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Research Article

Assessment of Students' Attitude Towards Learning of Physics in Senior Secondary Schools Using Inquiry-Based and Computer Assisted Instructional Strategies

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Abstract
The study focused on assessment of students' attitude on learning of physics in Senior Secondary Schools using Inquiry-Based method and Computer-Assisted Instruction. A quasi-experimental design using a pretest, posttest, three groups was employed for the study. The sample consisted of 90 Physics students randomly selected from Government Secondary Schools in Southwest Nigeria. Two Null Hypotheses were raised for this study and tested using One-Way ANOVA. The study revealed the homogeneity in the attitude of the three groups through the pre test performance prior to the treatment. The study shown that there was significant difference between the posttest attitude means scores of students in the Computer Assisted Instruction and Control group at 0.05 level of significance. Similarly, the mean difference between the posttest attitude mean scores of students in Inquiry and Control groups is statistically significant at 0.05 level.
The study also showed that both Computer-Assisted Instruction and Inquiry-Based method of teaching generate enthusiasm and interest in students which invariably lead to positive attitudes towards learning and comprehending scientific concepts. It was therefore recommended that Computer-Assisted-Instruction and Inquiry-Based Method should be given priority as a teaching strategy in the teaching and learning of Physics in Nigeria Secondary Schools.

Keywords: *Computer Assisted Instruction, Conventional method, and Inquiry-Based method.*

INTRODUCTION
Attitude refers to an individual's predisposition or tendency to respond positively or negatively toward a particular idea, object, person, or situation. It strongly influences behavior, decision-making, and the quality of learning outcomes. Attitudes are shaped by a combination of cognitive (knowledge), affective (feelings), and behavioral components (actions), and they significantly impact an individual's perception and engagement with learning (Ajzen, 2005; Eagly & Chaiken, 2007)

According to contemporary educational psychology, attitude is not merely an opinion or general feeling about something; it is a psychological construct that reflects a person's likes or dislikes and can be positive, negative, or neutral (Fraser, 2010). Gul and Arshad (2012) also emphasized that attitude functions as a hypothetical construct that reveals an individual's emotional orientation toward a subject or activity.

In the context of science education, especially subject like Physics, attitude is a critical yet often overlooked component. Research shows that developing a positive attitude toward science is more impactful for long-term engagement and achievement than simply acquiring factual knowledge (Osborne, Simon, & Collins, 2003). A learner's attitude influences not only their motivation and interest but also their persistence and performance in science-related tasks.

Reid (2003) underscored the integral role of attitude in the teaching and learning process, arguing that effective science education cannot occur in isolation from the affective domain. Both teacher and student attitudes must align positively to create a productive and outcome-driven learning environment. Factors influencing students' attitudes toward science subjects such as Physics include teaching methods, gender, self-efficacy, parental influence, teacher enthusiasm, classroom environment, and perceived relevance of the subject to future careers (Toma, Şerban, & Zaharia, 2021).

Negative attitudes toward science can hinder learning and discourage students from pursuing science-related fields. Therefore, fostering positive attitudes should be a deliberate and central focus in science education. Teachers and curriculum developers must recognize the emotional and motivational dimensions of learning, as these significantly contribute to student engagement and success in science subjects.

A number of researches are carried out about attitude towards (Physics) Science and relationship of attitude and academic achievements of students. Gungor et al, 2007; Papanastasious & Zembylas, 2002; Read & Skyabina, 2002 indicated many factors that contribute to negative attitude of students towards science subjects. The factors are associated to schools and science classes. Other factors include teaching methodology, gender motivation, presentation of lessons, science subject intelligence, science teachers' attitude towards students, self adequacy, influence of parents, previous knowledge, career interest, family background of students, implementation of science and achievements. The learner's attitude towards science is associated with academic achievement (Ajzen & Fishkein, 2000). Learners' interest, motivation, and academic achievement in science particularly in Physics are closely linked to their attitudes. A positive attitude enhances engagement with the science curriculum, fosters appreciation for the science learning environment, and improves relationships with science teachers (Osborne, Simon, & Collins, 2020). Indeed, a student's disposition toward science may have a greater long-term impact than their immediate academic success, influencing future choices, including career paths in science-related fields (Duschl, Maeng, & Sezen, 2021). It is therefore essential that any measurement of students' attitudes toward Physics includes not only content-related perspectives but also their perceptions of the learning environment and instructional strategies.

Craker (2006) noted that student attitudes can change with experience, and such change is influenced by factors such as the relevance of the content, the nature of the learning context, and the manner in which educational activities are structured. More recent research by Kim and Hodges (2021) supports this, suggesting that experiential and student-centered teaching approaches foster more favorable attitudes toward science. Studies by Adesoji (2008) and Gök and Silay (2008) have also highlighted that teacher pedagogy plays a critical role in developing constructive attitudes toward science. Effective teaching approaches particularly those that are interactive and inclusive encourage students to view science as approachable and relevant.

Furthermore, research confirms that attitudes, whether positive or negative, significantly affect learning outcomes in science. Negative attitudes act as barriers to understanding and reduce students' willingness to engage with the subject (Erdemir, 2009; Toma, 2021). Conversely, positive attitudes promote resilience and deeper learning. In a study on the relationship between teachers' attitudes and students' academic performance, Yara (2009) emphasized that attitude reflects one's overall approach to thinking, acting, and behaving. This outlook influences not only the individual student but also the dynamics within the classroom and the broader educational environment.

Reid (2003) also highlighted that attitude is an integral part of the teaching-learning process, asserting that meaningful learning cannot occur in isolation. Both learners' and teachers' attitudes contribute to the effectiveness of the educational process. A well-developed attitude encompasses self-awareness, environmental awareness, and awareness of social associations all of which are crucial for meaningful engagement and sustained interest in Physics.

Teachers are expected to adopt engaging, student-centered methods that not only improve academic outcomes but also foster enduring positive attitudes toward science. Recent pedagogical research supports this perspective, emphasizing that teaching strategies should prioritize student interest, active participation, and inquiry to improve attitudes and performance (Akpan & Igwe, 2021).

Inquiry-based science teaching, which involves helping students develop the processes and skills used by scientists to understand the natural world, is particularly effective in promoting deeper engagement. Through guided investigations and problem-solving tasks, students are encouraged to generate questions, formulate hypotheses, collect data, and draw conclusions—practices central to scientific inquiry (Bybee, 2018). This approach, often called "guided discovery," positions teachers as facilitators who support students' learning journeys, leading to stronger conceptual understanding and critical thinking skills (Harlen, 2022). Inquiry-based learning also supports the assimilation and accommodation of new knowledge and is vital for cultivating higher-order thinking abilities (OECD, 2019).

In addition to inquiry, the integration of technology in science education—particularly through Computer-Assisted Instruction (CAI)—has become increasingly relevant. Collette and Collette (2001) defined CAI as an instructional method that uses computer-based tools to enhance motivation and reinforce learning. This approach provides immediate feedback, allows self-paced learning, and often incorporates game-like elements that make science instruction more interactive and engaging. CAI promotes active learning, enabling students to construct their own understanding and apply knowledge to scientific problems (Yusuf & Fakomogbon, 2020). Alexander (2001) argued that such technology-rich environments improve achievement and motivation by encouraging students to take ownership of their learning, facilitating deeper comprehension and skill transfer.

PURPOSE OF STUDY

The purpose of this study was to assess students' attitude on learning of Physics in Secondary School using Inquiry-Based and Computer-Assisted –Instruction method of teaching.

Hypotheses: Two null hypotheses were formulated for the study

Ho_1 – There is no significant difference in the pre-test attitude mean scores of students in the three groups.

Ho_2 – There is no significant difference in the post-test attitude mean score of students in the three groups.

MATERIALS AND METHODS

Design: The study employed the use of quasi experimental design using a pre-test, post-test three group design. The three groups were;

- Inquiry-Based group (Experiment I)
- Computer-Assisted-Instruction group (Experiment II)
- Conventional Method group (Control)

The design is represented diagrammatically thus:

Experimental Group (G_1):	O_1	X	O_2
Experimental Group (G_2):	O_3	Y	O_4
Control Group (G_3):	O_5	Z	O_6

Subject: The subject for the study comprised 90 Senior Secondary School two (SSS2) Physics Students randomly selected from three states in Southwest Nigeria. The Multistage random sampling was used to select the sample. The first stage involved the random selection of the three states within the six-geopolitical Zone in Southwest which include Oyo, Osun and Ekiti State. Three government Secondary Schools were selected using purposive sampling techniques.

Instrumentation: The research instrument that were used for the study include Physics Achievement Test (PAT) and Physics Attitudinal Scale (PAS). The instrument (PAT) consisted of 40 objective test items constructed by the researchers based on the topics in the package, these include Projectile, Linear momentum and Light. The Instrument was subjected to screening by experts in Physics to ensure the Face and Content validity. The reliability of the instrument PAT and PAS were ascertained using test-retest method. The reliability coefficient of 0.85 was obtained which is considered high enough for reliability of the instrument.

Procedure and Data Analysis: The research was carried out in three stages, administration of pretest, the treatment and post test. The students in all the three groups were exposed to different treatments. The pretreatment stage (two weeks), the treatment stage (four weeks) and the post treatment stage (two weeks). The whole study covered eight weeks. The experimental group (G1) was exposed to the Inquiry-Based method, the Computer Assisted Group which was experimental group (G2) were taught using specially designed package while the third group (G3) which is the Control group was exposed to Conventional method. All the students in the three groups attempted the pre test and post tests before and after the treatment respectively. The performances of the students were analyzed using inferential statistics. One way Analysis of Variance (ANOVA) was used to test the two hypotheses raised for the study.

RESULTS

Ho_1: There is no significant difference in the pre test attitude mean scores of Students' in the three groups before the treatment.

In order to test this hypothesis, scores of the students in the three groups were computed and subjected to statistical analysis involving Analysis of Variance (ANOVA) at 0.05 level of significance. The result is presented in Table 1.

Table 1: ANOVA showing pre-test attitude mean scores of the students in the three groups.

Source	***SS***	***df***	***MS***	***F***	***P***
Between Groups	160.622	2	80.311	.723	.488
Within groups	9658.667	87	111.019		
Total	9819.289	89			

P>0.05

Table 1 above shows that there is no significant difference in the pretest attitude mean scores of the students in the three groups ($F_{2,\ 87} = 0.723$; $p>0.05$). The null hypothesis is not rejected. This implies that there is no significant difference in the pretest attitude means scores of the students in the three groups.

Ho_2: There is no significant difference in post test attitude mean scores of the Students' in the three groups.

To test this hypothesis scores on Post test attitude mean scores of the students in the three groups were computed and subjected to statistical analysis involving Analysis of Variance (ANOVA) at 0.05 level of significance. The result is shown in Table 2.

Table 2: ANOVA of the posttest attitude means scores of the students in the three groups

Source	***SS***	***df***	***MS***	***F***	***P***
Between Groups	4682.222	2	2341.111	24.490	.000
Within groups	8316.667	87	95.594		
Total	12998.889	89			

P<0.05

Table 2 above shows that there is significant difference in the post-test attitude mean scores of the students in the three groups ($F_{2,\ 87} = 24.490$; $P<0.05$). The null hypothesis is rejected. This implies that there is significant difference in the post-test attitude means scores of the students in the three groups. In order to locate the sources of significance difference among the groups, Scheffe Post hoc analysis was used. The result is presented in Table 3.

Table 3: Scheffe Posthoc showing posttest attitude means scores of the students by treatment.

Group	***Control***	***Computer Assisted Instruction***	***Inquiry-Based***	***N***	***Mean***
Control		*	*	30	125.00
Computer assisted instruction				30	139.00
Inquiry				30	141.33

The result in Table 3shows that there is significant difference between the posttest attitude mean scores of students in the Computer Assisted Instruction and control group at 0.05 level of significance. Similarly, the mean difference between the posttest attitude mean scores of students in Inquiry and control groups is statistically significantly at 0.05level.

DISCUSSION

The results of the analysis indicated that there was no statistically significant difference in the pre-test attitude mean scores among the students in the three instructional groups. This suggests that students' initial attitudes toward Physics were comparable across the groups prior to the intervention. However, a key finding of the study revealed a significant difference in the post-test attitude mean scores among the groups. Specifically, students in the Computer-Assisted Instruction (CAI) and Inquiry-Based Learning (IBL) groups demonstrated significantly more positive attitudes toward Physics compared to those in the Conventional Teaching group. This implies that both CAI and IBL were effective in enhancing students' attitudes toward the subject.

Further findings showed that the Inquiry-Based Learning approach, in particular, had a strong positive effect on students' attitudes and their engagement in Physics learning. This supports the assertion that inquiry-based instruction not only deepens conceptual understanding but also fosters interest and positive dispositions toward science learning (Kim & Hodges, 2021; Harlen, 2022). Ashiq (2011) similarly observed that the inquiry method stimulates enthusiasm and interest in students, ultimately leading to more favorable attitudes and improved comprehension of scientific concepts. More recent research affirms that active, student-centered instructional methods such as inquiry and technology-enhanced learning—significantly contribute to improved student motivation, engagement, and achievement in science education (Bybee, 2018; OECD, 2019; Yusuf & Fakomogbon, 2020).

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, it is concluded that both the Inquiry-Based Learning (IBL) method and Computer-Assisted Instruction (CAI) significantly enhance students' attitudes toward the learning of Physics. These instructional approaches not only improve engagement but also foster sustained interest and positive dispositions toward the subject.

In light of these findings, it is recommended that Physics educators at the secondary school level prioritize the adoption of Inquiry-Based and Computer-Assisted instructional strategies in their teaching practice. These methods should be integrated more systematically into classroom pedagogy to promote active, student-centered learning experiences. Furthermore, the development and implementation of CAI instructional packages should be encouraged and supported through curriculum planning.

It is also recommended that the Federal Ministry of Education and relevant curriculum development bodies consider incorporating these innovative teaching approaches into the national Physics curriculum. This would align with the objectives of the *National Policy on Education* in Nigeria, which emphasizes the use of modern, technology-driven, and learner-centered pedagogies to enhance teaching and learning outcomes.

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