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# Impact of Artificial Intelligence on Instructional Practices and Student Learning In Distance Learning Centres in Nigeria

Nnadi Ekwutosi Monica[1], Ukwuezeh Priscilla Chika[2]*, Chinyere Jacinta Oti[3], Eze Kenneth Oma[4], Ezeatu Chimezie Juliet[5] & Ezema Felicitas Chiechezonam[6]

1,2,3,4.Department of Art Education, University of Nigeria, Nsukka.
5,6.Department of Science Education, University of Nigeria, Nsukka.
*Corresponding Author Email: chika.ukwuezeh.@unn.edu.ng

## Abstract

This study examined the impact of artificial intelligence on instructional practices and student learning in distance learning centres in Nigeria. This study adopted a descriptive survey research design. Multi-stage sampling procedure comprising proportionate stratified random sampling technique, purposive sampling technique and simple random sampling technique were used in drawing the 250 respondents that participated in the study. Impact of Artificial Intelligence on Teaching and Learning of Biology in Distance Learning Centres Questionnaire was used as the instrument for data collection. The data obtained were analyzed using mean and standard deviation to answer the research questions, while T-test was used to test the null hypotheses at 0.05 level of significance. The findings of the study reveals that many AI technologies are currently being integrated into distance learning centers in Nigeria. The findings also revealed that there is a high impact of AI integration in instructional delivery in distance learning centers. Students in distance learning centres should utilize more AI tools that are currently being integrated to improve their engagement, understanding and learning outcome.

**Keywords:** *Artificial Intelligence, Distance Learning, Teaching and Learning.*

## INTRODUCTION

In recent years, the merging of artificial intelligence (AI) and education has materialized into a transformative force that is reforming traditional teaching methods and modernizing education in general. The global shift towards online education, which was accelerated by the COVID-19 pandemic, had highlighted the importance of distance learning centers around the world (Almasri, 2022). However, adapting distance learning, with its often complicated concepts, extensive terminologies, and experimental nature, poses unique challenges. AI, through adaptive learning platforms and intelligent tutoring systems, may possess the potential to address some of these challenges (Bozkurt, et al., 2021). The adoption of AI in distance learning centers in Nigeria is still underdeveloped, despite investment of immense resources in education for its growing population(Ugwuoti et al., 2023).

Education is an indispensable tool for the socio-economic development of a nation and individual. Education generally refers to the process of bringing desirable change into the behavior of human beings. Adeniyi (2019) defined education as the process of imparting or acquiring knowledge or habits through instruction or study. According to Ugwuadu (2016), governments around the world give education a priority in the provision of social services to the people because it plays the role of preparing young men and women for the task of national development socially, politically and economically. However, Tafi (2016) noted that for developing nations to attain and sustain its national development, a well-planned and

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implemented science and technological education curriculum is an essential tool. Therefore, science receives much emphasis in education because of its significance and relevance to life and society.

Distance learning is generally referred to as the education of students who may not always be physically present at school. Saykılı (2018), defined distance learning as a form of education which brings together the physically-distant learner(s) and the facilitator(s) of the learning activity around planned and structured learning experiences via various two or multi-way mediated media channels that allow interactions between/among learners, facilitators as well as between learners and educational resources. Patricia and Joan (2024) also defined distance learning as education that uses computer technologies and learning platforms to provide education to students virtually and support regular interaction without bias between students and teachers, synchronously or asynchronously. According to Khedrane (2024), distance learning was limited to a number of countries because its requirements are often expensive and require great preparation, infrastructure, and awareness of how to deal with distance education technologies. However, during the Covid-19 pandemic, it turned into a necessity as a preventive solution to stop the spread of the epidemic, and since that time, it has become a system approved by all countries alongside traditional face-to-face education (Khedrane, 2024). Gulnora et al. (2022) noted that distance learning includes features that improve the educational process as it ensures the possibility of a large number of students to benefit from educational opportunities regardless of geographical and financial restrictions. However, recent advances in Information and Communication Technologies (ICTs), particularly Artificial Intelligence (AI), are revolutionizing distance education.

Artificial Intelligence (AI) is often defined as a computer system with the ability to perform tasks commonly associated with intelligent beings. AI is a broad field encompassing various technologies that have been developed over the past 50 years to enable machines to perform tasks traditionally requiring human intelligence, such as perceiving, reasoning, learning, and interacting (Ergen, 2019). The world today has become known as the age of technology, in which machines and artificial intelligence technologies have become a partner and driver of all dimensions of life, including education. The applications of AI in education are rapidly evolving, reshaping the overall teaching and learning landscape (Popenici & Kerr, 2017). AI algorithms and educational robots are now integral to learning management and training systems, providing automation and support for a wide array of teaching and learning activities (Costa et al., 2017). As a result, learners, teachers, and educational institutions are quickly embracing AI in education. Recent statistics indicate that 43% of college students in the US use AI tools like ChatGPT and half of instructors employ AI to develop their lessons (Businessolution.org, 2023). Thus, Chiu et al. (2023) notes that research on AI in education has surged in recent years, yielding a substantial body of work exploring various aspects of these applications, including design, effectiveness, and outcomes.

Artificial intelligence (AI) has numerous benefits in education, profoundly affecting teaching and learning of Biology. This was highlighted by Ugwuoti, et al. (2023) who noted that AI helps students gain a deeper understanding of Biology concepts by providing interactive visualizations, simulations, and other multimedia content, which can improve their academic achievement. In addition, Onaolapo (2023) stated that AI gives Biology teachers flexibility, and reduce the burden of attending classrooms, marking papers and other tasks, which improves their overall teaching experience and quality.

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The integration of Artificial Intelligence (AI) in educational settings has the potential to transform teaching and learning processes, particularly in the context of distance learning. However, while the rapid advancement of Artificial Intelligence (AI) presents significant opportunities in the educational settings, particularly in distance learning environments, it also presents new and broadening set of challenges related to technology access, familiarity, and pedagogical adaptation. In Nsukka LGA, Nigeria, where access to traditional educational resources may be limited, the role of AI in enhancing the quality of education is of paramount importance, as it holds the potential to improve educational accessibility for distance learners. This is particularly important in the teaching and learning of Biology, which holds significant importance in human survival, and national development. However, there is a lack of empirical evidence regarding the extent to which AI tools are effectively utilized, as well as the impact on instructional practices and student learning outcomes from distance learning centers within Nsukka LGA. This study thus seeks to identify the specific impacts of AI in teaching and learning on students learning outcome in distance learning centers in Nsukka LGA. The study also seeks to identify the obstacles faced by stakeholders in utilizing these innovative technologies, with the aim of providing actionable recommendations for educators, policymakers, and technology developers, which would ultimately result in enhancing the quality of education in Nsukka LGA. The purpose of this study is to explore the impact of Artificial Intelligence (AI) on teaching and learning in distance learning centres in Nsukka Local Government Area, Nigeria. The following research questions were raised;

1. What are the AI technologies currently being integrated into distance learning centers?
2. What is the impact of AI integration on teachers' lesson preparation in distance learning centers?
3. What is the impact of AI integration on teachers' instructional delivery in distance learning centers?
4. What are the challenges faced by both teachers and students in implementing AI technologies in distance learning centers?
5. What are the possible solutions to the challenges of integrating AI in the teaching and learning of Biology in distance learning centers?

## METHODS

### Design of the study

The descriptive survey research design was adopted for this study. Survey research design is characterized by population and sample size as well as the use of data collection instrument. Mike (2016) stated that descriptive research is used to systematically describe the facts, qualities or characteristics of a given population, event, area or subject of interest accurately to answer questions posed by a problem under investigation. Ali (2016) also defined a descriptive survey design as method which uses a sample of a study to document, describe and explain what is in existence or non-existence on the present status of phenomena being investigated. Ali further stated that in descriptive survey study, views and facts are collected through questionnaire and/or interviews which are scheduled to produce answers to research questions. The justification of using this method for this research is based on the fact that it takes into consideration aspects like the sample size in relation to the target population, and the variables under the study, which is then analyzed to provide answers to the research questions of this study.

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## Participants

The sample size of 250 respondents were selected from the total number of undergraduates in the University of Nigeria, Nsukka. A multi-stage sampling procedure was used in this study. The first stage involved proportionate stratified random sampling technique which was used to effectively capture the data while ensuring equal representatives across each of the distance learning centers. This technique divides the population into distinct subgroups, or strata, where each stratum is represented proportionally in the sample size to maintain accuracy and representation across the institutions. In applying this sampling technique, the total population is first grouped according to their respective institutions, which gives us three strata, one for each distance learning center. Next, the sample size for each distance learning centre is calculated to be proportional to their population. Thus, the distribution of sample size is as follows: UNN CDeL, with 202, NOUN, with 38 and NTI, with 10. The second stage involved purposive sampling technique, where the distribution of sample size for distance learning centre is divided by 2, to capture equal the representation of male and female gender. This is because gender is a variable in the study. The third stage involved simple random sampling technique where both students and teachers in each of the distance learning centers were randomly selected based on availability.

## Instrument

The instrument for data collection was a self-developed questionnaire by the researchers titled, 'Impact of Artificial Intelligence in Teaching and Learning in Distance Learning Centers Questionnaire' (IAITLDLCQ). The items in the questionnaire are grouped into 2 sections (A and B). Section A sought demographic information of the respondents, while Sections B, made up of 9 clusters, is designed to seek information from the respondents based on the research questions of the study. Cluster 1 comprises 10 items, with options consisting of Strongly Agree, Agree, Disagree, and Strongly Disagree. Cluster 2 comprises 10 items, with options consisting of Very High Impact, High Impact, Low Impact, and Very Low Impact. Cluster 3 comprises 9 items, with options consisting of Very High Impact, High Impact, Low Impact, and Very Low Impact. Cluster 4 comprises 10 items, with options consisting of Very High Impact, High Impact, Low Impact, and Very Low Impact. Cluster 5 comprises 9 items, with options consisting of Very High Impact, High Impact, Low Impact, and Very Low Impact. Cluster 6 comprises 10 items, with options consisting of Very High Impact, High Impact, Low Impact, and Very Low Impact. Cluster 7 comprises 7 items, with options consisting of Very High Impact, High Impact, Low Impact, and Very Low Impact. Cluster 8 comprises 10 items, with options consisting of Strongly Agree, Agree, Disagree, and Strongly Disagree. Cluster 9 comprises 10 items, with options consisting of Strongly Agree, Agree, Disagree, and Strongly Disagree.

## Validity Procedures

The instrument is validated by three experts. To establish face-validity for the items, the experts were requested to validate the instrument in terms of clarity of items, simplicity of vocabulary and relevance of items to the study, and their comments and corrections were used to improve on the instrument. The Instrument was trial tested using 20 students from the University of Nigeria, Nsukka that did not participate in the main research. The results gotten from their responses was used to determine the reliability of the instrument using the Cronbach's Alpha statistics, which yielded an overall reliability score of 0.79, and was considered high enough for the study.

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### Data Collection

The researchers obtained a letter of identification from the Head, Department of Science Education, which was presented to the school administration of the three distance learning centers in Nsukka L.G.A, in order to enable them to carry out the. The questionnaire was distributed by the researchers, which made it easy for the clarification of ambiguities in the questionnaire and as well for the prompt collection of completed questionnaires. This was done in order to ensure a high return rate.

### Data Analysis

The response provided by the respondents were analyzed using frequency counts, mean and standard deviation. Where 1.00 – 1.49 = VLE/SD, 1.50 – 2.49 = LE/D, 2.50 – 3.49 = HE/A, and 3.50 – 4.00 = VHE/SA. The mean of 4, 3, 2 and 1 is 2.50, hence in the analysis, the mean of 2.50 is used as cut-off point or criterion level. Any item with mean of 2.50 and above is accepted while any mean below 2.50 is rejected. The hypotheses were analyzed using t-test analysis. All computations were carried out using Statistical Package for Social Sciences (SPSS v. 20.4).

## RESULTS

Table 1 shows the mean and standard deviation ratings on the AI technologies currently integrated into distance learning centers. The mean rating ranged from 2.07 to 3.67 with standard deviation that ranged from 0.43 to 0.78. All the items except item 6, item 9 and item 10 had mean ratings above the cut of point value of 2.50. The cluster mean of 3.44 and standard deviation of 0.52 indicates that most of the AI technologies listed are currently being integrated into distance learning centers.

Table 1: Mean and Standard Deviation ratings on the AI technologies currently being integrated into distance learning centers

| S/N | AI Technology | N = 250 $\bar{X}$ | SD | Decision |
|---|---|---|---|---|
| 1 | Adaptive learning platform | 3.67 | 0.55 | Agree |
| 2 | Intelligent tutoring systems | 3.63 | 0.78 | Agree |
| 3 | Virtual labs and simulations | 2.60 | 0.77 | Agree |
| 4 | AI driven content creation tools | 3.54 | 0.53 | Agree |
| 5 | Natural language processing tools (Chat GPT, etc.) | 3.61 | 0.53 | Agree |
| 6 | Canva Magic write | 2.20 | 0.61 | Disagree |
| 7 | Eduaide AI | 3.60 | 0.50 | Agree |
| 8 | Plerplexity AI | 3.53 | 0.73 | Agree |
| 9 | AudioPen | 2.07 | 0.43 | Disagree |
| 10 | Quizizz | 2.43 | 0.52 | Disagree |
| 11 | Slidego | 3.64 | 0.92 | Agree |
| | Cluster Mean and Std. Dev. | 3.44 | 0.52 | Agree |

***$\bar{X}$ = Mean, SD = Standard Deviation, N =Number of Students $\bar{x} < 2.5$ = Disagree, $\bar{x} \geq 2.5$ = Agree***

Table 2 shows the mean and standard deviation ratings on the impact of AI integration on teachers' lesson preparation in distance learning centers. The mean rating ranged from 2.53 to 3.37 with standard deviation that ranged from 0.41 to 1.25. All the items had mean ratings above the cut of point value of 2.50. The cluster mean of 3.17 and standard deviation of 0.84 indicates a high extent of the impact of AI integration on teachers' lesson preparation in distance learning centers.

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**Table 2: Mean and Standard Deviation ratings on the impact of AI integration on teachers' lesson preparation in distance learning centers**

| S/N | Item Statement | N = 250 $\bar{X}$ | SD | Decision |
|---|---|---|---|---|
| **1** | AI tools simplify any process of generating lesson plans | 2.77 | 1.10 | High Extent |
| **2** | AI-driven platforms improve the accuracy and relevance of lesson content tailored to curriculum | 3.07 | 0.98 | High Extent |
| **3** | AI reduces the time required for lesson preparation by automating repetitive tasks | 3.00 | 1.05 | High Extent |
| **4** | AI technologies provide access to a wide range of up-to-date teaching resources for my lesson plan | 3.37 | 0.89 | High Extent |
| **5** | AI systems assist in creating personalized learning materials for diverse students' needs | 3.13 | 0.94 | High Extent |
| **6** | AI integration enhances teachers' ability to design interactive and engaging lesson activities | 3.27 | 1.25 | High Extent |
| **7** | AI tools reduce stress associated with lesson preparation by offering user-friendly interface | 2.53 | 0.51 | High Extent |
| **8** | AI technologies enable teachers to align lesson objectives with learning outcomes more effectively | 3.20 | 0.41 | High Extent |
| **9** | AI supports collaborative lesson planning by enabling resource sharing among teachers | 3.33 | 0.94 | High Extent |
| **10** | AI helps teachers to adjust lesson plans by providing insights about students' performance | 2.94 | 0.86 | High Extent |
| | Cluster Mean and Standard deviation | 3.17 | 0.84 | High Extent |

***$\bar{X}$= Mean, SD= Standard Deviation, N=Number of Students`, $\bar{x} < 2.5$ = Low Extent, $\bar{x} \geq 2.5$ = High Extent***

Table 3 shows the mean and standard deviation ratings on the impact of AI integration on teachers' instructional delivery in distance learning centres. The mean rating ranged from 3.20 to 3.63 with standard deviation that ranged from 0.61 to 0.90. All the items had mean ratings above the cut of point value of 2.50. The cluster mean of 3.38 and standard deviation of 0.73 indicates a high extent of the impact of AI integration on teachers' instructional delivery in distance learning centres.

**Table 3: Mean and Standard Deviation ratings on the impact of AI integration on teachers' instructional delivery in distance learning centres**

| S/N | Item Statement | N = 250 $\bar{X}$ | SD | Decision |
|---|---|---|---|---|
| **1** | AI tools enhance teachers' ability to deliver personalized instruction to students | 3.20 | 0.61 | High Extent |
| **2** | AI improves the clarity and quality of instructional materials used during teaching | 3.63 | 0.81 | High Extent |
| **3** | AI technologies help in identifying and addressing individual students' learning challenges during lesson delivery | 3.23 | 0.90 | High Extent |
| **4** | AI-powered simulations and visual aids make teaching complex concepts more interactive and engaging. | 3.60 | 0.67 | High Extent |
| **5** | AI integration enhances teachers' ability to manage classroom activities efficiently | 3.43 | 0.68 | High Extent |
| **6** | AI technologies assist in adapting teaching strategies to diverse learning needs within the classroom | 3.30 | 0.75 | High Extent |
| **7** | AI reduces the workload associated with routine instructional tasks, allowing more focus on student interaction | 3.40 | 0.50 | High Extent |
| **8** | AI-powered tools facilitate collaborative learning environments between teachers and students. | 3.22 | 0.76 | High Extent |

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| | | | | |
|---|---|---|---|---|
| **9** | AI helps teachers align instructional practices with institutional goals and curriculum standards | 3.40 | 0.70 | High Extent |
| | Cluster Mean and Standard deviation | 3.38 | 0.73 | High Extent |
| ***X̄= Mean, SD= Standard Deviation, N=Number of Students`, x̄ < 2.5 = Low Extent, x̄ ≥ 2.5 = High Extent*** | | | | |

Table 4 shows the mean and standard deviation ratings on the challenges faced by both teachers and students in implementing AI technologies in distance learning centers. The mean rating ranged from 2.58 to 3.15 with standard deviation that ranged from 0.53 to 1.25. All the items had mean ratings above the cut of point value of 2.50. The cluster mean of 3.15 and standard deviation of 0.90 indicates that all the item statements are challenges faced by both teachers and students in implementing AI technologies in distance learning centers.

**Table 4: Mean and Standard Deviation ratings on the challenges faced by both teachers and students in implementing AI technologies in distance learning centers**

| S/N | Item Statement | N = 250 X̄ | SD | Decision |
|---|---|---|---|---|
| **1** | Lack of access to AI tools | 3.14 | 1.25 | Agree |
| **2** | Limited technical knowledge | 2.72 | 0.53 | Agree |
| **3** | Disapproval from students or colleagues | 3.22 | 0.92 | Agree |
| **4** | Difficulty in integrating AI with existing curricula | 2.68 | 0.89 | Agree |
| **5** | High costs associated with AI tools | 2.58 | 0.73 | Agree |
| **6** | Privacy / data security concerns | 3.01 | 0.62 | Agree |
| **7** | Technical issues, such as software bugs or system downtime, disrupt the use of AI in learning | 2.91 | 1.14 | Agree |
| **8** | Insufficient institutional support for the adoption and maintenance of AI systems in schools | 2.73 | 1.12 | Agree |
| **9** | Limited access to reliable internet connectivity hinders the effective use of AI in education | 2.68 | 1.09 | Agree |
| **10** | AI systems sometimes provide inaccurate or irrelevant information, reducing their reliability | 3.12 | 0.51 | Agree |
| | Cluster Mean and Standard deviation | 3.15 | 0.90 | Agree |
| ***X̄= Mean, SD= Standard Deviation, N=Number of Students`, x̄ < 2.5 = Low Extent, x̄ ≥ 2.5 = High Extent*** | | | | |

Table 5 shows the mean and standard deviation ratings on the possible solutions to the challenges of integrating AI in the teaching and learning in distance learning centers. The mean rating ranged from 2.68 to 3.41 with standard deviation that ranged from 0.53 to 1.09. All the items had mean ratings above the cut of point value of 2.50. The cluster mean of 2.93 and standard deviation of 0.80 indicates that all the item statements are the possible solutions to the challenges of integrating AI in the teaching and learning in distance learning centers.

**Table 5: Mean and Standard Deviation ratings on the possible solutions to the challenges of integrating AI in the teaching and learning in distance learning centers**

| S/N | Item Statement | N = 250 X̄ | SD | Decision |
|---|---|---|---|---|
| **1** | Providing funding and subsidies for AI tools can promote their adoption in education. | 2.68 | 0.75 | Agree |
| **2** | Increased teacher training on AI technology. | 3.12 | 0.53 | Agree |
| **3** | Developing AI platforms that align with the curriculum to enhance their usefulness. | 3.41 | 0.72 | Agree |
| **4** | Development of more user-friendly AI tools. | 2.68 | 1.09 | Agree |
| **5** | Provision of good policy for implementing the use of AI in teaching and learning. | 2.73 | 0.69 | Agree |

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| | | | | |
|---|---|---|---|---|
| **6** | Improving internet infrastructure in schools to facilitate seamless use of AI technologies. | 3.23 | 0.81 | Agree |
| **7** | Implementing robust privacy and data security measures can address concerns about data safety. | 2.84 | 0.74 | Agree |
| **8** | Offering incentives for schools that adopt and effectively use AI technologies can drive adoption. | 3.13 | 0.92 | Agree |
| **9** | Providing offline AI solutions for areas with limited internet access can expand reach. | 2.81 | 0.79 | Agree |
| **10** | Establishing partnerships with technology companies to provide schools with advanced AI tools. | 2.77 | 1.02 | Agree |
| | Cluster Mean and Standard deviation | 2.93 | 0.80 | Agree |
| ***X̄= Mean, SD= Standard Deviation, N=Number of Students`, x̄ < 2.5 = Low Extent, x̄ ≥ 2.5 = High Extent*** | | | | |

Table 6 shows that the mean responses of teachers for challenges faced in implementing AI technologies in distance learning centres is 3.16, with a standard deviation of 0.86, while the mean responses of students is 3.14, with a standard deviation of 1.12. The table shows the p-value to be 0.22, which is significantly higher than the level of significance of 0.05. This shows that there is no statistically significant difference in the challenges faced by both teachers and students in implementing AI technologies in distance learning centres, and thus, hypothesis $Ho_1$ which states that 'there is no significant difference between the challenges faced by both teachers and students in implementing AI technologies in distance learning centres', is accepted.

**Table 6: T-test for significant difference between the challenges faced by both teachers and students in implementing AI technologies in distance learning centres**

| Grouping Variable (Role) | N | Mean | SD | t | df | Sig. |
|---|---|---|---|---|---|---|
| Teacher | 17 | 3.16 | 0.86 | 0.34 | 2 | 0.22 |
| Student | 233 | 3.14 | 1.12 | | | |

## DISCUSSION

This study has revealed that most of the AI technologies are currently being integrated into distance learning centers in Nsukka LGA. This is shown in Table 1, which displayed the mean and standard deviation ratings on the AI technologies currently being integrated into distance learning centers. With a cluster mean of 3.44 and standard deviation of 0.52, the table indicates that most of the AI technologies listed are currently being integrated into Biology education in distance learning centers. The AI technologies not integrated are Canva Magic Write, AudioPen, and Quizizz. This finding agrees with Adebayo (2020) who explored the integration of AI into educational systems to improve learning outcomes, and revealed that many AI tools are being integrated in educational institutions in Nigeria. This is supported by the findings of another study conducted by Nwafor and Adeyemi (2023) who revealed that there is a gradual integration of AI tools in education in Nigeria, which is still in its developmental stages with growing initiatives to increase digital literacy and investments in education technologies, especially in higher institutions and private education sectors.

This study has revealed that there is a high impact of AI integration on teachers' lesson preparation in distance learning centers in Nsukka LGA. This This is shown in Table 2, which displayed the mean and standard deviation ratings on the impact of AI integration on teachers' lesson preparation in distance learning centers, and shows a cluster mean of 3.44 and standard deviation of 0.52. This finding also corroborates the finding of Nwafor and Adeyemi (2023)

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who noted that AI integration in distance learning centers in distance learning centers helps the teachers reduce their workload in lesson planning and students' assessment.

This study has revealed that there is a high impact of AI integration on Biology teachers' instructional delivery in distance learning centers in Nsukka LGA. This is revealed in Table 3 which showed the cluster mean and standard deviation ratings on the impact of AI integration on teachers' instructional delivery as 3.38 and 0.73 respectively. This finding agrees with Onaolapo (2023) who revealed that AI in distance learning centers gives teachers flexibility in instructional delivery, and reduce their burden of attending classrooms and other tasks, which improves their overall teaching experience and quality.

This study has revealed that all the item statements, which includes among others, lack of access to AI tools, limited access to reliable internet connectivity, and technical issues such as software bugs or system downtime which can disrupt the use of AI in learning, are the challenges faced by both teachers and students in implementing AI technologies in distance learning centers. This is shown in Table 8 which revealed the cluster mean and standard deviation ratings as 3.15 and 0.90 respectively. In addition, the study revealed that there is no significant difference between the challenges faced by both teachers and students in implementing AI technologies in distance learning centres, as indicated by the p-value to be 0.22, which is significantly higher than the level of significance of 0.05. This finding agrees with Ajayi (2023) who noted that AI-driven systems rely on stable internet connections, advanced hardware, and uninterrupted electricity, all of which are inconsistently available in many parts of Nigeria. The finding also agrees with Okafor and Abubakar (2023) revealed that many households and educational institutions in Nigeria cannot afford high-speed internet and digital devices, such as laptops or tablets, required for the use of AI tools in distance learning.

This study has revealed that all the item statements which includes among others, improving internet infrastructure in schools to facilitate seamless use of AI technologies, increased teacher training on AI technology, and providing funding and subsidies for AI tools to promote their adoption in education, are the solutions to challenges of integrating AI technologies in Biology education in distance learning centers. This is shown in Table 9 which revealed the cluster mean and standard deviation ratings as 2.93 and 0.80 respectively. This finding agrees with Obi and Suleiman (2023) who noted that government incentives, like tax breaks for companies supporting educational AI projects can offer cost-effective AI solutions tailored for the Nigerian educational context. The finding also agrees with Nwafor and Olatunji (2023) who revealed that collaboration between telecom companies and government bodies to deliver reliable and affordable internet connectivity to schools, especially in remote areas, would make it easier for integration to access AI-powered educational tools for distance learning.

## CONCLUSION

AI technologies are currently being integrated into distance learning centers in the LGA, and they have a high impact on Biology teachers' lesson preparation, and instructional delivery. However, its integration by teachers and students faces some challenges. For students, this study has revealed that AI technologies make learning in distance learning centres more engaging, as well as improves their understanding and learning outcome. This implies that students who want to improve their understanding and learning outcome can utilize AI tools that are currently being integrated in Biology education. This study has revealed that AI technologies aids Biology teachers' lesson preparation, instructional delivery, and lesson

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assessment. This implies that teachers who intends to reduce their workloads in lesson preparation, instructional delivery, and lesson assessment can utilize AI tools that are currently being integrated in Biology education in distance learning centers. This study has also revealed that AI technologies have significant positive impact on both teachers and students in Biology education in distance learning centers. This implies that AI developers interested in improving education should create more effective, user-friendly AI educational tools that align with distance learning practices, current educational standards and pedagogical frameworks, and learning objectives.

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