

Effects of Computer-Aided Instruction on ... Usaini, J. & Basiru, M. (2025)

Effects of Computer-Aided Instruction on Attitude and Performance in Family Health Concepts among Upper Basic Students in Sabon Gari, Kaduna State, Nigeria

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Abstract

This study investigated the effect of Computer-Aided Instruction (CAI) on students' attitude and academic performance in Family Health concepts among Upper Basic II students in Sabon Gari Local Government Area, Kaduna State, Nigeria. A quasi-experimental pretest-posttest control group design was employed, involving 102 students from two public secondary schools. Participants were assigned to experimental and control groups. The experimental group was taught using a multimedia-based CAI package, while the control group was taught using the conventional method. Two validated instruments—the Family Health Concept Performance Test (FHCPT) and the Family Health Attitude Questionnaire (FHAQ) were used for data collection. Results indicated a statistically significant improvement in the experimental group's performance ($M = 28.37$, $SD = 1.73$) compared to the control group ($M = 15.61$, $SD = 2.41$), with a t -calculated value of 31.62 ($p < 0.05$). Similarly, the attitude scores favored the experimental group, as shown by a significant Mann-Whitney U -test result ($U = 75.30$, $p < 0.05$). These findings suggest that CAI enhances students' understanding and improve more positive attitudes toward Family Health concepts. The study concludes that CAI is an effective instructional strategy for attitude and academic performance of students in basic science. It recommends that policymakers and teachers integrate CAI into classroom instruction, supported by adequate infrastructure and teacher training, to improve teaching of Basic Science in Nigerian schools.

Keywords: Computer-Aided Instruction, Attitude, Familia Health, Academic Performance

Introduction

In the evolving landscape of global education, the integration of digital technology into teaching and learning has become not only desirable but essential. The growing complexity of knowledge, coupled with the diversity of learners' needs, demands instructional approaches that go beyond traditional teacher-centered methods (Ghaaleb, 2024). One such approach is Computer-Aided Instruction (CAI), which leverages multimedia tools to enhance learning through interactive, individualized, and engaging content delivery. According to Odey (2025), CAI has been identified as a promising innovation for improving learners' outcomes, especially in science-related subjects. Computer-Aided Instruction (CAI) is an instructional method that utilizes computers and software applications to present lessons, provide practice opportunities, and offer immediate feedback to learners (Owede, 2024). Its interactive nature promotes learner autonomy, enhances motivation, and facilitates the understanding of abstract concepts. Studies have shown that CAI significantly improves learners' academic performance and encourages positive attitudes toward the subject matter (Owede, 2024; Bakare, 2024). In contexts where students often struggle with understanding and comprehension and low attitude towards concepts such as family health, CAI can serve as a bridge to effective learning. Attitude toward learning, defined as a learned predisposition to respond favorably or unfavorably to academic content, plays a pivotal role in students' educational outcomes. Positive attitudes are associated with increased attitude, participation, and willingness to explore subject matter, while negative attitudes often lead to apathy, and academic underachievement (Katsantonis & Katsantonis, 2024). In the concept of health education, sensitive topics like hygiene, sexual health, and family responsibilities are taught, students' attitudes can significantly influence their academic performance and attitude. Thus, transforming negative attitudes into positive dispositions is a key goal of in improving academic performance in family health concepts (Kostić, 2024). According to Li et al., (2024) Academic performance refers to the measurable outcomes of learners' engagement with instructional content, typically assessed through tests, assignments, and other evaluative methods. Poor performance in science-related subjects at the basic education level has been a persistent challenge in Nigeria.

Effects of Computer-Aided Instruction on ... Usaini, J. & Basiru, M. (2025)

Several studies have attributed this to factors such as overcrowded classrooms, limited instructional materials, insufficient teacher training, and the use of monotonous teaching strategies (Vakili, et al., 2024). There is increasing agreement that innovative teaching methods like CAI can address these gaps by making learning more accessible, engaging, and efficient. Family Health, a sub-theme in the Basic Science curriculum, addresses topics such as Family Health, personal hygiene, family roles, reproductive health, and disease prevention. These topics are not only vital for academic purposes but are crucial for developing responsible and healthy adolescents. However, research has indicated that many students find Family Health topics abstract or embarrassing, especially when taught using conventional chalk-and-talk methods (Yillah et al., 2025). Students often exhibit low attitude, poor understanding, and negative attitudes, which in turn reflect in their academic performance.

Empirical studies have emphasized the positive impact of CAI on both affective (attitude) and cognitive (performance) learning outcomes. For instance, Haruna and Ambode (2024) and Nganyadi(2024) reported that, students taught with CAI performed significantly better than those exposed to conventional method in Basic Science. Similarly, Delello (2025) found that CAI helped in reshaping students' attitudes by providing a non-threatening, personalized learning environment. These findings show the potential of CAI as an effective instructional method in enhancing learning across various subjects. Despite these, there remains a gap of localized research examining the application of CAI in specific content areas like Family Health within Nigeria's Basic Education sector. there is a need for innovative teaching approaches that can make learning more meaningful, inclusive, and effective. It is against this background that this study investigates the effect of Computer-Aided Instruction on attitude and performance in Family Health concepts among Upper Basic II students in Sabon Gari LGA, Kaduna State, Nigeria.

In recent years, the consistent low performance of students in science-related subjects at the basic education level in Nigeria has raised serious concerns among educators, researchers, and policymakers. Despite curriculum reforms and teacher capacity-building programs, many students continue to exhibit low academic performance and negative attitudes toward core science topics such as Family Health, a concept central to the Basic Science curriculum that addresses hygiene, Family Health, family responsibilities, and reproductive health (Siphukhanyo & Olawale, 2024). According to Okpara and Ezeador (2024) Conventional teaching methods, often characterized by teacher-centered delivery, rote memorization, and inadequate use of instructional media, have been widely criticized for failing to stimulate learners' attitude. Family Health, being both sensitive and context-dependent, requires student-centered and interactive strategies that not only enhance understanding but also shape students' attitudes positively. However, the teaching methods commonly used in classrooms often fall short of achieving this dual objective (Du & Han, 2024). Several studies conducted have shown that Computer-Aided Instruction (CAI) can significantly improve students' academic performance and positively influence their attitude toward learning (Bakare, 2024; Owede, 2024; Panga et al., 2025; Uwaifo, et al., 2025). Yet, there is a noticeable gap in empirical research regarding the use of CAI specifically for teaching family health concept at the Upper Basic level. Therefore, this study investigated the effect of Computer-Aided Instruction on students' attitude and academic performance in Family Health concepts among Upper Basic II students in Sabon Gari Local Government Area of Kaduna State, Nigeria.

Objectives of the Study

The main objective of the study is to investigate the effect of Computer-Aided Instruction on Attitude and Performance in Family health Concept among Upper Basic II students in Sabon Gari Local Government, Kaduna state, Nigeria. Therefore, the study specifically aims to:

1. Determine the effect of Computer-Aided Instruction on Upper Basic II students' academic performance in family health concept.
2. Examine the effect of Computer-Aided Instruction on Upper Basic II students' attitude in family health concept.

Research Questions

The following research questions guided the study:

1. What is the difference between the mean academic performance scores of Upper Basic II students taught family health concepts using Computer Aided Instruction and those taught using conventional method?
2. What is the difference between the attitude level of students taught family health concepts using Computer Aided Instruction and those taught using conventional method?

Null Hypotheses:

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

H₀₁: There is no significant difference in the mean academic performance scores of students taught the family health concept using Computer-Aided Instruction and those taught using conventional method.



Effects of Computer-Aided Instruction on ... Usaini, J. & Basiru, M. (2025)

H₀₂: There is no significant difference in the attitude of students taught the family health concept using Computer-Aided Instruction and those taught using conventional method.

Methodology

This study adopted a quasi-experimental research design, pretest-posttest non-equivalent control group design. This design was chosen because it allows for the comparison of outcomes between a group exposed to the treatment and a group taught using the conventional method, without the need for random assignment of subjects (Sambo, 2008). The design is appropriate for educational settings where intact classes are used. The population for this study comprised all Upper Basic II in Sabon Gari Local Government Area of Kaduna state, Nigeria during the 2024/2025 academic session. The population was selected because family health is a key component of the Upper Basic II Basic Science curriculum, and students at this level have already acquired foundational knowledge suitable for this study. A total of 102 Upper Basic II students selected from two public secondary schools in Sabon Gari Local Government Area participated in the study. A purposive sampling technique was used to select schools that had basic computer facilities. The sampled schools were assigned to experimental and control groups. Two instruments were developed and validated for data collection: the Family Health Concept Performance Test (FHCPT) which is a 30-item multiple-choice test designed to assess students' performance in family health concepts. The test items were derived from the Basic science past Basic Certificate Examination questions 2020-2025. The instrument was validated by experts in the Department of Science Education, Ahmadu Bello University, Zaria. A reliability coefficient of 0.83 was obtained using the Pearson Person Moment Correlation Coefficient (PPMC) by test-retest method at an interval of two weeks.

The Family Health Attitude Questionnaire (FHAQ) is a 20-item Likert-type questionnaire developed to measure students' attitude in family health concept. The items were scored on a 5-point scale (Strongly Agree to Strongly Disagree). The FHAQ was validated by experts from the Department of Educational Psychology and Counselling, Ahmadu Bello University, Zaria. Cronbach's Alpha was used to determine the reliability, yielding a coefficient of 0.79. The experimental group was taught using a Computer-Aided Instruction (CAI) package specifically developed for teaching the family health concept. The CAI included multimedia animations, and simulations designed to promote active learning. The lesson was delivered over a 6-week period, with two 40-minute Basic science lessons per week. The control group was taught the same content using the conventional method, Posttests was administered to both groups at the end of the 6-week instruction. The FHCPT and FHAQ were administered as posttests to both groups by the researcher. The data obtained were analyzed using descriptive and inferential statistics. Mean, standard deviation, mean rank and sum of rank were used to answer the research questions on performance and attitude of students in each group. Independent sample t-test and Mann Whitney U-test were used to test the null hypotheses and determine the effect of CAI on students' performance and attitude in family health concept. The null hypotheses were tested at 0.05 level of significance.

Presentation of Results

Research Question One: What is the difference between the mean academic performance scores of Upper Basic II students taught family health concepts using Computer Aided Instruction and those taught using conventional method? This research question was answered using mean and standard deviation.

Table 1 Mean and Standard Deviation of Posttest Scores of FHCPT for Experimental and Control Groups

Group	N	Mean	Std Deviation	Mean difference
Experimental	50	28.37	1.73	12.76
Control	52	15.61	2.41	

Table 1 shows that the experimental group has a mean score of 28.37 and a standard deviation of 1.73, while the control group has a mean score of 15.61 and standard deviation of 2.41 and a mean difference of 12.76. This implies that experimental group performed better than control group. To find out whether significance difference exist or not, null hypothesis one was tested.

Null Hypothesis One: There is no significant difference in the mean academic performance scores of students taught the family health concept using Computer-Aided Instruction and those taught using conventional method.

To test this null hypothesis, independent sample t-test was used, a summary of the analysis is presented in Table 2.



Effects of Computer-Aided Instruction on ... Usaini, J. & Basiru, M. (2025)

Table 2: Summary of t-test Analysis of Post FHCPT Scores of Students in Experimental and Control Groups.

Group	N	Mean	Std. Deviation	Df	t-cal	P-value	Decision
Experimental	50	28.37	1.73	100	31.62	0.000	*Sig
Control	52	15.61	2.41				

*Significant at $P \leq 0.05$ level of significance

Result from Table 2, shows that the t-calculated is 31.62 and a P-value of 0.000 at the degree of freedom of 100 is obtained. The P-value is less than the alpha value of 0.05. Hence, the null hypothesis is rejected. This means that, there is a significant difference in the mean academic performance scores of SS2 Basic science students taught family health concept using Computer Aided Instruction. This difference is in favour of the experimental group. This also implies that; Computer Aided Instruction is effective for improving the performance of students in the experimental group.

Research Question Two: What is the difference between the attitude level of students taught family health concepts using Computer Aided Instruction and those taught using conventional method?

Here, the mean rank of students post attitude scores in the experimental and control groups were compared and presented in Table 3

Table 3: Summary of Mean Rank Attitude Scores of FHAQ for the Experimental and Control Groups

Group	N	Mean Rank	Sum of Rank	Mean Rank Difference
Experimental	50	91.17	4758.50	56.26
Control	52	34.91	1815.50	

From Table 3, the mean rank value 91.17 was obtained in the experimental group with a value of 4758.50 as the sum of rank; while in the control group, a mean rank value of 34.91 with a sum of 1815.50 was also obtained. A mean rank difference of 56.26 was computed, this shows that the experimental group develop a higher attitude than the control group.

To find out where significance difference exists, null hypothesis two was tested.

Null Hypothesis Two: There is no significant difference in the attitude of students taught the family health concept using Computer-Aided Instruction and those taught using conventional method.

Mann-Whitney U-test was used to test this hypothesis using post attitude ranking of the students in both experimental and control groups. The details of the result were presented in Table 4.

Table 4: Summary of Mann- Whitney U-test Analysis of Scores for Students in the Experimental and Control Groups.

Group	n	Mean Rank	Sum of Rank	U-value	P-value	Decision
Experimental	50	91.17	4758.50	75.30	.000	Sig*
Control	52	34.91	1815.50			

*Significant at $P \leq 0.05$ level of significance

Results in Table 4 shows that, the mean rank of 91.17 was obtained by the experimental group and a sum of 4759.50. On the other hand, the mean rank value of the control group was 33.87 and the sum of rank was 1815.50. The Mann-Whitney U-value was 75.30. Since the P-value of .000 is less than 0.05, there is significant difference between the attitude level of students in the experimental and control groups in favour of the experimental group who were taught family health using Computer Aided Instruction. Hence, the null hypothesis is rejected. This implies that, Computer Aided Instruction enhances students' attitude than Conventional method.

Discussion of Findings

Result showed that there is a significant difference in the mean academic performance scores of students taught family health concepts of Basic science with Computer Aided Instruction and those taught with Conventional method. This shows that Computer Aided Instruction is effective in improving the performance of students in the experimental group. However, those taught family health concept using Computer Aided Instruction acquired significantly higher performance mean scores than those taught family health concept using Conventional method. This finding agrees with those of Bakare (2024); Owede (2024) and Uwaifo et al., (2025) who found that students who were taught using Computer Aided Instruction gained better academic

Effects of Computer-Aided Instruction on ... Usaini, J. & Basiru, M. (2025)

performance as a result of their engagement as compared to those taught using Conventional method. From findings of the study, the results also revealed a significant difference in the attitude level of students exposed to Computer Aided Instruction and conventional method. The significant difference is in favour of the experimental group as revealed in the mean rank value, mean value and U-value. This finding is in line with Bakare (2024) and Panga et al., (2025) who reported that, students taught using Computer Aided Instruction had significant higher attitude in than those taught using conventional method. Thus, the learning being meaningful to them led to continually sustained attitude in learning.

Conclusion

The findings of this study have clearly demonstrated that Computer-Aided Instruction (CAI) is an effective instructional strategy for improving both academic performance and attitude of Upper Basic II students in the Family Health concept of Basic science. This implies that CAI promotes better comprehension of complex and abstract Basic science content by integrating visual and interactive elements that enhance cognitive engagement. Furthermore, the study revealed that students in the experimental group also developed a significantly higher level of attitude in the Family Health topic. This suggests that CAI not only supports academic achievement but also positively influences students' attitudes to engage with scientific content. The integration of CAI in Basic science teaching provides a way for addressing persistent challenges of poor performance and low attitude in scientific concepts such as Family Health.

Recommendations

Based on the conclusions drawn from the findings of this study, the following recommendations are made:

1. The Federal and State Ministries of Education, through relevant agencies, should equip public secondary schools with functional computer laboratories, digital projectors, and reliable power supply to support the effective implementation of CAI in science classrooms.
2. Regular in-service training, workshops, and seminars should be organized for Basic science teachers to build their capacity in designing, adapting, and delivering CAI-based lessons, ensuring they are equipped with the technical and pedagogical skills necessary for technology integration.
3. Curriculum developers and the Nigerian Educational Research and Development Council (NERDC) should incorporate CAI-based activities and resources explicitly in the Basic science curriculum, especially in conceptually challenging areas like family health.
4. School-Based Initiatives School administrators should encourage teachers to adopt blended learning models, combining CAI with Conventional methods to accommodate diverse learners' needs and enhance science education delivery.

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Effects of Computer-Aided Instruction on ... Usaini, J. & Basiru, M. (2025)

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