

**Accessibility and Utilization of AI Tools for effective learning of Agricultural Science in  
Secondary Schools in Nsukka Local Government Area of Enugu State, Nigeria**

**BY**

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***Abstract***

*This study investigated the accessibility and utilization of AI tools for effective learning of Agricultural Science in secondary schools in Nsukka LGA of Enugu State Nigeria. The study adopted a descriptive survey research design. Two specific objectives, research questions and hypotheses was raised to guide the study. The study was conducted in Nsukka Local Government Area in Enugu State, Nigeria. The study sampled 86 teachers (24 male and 54 female) and made use of census sampling technique. The instrument for data collection was a 14-item structured questionnaire titled: "Accessibility and Utilization of AI tools for effective learning of Agriculture Science Questionnaire (AUAIASQ)". The questionnaire consisted of two sections: section A and B. section A elicited information on the demography of the respondents while section B was sub-divided into two clusters. The first cluster contained 7 item statements which sought information on the level of accessibility of AI tools for effective teaching of Agricultural Science; and the second cluster contained 7 item statements that elicited information on the level of utilization of AI tools for effective teaching of Agricultural Science. The questionnaire was structured on 4-point Likert Scale of Very High Level (4), High Level (3), Low Level(2) and Very Low Level (1), for positive item statements and their respective reverse scores for negative item statements. The real limit of numbers of 0.00-1.49 (Very low level, VLL), 1.50-2.49 (Low level, LL), 2.50-3.49 (High level HL) and 3.50 to 4.00 (Very High level, VHL). The instrument was subjected to face validation by three experts, trial-tested and its coefficient for internal consistency of 0.85 was established using Cronbach Alpha statistic. The questionnaire was distributed to and retrieved from the respondents through the help of three research assistants. Data collected were analyzed using mean and standard deviation while the hypotheses were tested using t-test at 0.05 level of significance. Findings showed that accessibility of AI tools for effective learning of Agricultural Science in secondary schools in Nsukka LGA is low. The findings further revealed that AI tools are rarely utilized for effective learning of Agricultural Science in Nsukka LGA. Based on the outcome, the study recommended that school Administrators should prioritize partnerships with organizations that can provide access to AI resources, such as universities or tech companies, to enhance the availability of these resources to teachers and students.*

***Keywords:*** Accessibility, Utilization, AI Tools and effective instruction

## **Introduction**

Artificial Intelligence (AI) is a broad term that refers to the development and use of computer systems that can perform tasks that normally require Human Intelligence, such as learning, problem-solving, and decision-making. According to Perkowitz (2017), Artificial Intelligence (AI) is an umbrella term for the methods and approaches used to create intelligent systems that can reason, learn, and act autonomously. Gartner (2019) refer it as a family of technologies that can be employed to make machines mimic human behavior and cognitive functions, allowing for the automation of knowledge- and task-based activities, as well as the development of interactive systems that have the ability to perceive, learn, reason, and solve problems. In view of Russell and Norvig (2016), Artificial Intelligence (AI) is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand Human Intelligence, but AI does not have to confine itself to methods that are biologically observable.

AI systems are often designed to mimic human intelligence, learning from data, recognizing patterns, and making predictions or decisions based on that data. However, there are several types of AI, including: Machine learning, Natural language processing, Robotics and automation among others.

The use of AI is becoming increasingly prevalent in various fields, including healthcare, finance, transportation, and education. While there are concerns about the potential impact of AI on society and the workplace, many experts believe that responsible and ethical use of AI can have significant benefits, such as increasing efficiency, improving decision-making, and enabling new and innovative applications.

The accessibility of AI tools is a critical issue in schools. Although there may be some efforts to provide some of the tools to the reach of students, access to these tools is still limited in many areas (Mukherjee & Mukherjee, 2023). That is why Makinde (2013) noted that the inadequacy of e-resources for educational purposes is a major problem that has continued to militate against teaching and learning in Nigeria. Also, Adeyemi, and Omotosho (2020) revealed that high cost of equipment, high cost of reagents and inadequate infrastructure are the major factors responsible for inadequate facilities in Nigeria education system. However, much work remains to be done to ensure that all students and teachers make maximum use of these tools.

The utilization of AI tools schools is a growing trend, but it is still facing some challenges. In view of this, Akinyemi and Ochoga (2020) revealed that the utilization of innovative tools in academic libraries in some schools is gradually growing and most of the libraries have taken steps to improve the use of these resources by their students and researchers. In Agricultural science, the integration of Artificial Intelligence (AI) in education has the potential to revolutionize the teaching and learning process, particularly in the teaching of subjects like Agriculture Science.

Agricultural Science as a subject in secondary schools is a field of study that provides students with an understanding of the principles and practices of agriculture. According Adigun (2024), it is the study of the practices and technologies that support and enhance food production, animal husbandry, and other forms of agricultural activities. Agricultural Science is a comprehensive study of agriculture, including the application of scientific principles and practical skills to the production, processing, and marketing of food, fiber, and other agricultural products (Alabi & Fakoya, 2024). In view of Ola (2024), Agricultural Science involves the systematic study of plants, animals, and soil, including their relationships with each other and with their environment, and the application of scientific principles to the management of agricultural enterprises.

The curriculum of Agricultural Science typically covers a wide range of topics, including Plant Science, Animal Science, Soil Science, Agricultural Economics, and Agricultural Technologies. The primary goal is to equip students with the knowledge and skills needed to become productive farmers, agribusiness professionals, or agricultural researchers. In secondary schools, Agricultural Science is usually taught through a combination of classroom instruction and practical activities, such as field trips, laboratory experiments, and livestock management. Nevertheless, Artificial Intelligence can play a significant role in the teaching of Agriculture Science in secondary schools in several ways such as Data analysis and prediction, Drones and robotics, Virtual reality and augmented reality and remote monitoring among others. Also the potential use of integrating AI into Agriculture Science education can have several benefits: improved agricultural productivity, skills development, sustainable agriculture, and equity in education

By the application of AI-enabled agricultural technologies, teaching students, such as precision farming and smart irrigation systems can help boost productivity and increase food security in Nigeria. Mba (2024) argues that AI-powered technologies can help reduce human error and labor-intensive tasks, enabling farmers to focus on more strategic aspects of agriculture, which can lead to greater productivity. In a study by Omonhinmin and Omonhinmin (2023), it is found that the adoption of AI-enabled technologies in agriculture can increase crop yields by up to 20%, reducing post-harvest losses and enhancing overall productivity. They assert that integrating these technologies into Agriculture Science education can equip students with the necessary skills to improve agricultural productivity in Nigeria.

Consequently, Incorporating AI into Agriculture Science curricula can help students develop skills in data analysis, computer programming, and robotics, preparing them for careers in agriculture or other related industries. According to Aliu et al. (2025), incorporating AI into Agriculture Science education can help students develop a more holistic understanding of agriculture, including the technological, ecological, and socioeconomic dimensions, preparing them for a variety of career paths in agriculture. Also, Oguntunde et al. (2021) highlight the importance of integrating AI into Agriculture Science curricula to develop students' skills in data analysis, computer programming, and robotics. They asserted that this will equip students with the necessary skills to participate in the future of agriculture, which is becoming increasingly technology-driven.

In addition, with access to AI-powered tools and data analysis, students can learn about sustainable farming practices, such as reducing water and pesticide use that can help protect the environment and conserve natural resources. Adelaja (2026) contended that AI can enable farmers to implement precision agriculture, which can minimize the use of chemical inputs, reduce environmental pollution, and conserve water resources, contributing to more sustainable agriculture in Nigeria. In a similar finding, Rufai (2022) noted that AI-powered tools can help farmers reduce their reliance on harmful pesticides and fertilizers, leading to more sustainable agricultural practices.

Likewise, using AI in Agriculture Science education can help level the playing field for students, especially in rural areas, by providing access to advanced tools and resources that might not be available in traditional classrooms. According to Obinyan (2023), AI-enabled tools can help

bridge the digital divide and provide equal opportunities for students in rural areas to access high-quality Agricultural Science education. Obinyan asserted that this can lead to greater equity in education, enabling students from diverse backgrounds to engage in advanced agricultural practices. Shittu (2027) maintained that using AI in Agriculture Science education can also facilitate distance learning, providing access to education for students who might otherwise be excluded due to geographical or socioeconomic constraints, promoting greater equity in education. In this sense, AI in Agriculture Science education in Nigeria, schools can help prepare students for the future of agriculture, while also promoting innovation and sustainability.

The accessibility and utilization of AI resources in Agricultural Science education is an important consideration for schools in Nigeria, particularly, in Nsukka local government area of Enugu State. Also, the adoption and utilization of AI resources in secondary schools remains limited as Liu, Iqbal and Li (2021) noted that AI research on area is still in its infancy, more empirical studies are needed, especially, in relation to real classroom and teachers. This study aims to address this gap by investigating the extent to which AI resources are perceived to be helpful for enhancing Agriculture Science learning among secondary school students in the Nsukka Local Government Area of Enugu State. This is evident by gathering some studies which have demonstrated the potential benefits of incorporating AI resources in Agriculture Science education, including improved understanding of complex agricultural processes, enhanced problem-solving skills, and more efficient data analysis.

In another development, researchers such as Eze et al. (2024) have found that Nigerian students who used AI-powered Agricultural simulation software exhibited greater knowledge of crop management and pest control than those who did not use the technology. Similarly, Onyeocha (2022) reported that the use of virtual reality systems in Agriculture Science classrooms improved students' spatial reasoning and visualization skills. Okechukwu (2025) examined the impact of AI-powered drones in Nigerian agriculture and found that they enabled more efficient and accurate crop monitoring, which can lead to improved yields and reduced waste.

Despite these benefits, some studies such as Adigwe and Nnaji (2023) have identified barriers to the accessibility and utilization of AI resources in Nigerian schools. According to Adigwe et al (2023), the lack of Internet connectivity, inadequate technical expertise among teachers, and limited funding for AI resources were significant obstacles in several secondary schools. Odigwe

and Uche (2024) conducted a survey of Nigerian secondary school teachers and found that a lack of training and awareness about AI resources were significant factors in the limited use of these tools in Agriculture Science education. This highlights the need for professional development opportunities to help teachers feel confident using AI resources in their instruction.

However, the adoption and utilization of AI resources in secondary schools especially in the study area remains a largely unexplored, this study aims to address this gap by investigating the extent to which AI resources are perceived to be helpful for enhancing Agriculture science learning among secondary school students in the Nsukka Local Government Area of Enugu State, Nigeria.

### **Statement of the Problem**

The integration of Artificial Intelligence (AI) tools in Agricultural Science in secondary schools has the potential to enhance students' learning experiences and improve the effectiveness of teaching. However, in many schools especially in the study area, the accessibility and utilization of AI resources remain limited, hindering their use and full potential in Agriculture Science education. This study seeks to identify the current state of AI accessibility and utilization in Agriculture Science education in the Nsukka local government area of Enugu State, Nigeria, and to propose strategies for addressing the challenges associated with AI integration

### **Purpose of the Study**

Accessibility and utilization of AI tools for effective learning of Agriculture Science in secondary schools in Nsukka Local Government Area of Enugu State, Nigeria. Specifically, the study is set to achieve the following specific objectives:

1. To determine the level of accessibility of AI related tools for effective learning of Agricultural Science in Nsukka LGA?
2. To determine level of utilization of AI related tools for effective learning of Agricultural Science in Nsukka LGA?

### **Research Questions**

1. What is the level of accessibility of AI related tools for effective learning of Agricultural Science in Nsukka LGA?

2. What is the level of utilization of AI related tools for effective learning of Agricultural Science in Nsukka LGA?

### **Hypotheses**

**H0<sub>1</sub>:** There is no significant difference between the mean responses of male and teachers on the accessibility of AI tools for effective learning of Agricultural Science in Nsukka LGA

**H0<sub>2</sub>:** There is no significant difference between the mean responses of male and teachers on the utilization of AI tools for effective learning of Agricultural Science in Nsukka LGA

### **Methods**

The study adopted a descriptive survey research design to investigate the level of accessibility and utilization of AI resources for effective learning of Agricultural Science in the Nsukka Local Government Area of Enugu State, Nigeria. The study was conducted in Nsukka Local Government Area in Enugu State, Nigeria. The L.G.A Shares borders with Edem, Opi, Ede-Oballa, and Obimo. The LGA is also home to the University of Nigeria, Nsukka (UNN), the first indigenous university in Nigeria. The study sampled 86 teachers and made use of census sampling technique.

The instrument for data collection was a 14-item structured questionnaire titled: “Accessibility and Utilization of AI tools for effective learning of Agriculture Science Questionnaire (AUAIASQ)”. The questionnaire consisted of two sections: section A and B. section A elicited information on the demography of the respondents while section B was sub-divided into two clusters. The first cluster contained 7 item statements which sought information on the level of accessibility of AI tools for effective teaching of Agricultural Science; and the second cluster contained 7 item statements that elicited information on the level of utilization of AI tools for effective teaching of Agricultural Science. The questionnaire was structured on 4-point likert scale of Very High Level (4), High Level (3), Low Level(2) and Very Low Level (1), for positive item statements and their respective reverse scores for negative item statements. The real limit of numbers of 0.00-1.49 (Very low level, VLL), 1.50-2.49 (Low level, LL), 2.50-3.49 (High level HL) and 3.50 to 4.00 (Very High level, VHL). The instrument was subjected to face validation by three experts, trial-tested and its coefficient for internal consistency of 0.85 was established using Cronbach Alpha statistics. The questionnaire was distributed to and retrieved

from the respondents through the help of three research assistants. Data collected were analyzed using mean and standard deviation while the hypotheses were tested using t-test at 0.05 level of significance.

## Results

**Question One:** What is the level of accessibility of AI tool for effective learning of Agricultural Science in Nsukka LGA, Nigeria?

**Table 1: Mean and standard deviation of responses of teachers' on the extent accessibility of AI tool for effective learning of Agricultural Science in Nsukka LGA, Nigeria**

S/N	Item Statements	Female		Male		Overall		Dec.
		N= 54		N= 32		N = 86		
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	
1	Students do not have reliable access to the Internet or other technological infrastructure required for AI use.	3.04	.672	2.84	.847	2.97	.743	Accepted
2	Students do not have adequate access to hardware or devices, such as laptops or tablets that are needed for using AI tools.	3.15	.711	3.16	.767	3.15	.728	Accepted
3	Students do not have sufficient training or support in using AI resources, such as tutorials or technical assistance.	2.67	.890	2.59	.911	2.64	.893	
4	Students do not have access to AI resources in a language that they understand or are comfortable using	3.04	1.063	2.63	1.100	2.88	1.089	Accepted
5	Students do not have easy access to AI-related content or educational materials, such as instructional videos or e-books.	2.78	.816	2.59	.837	2.71	.824	Accepted
6	Students do not have sufficient access to electricity or power sources to support the use of AI tools and resources.	3.67	.514	3.47	.621	3.59	.561	Accepted
7	Many teachers do not have adequate training or support in incorporating AI resources into their instruction.	3.76	.512	3.63	.707	3.71	.591	Accepted
	<b>Cluster Mean</b>	<b>3.16</b>	<b>.739</b>	<b>2.99</b>	<b>.827</b>	<b>3.09</b>	<b>.776</b>	<b>Accepted</b>

The data in Table 1 showed that mean responses indicated low accessibility of AI tools for effective learning of Agricultural science in secondary schools in Nsukka LGA. The respondents agreed that the accessibility of AI tools for effective learning of Agricultural Science is low.



Specifically, it was found that the level of access to reliable Internet connectivity is insufficient in schools; there is inadequate access to hardware or devices such as laptops or tablets that are needed for using AI. They lack sufficient training; have no access to AI resources in a language such as instructional videos or e-books. Finally, the result also showed that they lack sufficient access to electricity for learning Agricultural Science in secondary schools in Nsukka LGA, Enugu state. This implied that the respondents agreed that AI tools for learning Agricultural Science in secondary schools in Nsukka LGA, Enugu state, Nigeria are limited in accessibility.

A corresponding hypothesis formulated to further address the research question 1 is.

**H<sub>01</sub>:** There is no significant difference between the mean responses of female and male teachers on the accessibility of AI tools for effective learning of Agricultural Science in Nsukka LGA

**Table 2: t-test Analysis of Mean Ratings of female and male Agricultural Science teachers on the accessibility of AI tools for effective learning Agricultural Science in Nsukka LGA**

<b>Female</b>	<b>54</b>	<b>3.1561</b>	<b>.7397</b>				
				<b>84</b>	<b>0.957</b>	<b>.077</b>	<b>NS</b>
<b>Male</b>	<b>32</b>	<b>2.9866</b>	<b>.8271</b>				

Results in Table 2 indicated a t-calculated value of .957 and a significant p-value of .077. Since the p-value of .077 is greater than 0.05 level of significance, the null hypothesis is therefore accepted. Hence, there is no significant difference in the mean ratings of female and Male Agricultural Science teachers on the accessibility of AI tools for effective teaching in secondary schools in Nsukka LGA.

**Research Question 2: What is the level of utilization of AI tools for effective learning of Agricultural Science in Nsukka LGA?**

**Table 3: Mean and Standard Deviation of Responses of teachers on the level of utilization of AI related tools for effective learning of Agricultural Science in Nsukka LGA?**

S/N	Item Statements	Female		Male		Overall		Dec.
		N= 54		N= 32		N = 86		
		$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	
1	The curriculum used for lesson presentation does not cover AI-related topics such as automation in agriculture or machine learning for crop yield prediction.	3.3	0.571	3.09	0.466	3.22	0.54	Accepted
2	I most likely don't have the opportunity to help my students collaborate on projects involving AI resources, such as creating AI-based solutions for agricultural challenges.	3.3	0.603	3.16	0.574	3.24	0.593	Accepted
3	My students do not have access to extracurricular activities related to AI, such as robotics clubs or online communities focused on agriculture and technology.	3.31	0.722	3.19	0.693	3.27	0.71	Accepted
4	I rarely go for professional development opportunities which involves learning about AI resources and their applications in education.	2.96	0.751	2.81	0.738	2.91	0.746	Accepted
5	My school most likely lack adequate funding to maintain or upgrade AI tools and resources, limiting their accessibility to students.	3.15	0.711	3	0.622	3.09	0.68	Accepted
6	I hardly make use of AI-driven simulations or visualizations to illustrate complex concepts, such as weather patterns or soil quality in my lessons.	3.13	0.754	2.97	0.782	3.07	0.764	Accepted
7	My Agriculture Science students do not have access to AI-driven learning tools, such as digital textbooks or interactive modules, to supplement their learning.	2.98	0.789	2.91	0.856	2.95	0.81	Accepted
Cluster Mean score		3.16	.7001	3.02	.676	3.12	.692	Accepted

The result presented in Table 3 showed that the overall mean responses of female teachers in all the items (1-7) ranged between 2.91 -3.24 which fall within the real limit of number range of 2.50- 3.49 indicating acceptance that AI related tools are rarely utilized for effective learning of Agricultural Science in Nsukka LGA. The overall cluster mean of 3.12 which equally falls within the real limit of number range of 2.50 – 3.49 showed that respondents agreed that the level of utilization of AI related tool for effective learning of Agricultural Science in Nsukka LGA was to a low level.

Teachers reported limited experience using AI tool such as instructional videos or e-books for teaching Agricultural Science, which can contribute to lower utilization. Moreover, the integration of AI tools into the curriculum and teaching methods is not sufficiently provided, resulting in limited utilization. This is further compounded by low accessibility and understanding of AI resources among students and educators, and a lack of perceived usefulness of AI tools for learning Agricultural Science.

The Table also revealed a cluster Standard Deviation of .776 which showed that the mean responses of the teachers were close to the mean and were not far from each other.

A corresponding hypothesis formulated to further address the research question 2 is:

**H0<sub>2</sub>:** There is no significant difference between the mean responses of female and male teachers on the utilization of AI tools for effective learning of Agricultural Science in Nsukka LGA

**Table 4:** t-test Analysis on mean response of female and male teachers on the level of utilization of AI tools for effective learning of Agricultural Science in Nsukka LGA

<b>GENDER</b>	<b>N</b>	<b><math>\bar{X}</math></b>	<b>SD</b>	<b>Df</b>	<b>t-cal.</b>	<b>P-value</b>	<b>Remark</b>
<b>Female</b>	54	3.1614	0.70014				
				84	.915	.214	NS
<b>Male</b>	32	3.0186	0.67586				

The data in Table 4 indicates a t-calculated value of .915 and significant p-value of .214. Since the p-value of .214 is greater than 0.05 level of significance, the null hypothesis is therefore accepted. Hence, there is no significant difference in the mean responses of female and male teachers on the level of the utilization of AI tools for effective learning of Agricultural Science in Secondary schools in Nsukka LGA.

## **Discussion**

The findings of the study, as presented in Table 1, indicated that teachers in secondary schools in Nsukka LGA, agreed that the accessibility of AI tools for effective learning of Agricultural Science is low. Specifically, it was found that the level of access to reliable Internet connectivity is insufficient in schools; there is inadequate access to hardware or devices, such as laptops or tablets that are needed for using AI; they lack sufficient training; have no access to AI resources in a language such as instructional videos or e-books. Finally, they lack sufficient access to electricity for learning Agricultural Science in secondary schools in Nsukka LGA, Enugu state, Nigeria are limited in accessibility.

The low accessibility of AI tools in Agricultural Science is consistent with the findings of Adigun (2024), who found that many schools in Nigeria lack the resources and infrastructure needed to support the use of AI tools. Similarly, Odigwe and Uche (2024) found that teachers in some schools lacked awareness or training in using AI resources, contributing to their limited use in Agriculture Science education.

The findings of the study, as presented in Table 3, revealed that teachers of Agricultural Science in secondary schools in Nsukka agreed that the level of utilization of digital resources for effective learning of Agricultural Science is low. This finding is in line with the findings of Eze et al. (2024), who found that many students in Nigerian secondary schools were not exposed to hands-on activities involving AI tools, such as data analysis or virtual simulations, limiting their engagement with these resources

## **Conclusion**

The findings of the study suggested that many schools in the Nsukka Local Government Area do not have accessibility and rarely utilized AI resources for instructional purposes. However, evidence from the study suggested that by leveraging access and utilization of AI resources students of Agriculture Science education would be transformed, and it will help to foster the development of a more innovative and resilient agricultural sector in the Local Government Area, and Nigeria at large.

### **Recommendations**

1. School Administrators should prioritize partnerships with organizations that can provide access to AI resources, such as universities or tech companies, to enhance the availability of these resources to teachers and students.
2. Teachers should engage in professional development opportunities, such as workshops or seminars, to learn how to effectively incorporate AI resources into their Agriculture Science instruction.
3. Local Government officials should allocate funding for schools to purchase and maintain AI resources, ensuring that all schools in the Nsukka Local Government Area have equal access to these tools.

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