa having (0.77%) as well as not having a single author of significant machine learning from the entire Sub-Saharan Africa. The Journal publication on the use of AI in assessment practices by lecturers in Sub-Saharan Africa is very low.

The applications of AI in various sectors such as car driving, medicine and sports have been widely reported in literature. However, there is paucity of research studies on the application of AI in educational assessment activities. Table 2 indicated that few lecturers in private universities in the Zone apply AI in educational assessment activities such as examination administration, grading of scores, monitoring of virtual and physical examinations, formative and summative assessment as well as in construction of test items. This result aligns with the AIIR (2023) report regarding the number of notable machine learning authors between 2010 and 2021. The report showed that the USA had 285 authors, the UK had 139 authors, and China had 49 authors, while Sub-Saharan Africa, including private universities in the South East Zone, did not have any authors in this category. This may be the reason for the poor application of AI in assessment activities by lecturers of private universities in the Zone. In the same vein, one of the lecturers in Computer Science Department in one of the universities used for the study while responding to an oral interview remarked that:

she has read literatures on utilisation of AI in many sectors but has not applied the technology to assess her students' academic achievement because the AI-aided assessment has not been introduced in her university. She went further to state that even if the technology is introduced today in the university, it will require good time to get both the lecturers

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and students trained on the AI's application guidelines to make it an effective tool for the assessment of students' achievement (B. Chukwuebuka, personal communication, August 15, 2023).

Decision-making about students' achievement is increasingly becoming automated using artificial intelligence. On this note, the perception of lecturers on the application of AI in assessment activities may be essential. Table 3 revealed that lecturers perceived AI-aided assessment as an approach to (a) improve students' academic achievement, (b) a paradigm shift from traditional assessment of single examination to AI-aided holistic assessment, (c) promote effective feedback on students' accomplishments, and (d) facilitate personalised or tailor-made examinations. Corroborating this result, Janpla and Piriyasurawong (2020) and Mirchi et al. (2020) in their study found that AI facilitates test production while Samarakou et al. (2016) found that AI-aided assessment provides personalised feedback on students' holistic academic achievement. Furthermore, AI has the potential to integrate students' academic backgrounds, grades, accomplishments, communication, behaviour, attitudes, interests, et cetera into the overall academic achievement for better decision-making on the students (Bouchet et al., 2013). The result on table 3 revealed that AI was perceived by lecturers as having inherent challenges in assessing students' academic achievement. To this effect, one of the interviewees asserted: "I don't think it is proper and effective to apply AI in assessment of students' academic accomplishments without human involvement" (D. Nnaji, personal communication, August 15, 2023). In a similar vein, UNESCO (2021) gave a note of caution against relying solely on AI to predict students' educational accomplishments and advised that educational policymakers should explore the potential of AI-based progressive assessments with human assistance to provide continuous updates on students' accomplishments to benefit teachers, students, and parents. These concerns of using solely AI results are relevant due to fundamental social and human issues like behaviour, freedom and fairness.

CONCLUSION

The study investigated the application of artificial intelligence in the assessment of students' academic achievement in private universities in the South East Zone of Nigeria and concluded that the level of awareness on the application of AI in assessment by lecturers of the universities is high. The study also concluded that even though the lecturers have not adopted the technology in assessment of their students' academic achievements, they perceived the technology as a crucial tool that facilitates holistic assessment of students' achievement, effective feedback on students' achievements and personalised examinations.

RECOMMENDATIONS

This paper recommends that:

1. National University Commission, (NUC), the organ of government charged with the responsibility of setting Minimum Academic Standards for universities should increase advocacy and sensitization of lecturers in the Zone on applications of AI in assessment;
2. a new policy direction towards paradigm shift from traditional assessment of single examination to a more holistic AI-aided approach to facilitate correct, fair and equitable decision-making on students' achievements should be made;
3. through strategic policies, investments and collaborations AI can improve assessment activities to drive overall economic and social progress; and
4. Lecturers of private universities in the Zone should be encouraged to undertake AI training towards effective delivery of assessment practices.

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