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**Impact of Artificial Intelligence Integration Technology on the Academic Achievement of  
Senior Secondary Schools Students in Federal Capital Territory**

by

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### Abstract

The Study examined the impact of artificial intelligence integration on students' academic achievement in public Senior Secondary School students in the FCT, Abuja. The study adopted descriptive survey research design. The population of the study comprised of 24,771 SS2 students from all public Senior Secondary Schools in six Area Councils of the FCT Abuja. 384 students were selected using Research Advisors Table (2006). The instrument used for data collection was a structured questionnaire named Artificial Intelligence integration and Academic Achievement Questionnaire, (AIAAQ) as well as Mathematics and English Language achievement tests. The instruments were further subjected to pilot study. Results obtained from the exercise were used to obtain reliability indices of 0.75 0.71 and 0.77 for the questionnaire and achievement tests respectively. The research questions were answered using mean and standard deviation while the hypotheses were tested using t-test. The findings from the study showed that there is a significant impact of virtual learning integration technology on the academic achievement of public Senior Secondary Schools in the FCT, Abuja, and there is a significant impact of adaptive learning technology on the academic achievement of public Senior Secondary in the FCT, Abuja. The study recommended that teachers should be trained on the use of virtual learning environment and adaptive learning integration technology for the purpose enhancing students' academic achievement. The study concluded that virtual learning integration technology and adaptive learning integration technology enhances students' achievement in the FCT, Abuja.

*Keywords:* Artificial intelligence, technology integration, adaptive learning, academic achievement.

### **Impact of Artificial Intelligence Integration Technology on the Academic Achievement of Senior Secondary Schools Students in Federal Capital Territory**

Today's society places a great value on students' academic achievement because in the majority of the world's universities, entrance to these and other higher education institutions is determined by the students' performance on national examinations. While some academics agree that Artificial Intelligence (AI) helps students develop better study habits, others disagree. This has thus sparked discussions over the past 20 years on the impact of integrating AI into the teaching and learning process on students' academic achievement. It is significant to note that artificial intelligence (AI) is growing in strength as a tool for global economic development, and the education sector is no exception. According to Salido's (2023) research, students often use Artificial Intelligence (AI) resources, particularly the internet, for their studies. As a result, their learning habits have improved. According to Salido (2023), Artificial Intelligence (AI) has the power to change education as we know it, including where and how learning and teaching occur as well as the roles that instructors and students play in the process.

In addition, Onyia, and Mary (2013) pointed out that the exponential growth of digital information has altered how students view reading, studying, and the use of printed materials for study purposes. Of particular, this is due to its capacity to provide students with visual images of real-life experiences through movies, documentaries, and still images, greatly enhancing their cognitive potential. Mutungi (2014) noted that poor academic achievement among students is caused by the dearth of pertinent information resources in inadequate school libraries. But with the internet becoming more and more popular, students are no longer restricted to the materials in their libraries. Students' horizons are expanded via the Internet to look for knowledge outside their local borders. Students' reading chances are increased when they have access to and use internet services effectively in secondary schools, thereby, benefitting their academic achievements (Shahibi, Khafidhah and Rusli, 2017). AI is used by educational institutions to provide students with 21st-century skills and knowledge (Ugah et al., 2023). This contributes to global accessibility to education, educational equity, and the dissemination of high-quality instructional materials.

Artificial Intelligence (AI) refers to the technology utilized in electronic data transmission, manipulation, and storage. AI is already widely used in education, particularly in secondary and post-secondary institutions. It offers a wide range of effective tools that will facilitate the transformation of the current text-bound, teacher-centred, segregated classrooms into rich, interactive, student-focused learning environments. In a way that was previously impractical in a regular classroom environment, Artificial Intelligence (AI) can bring real-life concerns into the classroom. Students have access to a flexible platform for research, engagement, co-operation, and collaboration, thanks to AI and the Internet (Owoc et al., 2021). Learning, which was formerly seen to be dull, is now meaningful and pleasant because of the use of moving and still visuals, life experiences, and AI-powered social research (Williamson, 2023). Artificial intelligence learning may take various forms and prominent among them include the use of virtual learning environment and adaptive learning environment.

A **Virtual Learning Environment**, or **VLE**, refers to a digital space where learners and educators conduct on-line courses. Educators may deliver course materials through video presentations, audio recordings, virtual classes or other digital means. VLE gives students access to education no matter where they are. VLEs are part of the broader concept of **e-Learning** as students and teachers use various multimedia resources and communication tools to access and deliver educational materials. Virtual learning environments are designed to support teaching and learning through optimised digital classrooms that may include [learning management systems](#) (LMS) and other educational technology to encourage learning. The focus of a VLE is on creating a comprehensive and interactive on-line space conducive to teaching and learning. It emphasises the educational experience, simulating a classroom environment in a digital setting. An LMS is more focused on the administrative and management aspects of delivering education and training. It emphasizes tracking, reporting, and managing the logistics of the learning process. Aside virtual learning environment, creating a suitable adaptive learning environment may also enhance students' learning experiences.

Adaptive learning environment is an environment that facilitates the delivery of custom learning experiences that address the unique needs of an individual through just-in-time feedback, pathways, and resources (rather than providing a 'one-size-fits-all' learning experience). Here, an instructor is tutoring a student to help them understand a difficult concept. Almost inevitably, this instructor will alter their hints and advice in response to verbal and non-verbal cues from the learner, shifting the lesson flow to accommodate questions and lingering confusion, referencing current events or known student passions and preferences, changing activities in the moment (e.g. the student is having trouble, so walking them through the assignment instead of asking them to work alone). Adaptive learning technology aims to emulate and support (not replace!) the talents of great educators to provide the best possible learning experience for every single student. It helps scale the benefits of adaptive learning to tens, hundreds, or thousands of students at a time.

Students studying Mathematics and English Language typically perform poorly academically as a result of the inadequate use of this resource in teaching and learning. This is evident in the kids' appalling performance in the subjects they are studying. Despite the government's efforts to guarantee that AI is available for appropriate use, low performance among secondary school students was noted. In this context, the study looks at the relationship between Artificial Intelligence usage and Academic Performance in Mathematics and English language among students in Abuja, Nigeria. The goal of this study therefore, is to determine the impact of AI integration on the academic achievement of public Senior Secondary Schools in the FCT, Abuja.

**The main objective of the study is to investigate the impact of artificial intelligence integration on students' academic achievement. Specifically, the study is geared towards achieving the following objectives:**

1. To determine the impact of virtual learning integration technology on the academic achievement of public Senior Secondary Schools in the FCT, Abuja.
2. To examine the impact of adaptive learning integration technology on the academic achievement of public Senior Secondary Schools in the FCT, Abuja.

### Research Questions

The following research questions guided the study:

1. What is the impact of virtual learning integration technology on the academic achievement of public Senior Secondary Schools in the FCT, Abuja?
2. What is the impact of adaptive learning integration technology on the academic achievement of public public Senior Secondary Schools in the FCT, Abuja?

### Hypotheses

The following null hypotheses guided this study and will be tested at 0.05 level of significance:

1. There is no significant impact of virtual learning integration technology on the academic achievement of public senior secondary schools in the FCT, Abuja.
2. There is no significant impact of adaptive learning integration technology on the academic achievement of public senior secondary schools in the FCT, Abuja.

**Ajana, Abanum. and Afolabi (2024)** examined the effect of virtual learning integration technology on academic performance, autonomy and response rate of Basic Science students in JSS 2 in Ojo Local Government Area of Lagos State. Quasi-experimental research design was adopted for the study. The population for the study comprised of all Basic Science students in JSS 2 in Ojo Local Government Area of Lagos State. Simple random sampling technique was used to select 90 JSS 2 students from Junior Secondary Schools in Ojo Local Government Area from. A self-designed multiple-choice Achievement Test in Basic Science (ATBS) which measures the academic performance, response rate and autonomy of the students with 30 items was used for data collection. The instrument was tested for item difficulty index, discrimination index. The Kuder Richardson (KR-20) value was 0.78. The item was reduced to 20 items after the item analysis. Mean and standard deviation was used to answer the research questions while the hypotheses were tested using multiple analysis of variance (MANOVA). The outcome of the analyses revealed that students taught using VLE outperformed those taught using the CLE. Based on the findings, it was recommended that all schools should introduce virtual learning classrooms to ensure a continuous

interaction of the learners anywhere-anyplace with each other, the content and the instructor or teacher.

**Izuegbunam and Osuafor, (2021)** *examined the effect of adaptive learning integration technology (ALA) on students' achievement in chemistry in Awka Education Zone. Two research questions guided the study and three hypotheses were tested at 0.05 alpha level. Quasi-experimental design was adopted for the study. The population of the study was 1, 942 senior secondary three (SS3) students offering chemistry in Awka Education Zone out of which a sample size of 109 students was drawn using purposive and random sampling techniques was involved in the study. The instrument for data collection was Chemistry Achievement Test (CAT) validated by three experts. The reliability of CAT was established using Kuder-Richardson Formula 20 to be 0.70. Research questions were answered using mean and standard deviation while analysis of covariance was used to test the null hypotheses. The result of the study showed that students taught using ALA had higher mean gain scores in achievement than those taught using conventional instructional method. The findings of the study revealed that there was a significant difference between mean achievement scores of students taught chemistry using ALA and conventional instructional method in favour of ALA. It was concluded that ALA is an effective instructional approach for improving students' achievement in chemistry. It was recommended among others that chemistry teacher should always form a pre-assessment test covering all such basic knowledge needed to understand the chemistry concept to be taught, so as to uncover areas where students need remedial instruction. deviation to answer the research questions raised while analysis of covariance (ANCOVA) was used to test the formulated hypotheses at  $p < 0.05$  level of significance. The findings of the study revealed that the experimental group achieved higher than the control group. Further findings also showed that the experimental group had higher interest than the control group. Based on the findings of the study some recommendations were made.*

### **Method**

Descriptive survey research design was used in this study. The population of the study comprises 24,771 SS2 students from all public Senior Secondary Schools in six Area Council. 384

students were selected using Research Advisors Table (2006). The instrument used for data collection was a structured 10-item questionnaire named Artificial Intelligence Integration and Academic Achievement Questionnaire (AIIAAQ). In addition, Mathematics Achievement Test and English language Achievement Test were developed for the study for the purpose assessing students' academic achievement. The instruments were further subjected to pilot study. The instruments were pilot tested on 30 students; the respondents were part of the population but not part of the sample for this study. Even though the instruments were standardized, they were still subjected to reliability in order to ascertain their degree of consistency. The data obtained from the pilot test was used to compute the internal consistency of the instrument using Cronbach's Alpha reliability method. Results obtained from the exercise were used to obtain reliability indices of 0.75, 0.71 and 0.77 for the questionnaire and achievement tests in Mathematics and English language respectively. Mean and standard deviation was used to answer the research questions developed for the study while t-test statistics was used to test the hypotheses at 0.05 level of significance.

### **Results**

Research Questions 1: What is the impact virtual learning integration technology on students' academic achievement in science in public Senior Secondary Schools of the FCT, Abuja?

**Table 1**

*Mean and Standard Deviation showing Impact of virtual learning Integration Technology on Student's Academic Achievement in Public Senior Secondary School of the FCT, Abuja*

*Academic Achievement in Public Senior Secondary School of the FCT, Abuja*

S/N	Items	SA	A	D	SD	Mean	Std. Dev	Remarks
1	The use projectors during lessons encourages me to participate during classroom instruction and improves my grades in school	114	88	89	89	2.60	1.15	Agreed
2	The use of video clips during lessons makes me learn better	63	203	88	26	2.80	0.80	Agreed
3	The use of smart phones has exposed me to zoom and video whatss App lessons that makes me learn and perform better	75	206	74	25	2.87	0.80	Agreed
4	The use of smart boards enables my mates and I to understand lessons better and this improves our grades	207	49	62	62	3.06	1.17	Agreed
5	The exposure of my class mates and I to online lessons has made us perform better in school.	100	89	103	88	2.53	1.14	Agreed
<b>Average Mean/Standard Deviations</b>						<b>2.77</b>	<b>1.01</b>	

Table 1 shows the impact of virtual learning integration technology on students' academic achievement in public senior secondary school of the FCT, Abuja. Results based on the table indicate that based on items 1 to 5, the average mean was given as 2.77. This value is higher than the mean value of 2.50 for a four-point likert scaled instrument. Hence, virtual learning integration technology has a high impact on students' academic achievement in public senior secondary school of the FCT, Abuja.

Research Questions 2: What is the impact of adaptive learning integration technology on the academic achievement of public senior secondary schools in the FCT, Abuja?

**Table 2**

*Mean and Standard Showing Impact of Adaptive Learning Integration Technology on Students Academic Achievement in Public Senior Secondary School of the FCT, Abuja*

S/N	Items	SA	A	D	SD	Mean	Std. Dev	Remarks
6	Engaging in group discussions with my classmates has helped to learn better	100	89	100	88	2.60	1.15	
7	The teacher encourages my mates and I to study together and this has improved my grades in school	63	203	88	26	2.80	0.80	
8	my classmates and I learn from each other and share ideas that makes us learn better	75	206	74	25	3.06	0.80	
9	Writing tests and assignments regularly has made take my studies more seriously	207	49	62	62	3.06	1.17	
10	Our attendance to class and performance is well monitored by the teacher and this helps us to improve on our performance in school.	100	89	103	88	2.53	1.14	
<b>Average Mean/Standard Deviations</b>						<b>2.81</b>	<b>1.01</b>	

Table 2 shows the impact of adaptive learning integration technology on students' academic achievement in public senior secondary school of the FCT, Abuja. Results based on the table indicate that based on items 1 to 5, the average mean was given as 2.81. This value is higher than the mean value of 2.50 for a four-point likert scaled instrument. Hence, adaptive learning integration technology has a high impact on students' academic achievement in public senior secondary school of the FCT, Abuja.

**Hypothesis 1:** There is no significant impact of virtual learning integration technology on students' academic achievement in public senior secondary school of the FCT, Abuja.

**Table 3**

*t-Test Statistics Showing The Impact Virtual Learning Integration Technology On Students' Academic Achievement in Public Senior Secondary School of the FCT, Abuja*

Variables	N	Mean	Std Dev	t-cal	p-value	Decision	Conclusion
Virtual Learning Technology	380	2.77	1.01	25.00	0.024	Reject H <sub>0</sub>	Significant
Academic Achievement	380	60	60.24				

Table 3 above shows t-test statistic on the impact virtual learning integration technology on students' academic achievement in public senior secondary school of the FCT, Abuja. The p-value of 0.024 was found to be less than 0.05. Hence, the result reveals that there is a significant impact of virtual learning integration technology on the academic achievement in public senior secondary schools of the FCT, Abuja.

**Hypothesis 2:** There is no significant impact of adaptive classroom technology on academic achievement in public senior secondary schools of the FCT, Abuja.

**Table 4**

*t-Test Statistics showing the Impact of Adaptive Learning Integration Technology on Academic Achievement in Public Senior Secondary Schools of the FCT, Abuja*

Variables	N	Mean	Std Dev	t	p-value	Decision	Conclusion
Adaptive Learning Integration Technology	380	2.81	1.01	14.22	0.020	Reject H <sub>0</sub>	Significant
Academic Achievement	380	60.24	7.76				

Table 4 above shows t-test statistic on the impact adaptive learning integration technology on students' academic achievement in public senior secondary school of the FCT, Abuja. The p-value of 0.020 was found to be less than 0.05. Hence, the result reveals that there is a significant impact of adaptive learning integration technology on the academic achievement in public senior secondary schools of the FCT, Abuja.

### Discussion

Findings from the study on hypothesis one reveal there is a significant impact of virtual learning integration technology in ICT on public senior secondary school students' in public senior

secondary school of the FCT, Abuja. This finding is in agreement with the findings from the study of **Ajana, Abanum. and Afolabi (2024)** which showed there is a significant impact of virtual learning integration technology on the academic achievement in public junior senior secondary schools in Ojo local government Area of Lagos state. This entails that employing virtual learning integration technology enhances students' academic achievement.

Findings from the study on hypothesis two reveal there is a significant impact of adaptive learning integration technology on the academic achievement in public senior secondary schools of the FCT, Abuja. This finding is in agreement with the findings from the study of **Izuegbunam, & Osuafor, (2021) which indicated** *there is significant effect of adaptive learning technology on students' academic achievements in basic science among secondary school students in Awka Zone of Anambra State.* This entails that employing adaptive learning technology in the course of instructional delivery helps in improving students' academic achievement.

### **Conclusion**

Based on the findings of this study, the following conclusions were made:

1. There is a significant impact of virtual learning integration technology on the academic achievement of public Senior Secondary Schools in the FCT, Abuja?
2. There is a significant impact adaptive learning integration technology on the academic achievement of public Secondary Schools in the FCT, Abuja?

### **Recommendations**

Based on the findings of the study and conclusion, the following recommendations were made:

1. Schools should be equipped by the Federal ministry of Education with virtual learning tools for the purpose of creating an enabling environment that will enhance students' academic achievement.
2. Periodic trainings and seminars should be organized by the Federal Ministry of Education for teachers in order to facilitate the effective use of adaptive technological devices that may enhance students' academic achievement.

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