

**Original Article**

**EFFECT OF INTERACTIVE WHITEBOARDS (IWBs) ON STUDENTS' ACADEMIC ACHIEVEMENT AND RETENTION IN COMPUTER STUDIES AMONG JUNIOR SECONDARY SCHOOLS IN ABUJA MUNICIPAL AREA COUNCIL, FCT.**

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**Abstract**

The study investigated the effect of interactive whiteboards on students' academic achievement and retention in computer studies among Junior secondary schools in Abuja Municipal Area Council, Federal Capital Territory. Two research questions and two hypotheses guided the study. The study adopted a quasi-experimental research design. The study used human subjects. The participants included junior secondary school students in two public Junior secondary schools in Abuja Municipal Area Council. The sample size was 130 participants selected, using the purposive sampling technique. The participants recruited into the study were purposively assigned to the experimental group (A) and control group (B). The participants from group (A) were assigned to the experimental group containing 65 participants who used interactive whiteboards, while participants in group (B) were assigned to the control group containing 65 participants who did not use interactive whiteboards. Data collected was attributed to the SPSS software package. One-way ANCOVA was used to test the null hypotheses at a 0.05 alpha significance level. The results revealed among others that interactive whiteboards have a positive effect on students' academic achievement and retention in computer studies among junior secondary school students. Inadequacy of interactive whiteboards and lack of power supply were constraints to the use of IWBs in secondary schools. It was recommended among others that the government should equip the schools with adequate ICT media like interactive whiteboards, government should ensure a stable power supply in all schools.

**Keywords:** Computer studies, Interactive whiteboards, academic achievement, retention.

**Introduction**

Computer studies is the study of computers and computing. It includes their theoretical and algorithmic foundations, hardware and software, and their uses for processing information. Computer

studies degree programmes exist to teach students about computers in a general sense, without specializing in a specific aspect of the industry. These programmes may touch on many aspects of working with computers, such as hardware design, computer

programming, software development, web design, and information. Computer studies focus on how the computer works and how it is used in society. According to Collins Dictionary (2019), computer studies refers to a course of study devoted to using and programming computers. It is not about learning how to use the computer and it is much more than computer programming (Fisher, 2017).

Taylor (2011) saw computer studies as the study of ways of representing objects and processes. It involves defining problems, analyzing problems, designing solutions, and developing, testing, and maintaining programs. Meanwhile, the academic achievement of students in science subjects particularly in computers in both WAEC and NECO has been an issue of concern to every stakeholder in the secondary education system in Nigeria. Narad and Abdullah (2016) see academic achievement as the knowledge gained which is assessed by marks by a teacher and/or educational goals set by students and teachers to be achieved over a specific period. It is defined as the performance portrayed by students in tests, coursework, and examinations. This definition supports the argument of Adeyemi and Bolarinwa (2013) that grades in examinations could serve as predictive and criterion measures for academic achievement.

These students' grades can either be high or low.

Meanwhile, scholars like Akinjide (2018) and Ihekwoaba et al (2020) blame the poor academic achievement of students on several factors including inadequate learning facilities, inappropriate use of teaching methods, overloaded curriculum, poor mastery of the language of instruction (English language), poor knowledge of the concepts, lack of qualified teachers and overpopulated classes among others.

Government, researchers, and other stakeholders in the educational sector have made efforts to seek ways

of improving students' learning outcomes. These efforts are yet to yield satisfactory results. There is therefore the need to make computer classroom instruction more interesting for students. Okolocha and Nwaukwa (2020) noted that academic achievement is usually measured by test scores which are usually expressed in students' grades in the subject. This can only be obtained maximally by innovative technological instructional strategy. One of such innovative technological instructional strategies that can facilitate students' academic achievement and retention in secondary schools is Interactive Whiteboards (IWBs)

The interactive whiteboard (IWB) is a part of the Information and Communication Technologies (ICT) integration process in the educational system. It is one of the technologies most schools in developed countries like the US, Denmark, England, Spain, and Turkey invested in to promote quality teaching and learning processes. Interactive whiteboard otherwise referred to as Smart boards is a large interactive display in the form factor of a whiteboard. According to Mercer, et al (2010), an interactive whiteboard is an electronic device that enables interactive work with a computer directly from the board itself through clicking on the projected picture, an interactive pen, or a human finger. They are used in a variety of settings, including classrooms at all levels of education, corporate boardrooms, and broadcasting studios, among others.

Interactive whiteboard represents the first type of educational technology suitable for interaction in the classroom environment. As a part of ICT-enhanced teaching and learning, the use of an interactive whiteboard in the classroom can make a difference for students who have trouble with thinking abstractly in abstract subjects, because it makes the teaching and learning process more concrete when using the features of the IWB. According to Brečka and

Olekšáková (2013), the main advantages of IWB lie in the simplification of teachers' preparation for particular lessons, better visualization of presentations, the possibility of being connected online and also, and and active remote participation. It serves as an effective tool for the presentation of classroom instruction.

According to Wood and Ashfield (2018), the interactive whiteboard generally consists of a computer, a data projector, and an electronic screen. Interactive whiteboard has the potential to enhance students' academic achievement. This is because it appeals to many human senses at a time and the lesson being communicated by the teacher using the IWB could be made self-explanatory. This will not only increase the understanding of students in computers but will also improve their academic achievement and retention. The true success of interactive whiteboards depends on how they have been used by computer teachers in classroom instruction. Eztalks (2020), opined that with interactive whiteboards, a teacher can easily formulate and plan for the lesson beforehand. He/she can schedule specific learning tasks like labeling parts of a picture and matching words with their respective meanings.

Most public secondary schools in Nigeria do not have these technologies. Gabriel (2019) however argues that the majority of public secondary schools in Nigeria are not equipped with interactive whiteboards. For the few schools with gadgets, many teachers cannot successfully manipulate the gadgets. Many are not computer literate; therefore, they cannot use interactive whiteboards to improve students' academic achievement and retention. Most public school teachers lack the expertise in the mechanical and technical handling of some of the sophisticated ICT equipment such as the interactive whiteboards, projectors, and film strips among others used to

facilitate students' understanding of Computer studies.

According to Yusuf (2006) argues that the challenge of electricity is a constraint to the effective implementation of ICTs in our school system. Since the successful implementation of an interactive whiteboard cannot be assured without a constant power supply, then the problem of electricity comes into focus. Nigeria is yet to have a stable electricity supply, this creates problems for the effective integration of most technological media in education delivery. The high cost of alternative sources of electricity such as the power generator also makes it difficult for secondary schools to sustain the use of generators in powering their academic programme. It is against this background that this paper investigated the effect of interactive whiteboards on students' academic achievement and retention in Biology in senior secondary schools in Abuja Municipal Area Council, Federal Capital Territory, Abuja.

### **Statement of the Problem**

The academic achievement of students at external examinations in recent times in Computer is not encouraging. The WAEC and NECO Chief Examiners have consistently lamented the poor performance of candidates in Computer by using phrases like, "not satisfactory"; "downward trend"; "abysmal/dismal performance" "decline in pass rate"; "fluctuating performance"; and "persistent failure" in describing the performance of students. Some scholars attributed to lack of understanding, insufficient teaching-learning materials, and inadequate involvement of parents in learners' education as factors contributing to the poor achievement of students. But from the observation of the researcher, the poor state in which the subject and science in general are taught in secondary school needs to be checked. The "Chalk and Talk" method has been the most widely used science teaching

method. Despite the increasing adoption of IWBs in schools, there is limited empirical evidence on their effectiveness in improving academic outcomes and retention, particularly in the context of computer studies in junior secondary schools in Abuja. This is because many public schools in the Federal Capital Territory are not equipped with modern ICT media like interactive whiteboards. There is also the observable problem of epileptic power supply to power the electronic interactive whiteboard gadget where available. This problem thus necessitated the current study by examining the impact of IWBs on students' academic achievement and retention in computer studies in Abuja Municipal Area Council.

### **Purpose of the study**

The specific purpose of the study sought to:

- ❖ Determine the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council.
- ❖ Determine the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council.

### **Research Questions**

1. What are the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council?
2. What are the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council?

### **Hypotheses**

The following null hypotheses were tested in the study:

Ho1 There is no significant difference in the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council

Ho2 There is no significant difference in the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council

### **Method**

The study adopted a quasi-experimental design. There were two basic groups: the experimental group (A) who was taught using the interactive whiteboard and the control group (B), who was taught the same computer studies concepts without the use of interactive whiteboard. The experimental and control groups were intact classes in separate schools, but the schools were the same in terms of facilities and personnel. The study used human subjects. The participants included JSS III students in the 2024/2025 session from two public senior secondary schools in Abuja Municipal Area Council. The sample comprised 130 B students from two intact classes of two co-educational secondary schools. School A has 65 students (31 males and 34 females) and school B has 65 students (35 males and 30 females). The purposive sampling technique was used to select schools and participants that met the criteria for the study. The participants recruited into the study were purposively assigned to the experimental group (A) containing 65 participants who were taught with an interactive whiteboard and the control group (B) containing 65 participants who were taught without the use of an interactive whiteboard. One-way ANCOVA was used to test the hypotheses. A P-value of  $< 0.05$  was considered to be statistically significant.

**Results****Research Question 1**

What are the mean achievement scores of students taught computer studies with interactive whiteboards

and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council?

**Table 1: Mean Achievement and Standard Deviation scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council**

**N=130**

Group	N	Pretest SD( $\sigma$ )	mean ( $\bar{x}$ )	Posttest mean ( $\bar{x}$ )	SD( $\sigma$ )	Mean Score Difference
Control (IWBs)	65	19.01	22.02	52.76	10.66	33.75
Experimental (without IWBs)	65	26.62	9.04	74.68	8.02	48.06
<b>Mean Difference</b>	<b>130</b>	<b>7.61</b>		<b>21.92</b>		<b>14.31</b>

Table 1. shows the mean achievement scores and standard deviation of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council. The result of the analysis showed that students who were taught IWBs (control) obtained mean scores of 19.01 and 52.76 respectively in their pretest and posttest with corresponding standard deviations of 22.02 and 10.66. On the other hand, students who were taught without had mean scores of 26.62 and 74.68 respectively in their pretest and posttest with corresponding standard deviations of 9.04 and 8.02. From the result, it showed that learning took place. This is because the two groups achieved higher posttest mean scores than their

pretest mean scores. However, the post-test mean achievement scores of the experimental group were higher than the post-test mean achievement scores of the control group. Moreover, the standard deviation score of the posttest for students was 8.02 while the control group was 10.66 indicating that the student's scores were clustered around the mean with the experimental group than the control group. Hence, it was deduced that students who received who were taught without achieved higher than those with IWBs.

**Research Question 2**

What are the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council?

**Table 2: Mean retention and Standard Deviation scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council**

**N=130**

Group	N	Pretest SD( $\sigma$ )	Posttest mean ( $\bar{x}$ )	SD( $\sigma$ )	mean ( $\bar{x}$ )	Mean Score Difference
Control (IWBs)	65	39.52	9.29	46.60	8.80	7.08
Experimental (without IWBs)	65	46.74	11.27	60.21	7.96	13.47
<b>Mean Difference</b>	<b>130</b>	<b>7.22</b>	<b>13.61</b>			<b>6.39</b>

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Table 2. shows the mean retention scores and standard deviation of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council. The result of the analysis showed that students who were taught IWBs (control) obtained mean scores of 39.52 and 46.60 respectively in their pretest and posttest with corresponding standard deviations of 9.29 and 8.80. On the other hand, students who were taught without had mean scores of 46.74 and 60.21 respectively in their pretest and posttest with corresponding standard deviations of 11.27 and 7.96. From the result, it showed that learning took place. This is because the two groups achieved higher posttest mean scores than

their pretest mean scores. However, the post-test mean achievement scores of the experimental group were higher than the post-test mean achievement scores of the control group. In addition, the standard deviation score of the posttest for students who were taught was 7.96 while the control group was 8.80 indicating that the student's scores were clustered around the mean with the experimental group than the control group. Hence, it was deduced that students who were taught without IWBs retained more.

**Hypothesis 1:** There is no significant difference in the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council

**Table 3: Summary of One-way ANCOVA on the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.046 <sup>a</sup>	1	.046	.036	.850
Intercept(with IWBs)	2015.462	1	2015.462	1557.788	.000
Without IWBs	.046	1	.046	.036	.000
Error	395.902	128	1.294		
Total	2412.000	130			
Corrected Total	395.948	129			

a. R Squared = .000 (Adjusted R Squared = -.003)

Table 3 shows that  $F(1, 94) = 0.036$  and  $\text{sig} = 0.000$ . Since the significant value for treatment  $p = 0.000 < 0.05$ , the test statistic is considered significant. The null hypothesis of a significant difference between the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council was rejected. This means that the difference in mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council was statistically significant.

**Hypothesis 2:** There is no significant difference in the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council



**Table 4: Summary of One-way ANCOVA on the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional method in public secondary schools in Abuja Municipal Area Council**

Source	Type III Sum of Squares	Df	Mean Square		
			F		Sig.
Corrected Model	.374 <sup>a</sup>	1	.374	.289	.591
Intercept(with IWBs)	1859.283	1	1859.283	1438.264	.000
Without IWBs	.374	1	.374	.289	.026
Error	395.574	128	1.341		
Total	2412.000	130			
Corrected Total	395.948	129			

a. R Squared = .001 (Adjusted R Squared = -.002)

Table 4 shows that  $F(1, 94) = 0.289$  and  $p = 0.026$ . Since the significant value for method  $p = 0.026 < 0.05$ , the test statistic is considered to be significant. There was a significant difference between the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council. Thus, treatment was a significant factor as regards students' retention in teaching computer studies.

### Discussion of Findings

The effect of interactive whiteboards on students' academic achievement and retention in computer studies among junior secondary schools in Abuja Municipal Area Council was statistically significant for both the IWBs class) and none-IWBs class. Research question one sought to find the mean achievement scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council and it was found that students who were taught without IWBs achieved higher than those with IWBs. Also, research hypothesis one found that the difference in mean achievement scores of students mean achievement scores of students taught computer studies with

interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council was statistically significant. The findings were in agreement. Gabriel (2019) however argues that the majority of public secondary schools in Nigeria are not equipped with interactive whiteboards. This is so because the public school that is well equipped with IWB technology will always deliver better.

Research question two sought to find the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council and it was deduced that students who were taught without IWBs retained more. The hypothesis showed that there was a significant difference between the mean retention scores of students taught computer studies with interactive whiteboards and those taught with conventional methods in public secondary schools in Abuja Municipal Area Council was rejected. Thus, treatment was a significant factor as regards students' retention in teaching computer studies.

### Conclusion

Based on the findings of the study, it is therefore concluded that the use of interactive whiteboards

significantly contributes to students' academic achievement and retention. Interactive whiteboards enhance students' academic achievement and retention in computer studies among Junior secondary school students in Abuja Municipal Area Council. Lack of IWBs in secondary schools, inadequate power supply, and lack of technical knowledge of IWBs by teachers are constraints to the use of interactive whiteboards in enhancing students' academic achievement and retention.

### **Recommendations**

Based on the objectives and findings of the study, the following recommendations were put forward.

1. Government at all levels should equip the schools with adequate ICT media like interactive whiteboards to enhance students' academic achievement and retention in computer studies.
2. The government at all levels should ensure a stable power supply in all schools to facilitate the use of electronic-powered ICT media like interactive whiteboards.

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