

**Effect of Computer-Assisted Instruction on Motivation of Senior Secondary School
Agricultural Science Student in Kaduna State, Nigeria**

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Abstract

This study investigated the effect of Computer-Assisted Instruction (CAI) on the motivation of senior secondary school Agricultural Science students in Kaduna State, Nigeria. The study was motivated by the persistent use of conventional lecture methods, which are largely teacher-centered and have been associated with low student motivation and poor academic engagement in Agricultural Science. Grounded in Mayer's Cognitive Theory of Multimedia Learning, the study emphasized the role of interactive and multimedia-based instruction in enhancing students' learning experiences and motivation. A non-equivalent quasi-experimental research design was adopted, involving a sample of 130 SSII students drawn from two public secondary schools in Zaria Educational Zone. One group (68 students) was exposed to CAI (experimental group), while the other (62 students) was taught using the conventional lecture method (control group). Data were collected using a validated Student Motivation Questionnaire (SMQ) with a reliability coefficient of 0.79. Mean, standard deviation, and t-test statistics were used for data analysis at a 0.05 level of significance. The

findings revealed no significant difference in the baseline mean motivation of students in both experimental and control groups prior to the treatment, indicating initial equivalence. However, after the intervention, a significant difference was observed in the post-treatment motivation scores, with students in the experimental group demonstrating substantially higher motivation than their counterparts in the control group. The results confirmed that CAI had a significant positive effect on students' motivation. The study concluded that Computer-Assisted Instruction is an effective strategy for enhancing students' motivation in Agricultural Science. It was recommended, among others, that CAI should be integrated into the teaching of Agricultural Science, teachers should be trained in the use of ICT tools, and government should provide adequate technological infrastructure to support its implementation.

Keywords: Computer-assisted instruction, Motivation, agricultural science, secondary school

Introduction

Agriculture is the art and science of growing plants and rearing animals for food, human needs, and economic gain. In Nigeria, Agricultural Science is recognized as a vital subject taught at various levels of education to promote vocational skills and economic self-reliance. However, Agricultural Science education faces challenges such as poor and low among students (Nwike, 2024). The dominance of the conventional lecture method in Nigerian secondary schools has been widely criticized. The method is teacher-centered, encourages passive learning, and limits students' participation and interaction (Okpara, 2024). Research indicates that such instructional approaches negatively affect students' and motivation (Kailo, 2025). Conventional teaching emphasizes intellectual learning while neglecting experiential and interactive aspects of education, thereby limiting students' comprehension and engagement.

Information and Communication Technology (ICT) has transformed the educational landscape by introducing innovative teaching strategies (Kunwar, 2025). One such innovation is Computer-Assisted Instruction (CAI), which involves the use of computer-based educational software, multimedia tools, and interactive platforms to facilitate learning (Ahmed, 2023). CAI presents information in multiple formats including text, images, graphics, animation, and sound, thereby promoting active engagement and better understanding. Motivation plays a critical role in students' learning process. It provides direction, energy, and persistence toward achieving academic goals (Elvira et al., 2020). Studies have demonstrated that CAI significantly enhances students' motivation by making learning interactive, engaging, and self-paced (Mehmood, 2024; Sama'ila, 2024). Students exposed to technology-based instruction tend to develop better problem-solving skills, critical thinking abilities, and improved compared to those taught through conventional methods.

Despite the motivational benefits of CAI, students' performance in Agricultural Science in Kaduna State remains discouraging, as evidenced by WAEC Chief Examiners' Reports (2019–2024). These reports highlight weaknesses in practical agriculture, soil science, and agricultural economics. Therefore, this study investigates the effect of Computer-Assisted Instruction on the motivation of senior secondary school Agricultural Science students in Kaduna State.

Objective of the Study

The main objective of this study is to determine the effect of Computer-Assisted Instruction on the motivation of senior secondary school Agricultural Science students in Kaduna State, Nigeria.

Specifically, the study seeks to:

1. Determine the difference in the baseline mean motivation of senior secondary school Agricultural Science students in the experimental and control groups prior to treatment.
2. Determine the difference in the post-treatment mean motivation of senior secondary school Agricultural Science students in the experimental and control groups.

Research Questions

The study was guided by the following research questions:

1. What is the difference in the baseline mean motivation of senior secondary school Agricultural Science students in the experimental and control groups prior to treatment?
2. What is the difference in the post-treatment mean motivation of senior secondary school Agricultural Science students in the experimental and control groups?

Null Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

- H₀₁:** There is no significant difference in the baseline mean motivation of senior secondary school Agricultural Science students in the experimental and control groups prior to treatment.
- H₀₂:** There is no significant difference in the post-treatment mean motivation of senior secondary school Agricultural Science students in the experimental and control groups.

Literature Review

The study is grounded in Mayer's (2009) Cognitive Theory of Multimedia Learning (CTML), CAI enhances learning by combining verbal and visual representations in ways that

optimize cognitive processing. Mayer posits that students learn better when words and pictures are integrated meaningfully rather than presented separately. Clark and Mayer (2023) further emphasize that well-designed multimedia instruction reduces cognitive overload and enhances knowledge. Motivation plays a critical role in students' academic success. Elvira et al. (2020) defined motivation as a process that gives direction, energy, and persistence to learning behavior. Similarly, Mazumder (2014) noted that students must develop strong motivational levels to achieve educational goals effectively. Empirical studies show that CAI fosters students' intrinsic motivation by providing interactive content, immediate feedback, and learner control (Barut & Dursun, 2022; Mehmood, 2024).

In science and vocational subjects such as Agricultural Science, CAI enables visualization of abstract concepts like irrigation systems and soil processes, which enhances comprehension and engagement (Koranteng, 2023). Studies by Babale (2019) and Ibrahim (2024) revealed that students exposed to CAI performed significantly better in achievement and tests than those taught using conventional lecture methods. Despite the proven benefits of CAI, conventional teaching methods continue to dominate Nigerian classrooms (Okpara, 2024). The lecture method often limits student participation and reduces experiential learning opportunities (Kailo, 2025). Nwike (2024) observed that poor instructional approaches contribute to low achievement and in Agricultural Science. Given that Agricultural Science plays a vital role in Nigeria's economic development and food security (World Bank, 2021; Ndibuisi, 2024), there is a need for innovative teaching strategies such as CAI to enhance students' motivation and learning outcomes.

Methodology

The study adopted a non-equivalent quasi-experimental design using intact classes. According to Creswell (2018), quasi-experimental designs are suitable where random assignment is impractical. Creswell and Guetterman (2019) further noted that such designs are appropriate in educational settings where intact classes must be maintained. The study was conducted in Zaria Educational Zone, Kaduna State, Nigeria. Kaduna State lies between latitude 9°02'N and 11°32'N and longitude 6°15'E and 8°38'E, characterized by tropical wet and dry climate (Abaje et al., 2015). The population comprised 821 SSII Agricultural Science students in seventeen public secondary schools. A sample of 130 students from two randomly selected schools was used. One school (68 students) formed the experimental group, while the other (62 students) formed the control group. **Student Motivation Questionnaire (SMQ)** – 15-item Likert scale adapted from Reid and Mubeen (2016). Face and content validity were established by experts in Vocational and Foundation Education (Sekaran & Bougie, 2016). A pilot study yielded a reliability coefficient of 0.79, indicating acceptable reliability (Hair et al., 2017). Mean and standard deviation were used to answer research questions, while

independent and paired samples t-tests were used to test hypotheses at 0.05 significance level using SPSS version 25.

Results

Research Question 1: What is the difference in the baseline mean motivation of secondary school agricultural science students in the experimental and control groups prior to the treatment?

Table 1: Descriptive statistics of the mean motivation of secondary school agricultural science students.

Variable	Group	N	$\bar{X}$	SD
Baseline mean Motivation	Experimental	68	1.62	.49
	Control	62	1.61	.55
	Total	130		

Source: Field survey, 2025, Note: N=Number of students, M= Mean, SD= Standard deviation.

A descriptive statistic was performed to find out the difference in the baseline mean motivation of secondary school agricultural science students in the experimental and control groups prior to the treatment. The result in Table 1, revealed that there was no difference in the baseline mean motivation between the experimental (M =1.62, SD= .490) and the control group (M = 1.61, SD = .554). This implies that, both students in the experimental group and control group are in the same level of motivation.

Research Question 2: What is the post-treatment mean motivation of secondary school agricultural science students in the experimental and control groups?

Table 2: Descriptive statistics of the difference in the post-treatment mean motivation of secondary school agricultural science students

Variable	Group	N	$\bar{X}$	SD
Post-treatment mean motivation	Experimental	68	4.44	.500
	Control	62	1.84	.606
	Total	130		

Source: Field survey, 2025, Note: N=Number of students, M= Mean, SD= Standard deviation.

A descriptive statistic was performed to find out the post-treatment mean motivation of secondary school agricultural science students in the experimental groups. The result in Table 2, revealed that there was a difference in the post-treatment mean scores in motivation in the

experimental group ($M = 4.44$, $SD = .500$) and control group ($M = 1.84$, $SD = .606$). This indicated that, students in the experimental group are more motivated than those in the control group

Null Hypothesis 1: There is no significant difference in the baseline mean motivation of secondary school agricultural science students in the experimental and control groups prior to the treatment.

Table 3: Independent samples t-test baseline mean motivation of secondary school agricultural science students in the experimental and control groups prior to the treatment

Levene's Test for Equality of Variances								
Variable	Groups	N	M	SD	Df	t-value	Sig.	Decision
Pre-test	Experimental	68	1.62	.490	128	.052	.959	Accepted
	Control	62	1.61	.554				

Source: Field survey, 2025

Note: N =Number of students, SD = Standard deviation.

The results of the independent samples t-test in Table 3 showed a slight statistically significant difference in the baseline mean motivation of secondary school agricultural science students in the experimental ($M = 1.62$, $SD = .490$) and control groups ($M = 1.61$, $SD = .554$), $t(128) = .052$, $p = .000$ prior to the treatment. Consequently, Hypothesis 1 is accepted. This finding indicates that both students in the experimental and control group are at the same level of motivation.

Null Hypothesis 2: There is no significant difference in the post-treatment mean motivation of secondary school agricultural science students in the experimental group.

Table 4: Independent *samples t-test of the* post-treatment mean motivation of secondary school agricultural science students in the experimental group.

Levene's Test for Equality of Variances								
Variable	Groups	N	M	SD	df	t-value	Sig.	Decision
Post-test	Experimental	68	4.44	.500	128	26.797	.000	Rejected
	Control	62	1.84	.606				

Source: Field survey, 2025, Note: N =Number of students, Std. Dev= Standard deviation.

The results of the independent samples t-test in Table 4 showed a statistically significant difference between the post-test mean motivation scores of students in the experimental group ($M = 4.44$, Std. Dev = .500) and the control group ($M = 1.84$, Std. Dev = .606), $t(128) = 26.797$, $p = .000$. finding indicates that the CAI had a significant positive effect on the motivation of secondary school agricultural science students in Kaduna State, Nigeria.

Discussion of Findings

Difference in the Baseline Mean Motivation of Secondary School Agricultural Science Students in the Experimental and Control Groups Prior to Treatment

The findings of the study revealed that there was no significant difference in the baseline mean motivation of students in both the experimental and control groups prior to the treatment. This indicates that the two groups were statistically equivalent at the beginning of the study, thereby ensuring that any observed difference after the intervention could be attributed to the effect of Computer-Assisted Instruction (CAI) rather than pre-existing differences among the students. The similarity in mean scores (Experimental = 1.62; Control = 1.61) further confirms that both groups possessed nearly identical motivational levels before exposure to any instructional strategy.

This finding strengthens the internal validity of the study, as it demonstrates that the quasi-experimental design successfully controlled for initial group differences despite the use of intact classes. The result is consistent with the findings of Ibrahim (2024), who reported no significant difference between experimental and control groups at the pre-test stage in a similar CAI study. Such baseline equivalence is critical in educational research because it ensures fairness in comparison and supports the credibility of subsequent findings. Furthermore, the lack of difference at the pre-treatment stage suggests that the low motivation observed among students may be a general issue associated with the conventional lecture method commonly used in Nigerian secondary schools. This aligns with the observations of Okpara (2024) and Kailo (2025), who noted that traditional teaching approaches often lead to passive learning, reduced engagement, and diminished student motivation. Therefore, the pre-test result not only establishes group comparability but also highlights the broader challenge of low motivation in Agricultural Science prior to instructional innovation.

Difference in the Post-Treatment Mean Motivation of Secondary School Agricultural Science Students in the Experimental and Control Groups

The findings of the study showed a statistically significant difference in the post-treatment mean motivation scores of students in the experimental and control groups. Students exposed to Computer-Assisted Instruction recorded a substantially higher mean motivation

score ($M = 4.44$) compared to those taught using the conventional lecture method ($M = 1.84$). The large t -value ($t = 26.797$, $p < 0.05$) indicates that the observed difference was not due to chance, but rather the effect of the instructional strategy employed.

This result clearly demonstrates that CAI had a strong positive influence on students' motivation in Agricultural Science. The improvement in motivation among students in the experimental group can be attributed to the interactive, engaging, and learner-centered nature of CAI. Unlike the traditional lecture method, CAI incorporates multimedia elements such as text, images, animations, and audio, which stimulate learners' interest and sustain attention. It also allows for self-paced learning and immediate feedback, which are key factors in enhancing intrinsic motivation. The finding is in agreement with previous empirical studies. For instance, Mehmood (2024) and Sama'ila (2024) found that students exposed to technology-based instruction exhibited higher levels of motivation and engagement compared to those taught using conventional methods. Similarly, Barut and Dursun (2022) reported that multimedia learning environments significantly enhance students' interest, participation, and overall learning experience. The present study also supports the work of Koranteng (2023), who emphasized that CAI improves understanding of abstract agricultural concepts, thereby increasing students' confidence and willingness to learn.

From a theoretical perspective, the result aligns with Mayer's (2009) Cognitive Theory of Multimedia Learning, which posits that meaningful learning occurs when learners actively process information presented through both visual and verbal channels. The integration of multimedia elements in CAI reduces cognitive overload and facilitates deeper understanding, which in turn enhances motivation. Clark and Mayer (2023) further affirmed that well-designed multimedia instruction promotes active engagement and improves learning outcomes. In addition, the significant difference observed in this study underscores the limitations of the conventional lecture method, which has been criticized for promoting passive learning and limiting student interaction (Okpara, 2024). The low motivation score recorded by the control group further confirms that traditional instructional approaches may not adequately address students' learning needs in contemporary classrooms. Therefore, the superior performance of the experimental group highlights the effectiveness of CAI as a modern instructional strategy capable of transforming students' learning experiences.

Conclusion

The study concluded that Computer-Assisted Instruction significantly improves motivation among senior secondary school Agricultural Science students in Kaduna State, Nigeria. CAI promotes active engagement, enhances comprehension of agricultural concepts, and fosters sustained learning compared to conventional lecture methods. Integrating CAI into

Agricultural Science instruction can therefore address challenges of poor motivation and low academic performance in secondary schools.

Recommendations

Based on the findings of this study, the researcher recommended the followings:

1. Secondary schools should formally integrate CAI into Agricultural Science curriculum delivery.
2. Teachers should receive professional training on effective use of CAI tools.
3. Kaduna State Ministry of Education should provide adequate ICT infrastructure.
4. Continuous monitoring and evaluation should be conducted to assess CAI effectiveness.
5. Regular professional development workshops should be organized for Agricultural Science teachers.

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