

# Motivating Students' Learning Outcomes Through Inquiry-Based Strategy In Junior Secondary Schools In Basic Science In Ondo State, Nigeria

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*Abstract: This paper examined the effects of Inquiry-based strategy in motivating students' learning outcomes in Basic Science in junior secondary schools in Ondo State. The study adopted a quasi-experimental pre-test, post-test, control group design. Four null hypotheses were generated and tested at 0.05 level of significance. The sample consisted of 120 junior secondary school II Basic Science students selected through multistage random sampling technique. The instrument that was used for the study was Basic Science Achievement Test (BSAT). It is a self-designed instrument that consisted of information on bio-data of the respondents and 40 multiple-choice items. Expert judgements were used to ensure face and content validity. Test-retest method was used to determine the reliability and reliability Coefficient of 0.72 was obtained. The data were analyzed using inferential statistics of t-test. The study found out that there was a significant difference between the posttest achievements means scores of students exposed to Inquiry-based strategies and conventional strategies. It was also revealed in the study that there was no significant difference between the posttest achievement and retention means scores of students exposed to conventional strategies. Based on this finding, it was recommended among other things that the state government should organize a seminar among the teachers in secondary schools on the effective use of Inquiry-based strategies in their various classes to enhance learning outcomes.*

*Keywords: Inquiry-based, Strategy, Learning outcome, Basic Science,*

## I. INTRODUCTION

Students' view of science affects the quantity and quality of knowledge acquired in the classroom. Their thoughts about science are the mirror of science education, since it is this very notion that influences their attitude and the way they perceive science and of course learning achievement in schools. Science and technology play a vital role in the lives of individuals and in the development of a nation. It is widely and generally acknowledged that the gateway to the survival of any nation socially and economically is through scientific and technological literacy which can only be achieved through science and technology education (Alebiosu and Ifamuyiwa, 2008).

Basic science and technology, formerly known as integrated science, is the first knowledge of science and technology which a child encounters at the junior secondary

school level. Hence, basic science and technology curriculum prepares students at the; junior secondary school level for the study of core science and technical subjects at the senior secondary school level (OlaREWaju, 1994). This implies that for a student to be able to study science and technical subjects at the senior secondary school level successfully, he/she has to be well grounded in basic science and technology at the junior secondary school level. In view of this, basic science and technology is being given greater emphasis at the junior secondary school in Nigeria. To further promote the study of science and technology, the FGN (2012) stressed that 60 percent of the students seeking admission into the nation's tertiary institutions should be admitted into science and technically-oriented programs, while the remaining 40 percent of the students could be admitted into Arts and Social Science programs. This is in a bid to encourage youngsters to select the study of science and technology subjects. In this

connection, educators are of the view that changes in students' outcomes must be supported by parallel changes in curriculum and methods of instruction (Ajibola, 2008).

In an attempt to improve the standard of science and technical subjects teaching and learning, a lot of research studies have been carried out. Studies in basic science and technology education have reported that many students at the junior secondary school level or upper basic level (as it is sometimes called) have developed negative attitudes towards the study of the subject. At this level, perhaps, many students, because of their low interest and achievement in the subject, do not seem to benefit much from the basic science and technology curriculum (Olanrewaju, 1999). There are a variety of methods for teaching basic science and technology, namely, project method, field trip, inquiry, exposition, demonstration, experimentation, guided discovery method, etc. All these methods rely on various forms of teacher-student activities. However, some are more activity oriented than others. The Inquiry-based method, for example, has been an effective approach which is activity based for both students and teachers. Since its inception, the term "inquiry" has been burdened with an identity crisis (Barrow, 2006). Originally, the term was used to invoke the idea of teaching science in the way it is actually practiced by scientists—problem solving through formulating and testing hypothesis (Dewey, 1910).

In inquiry based method, the instructor poses an initial problem such as in the "simple experiment" labs of Chinn and Malhotra but then guides the students in selecting variables, planning procedures, controlling variables, planning measures, and finding flaws through questioning that will help students arrive at a solution that motivates and boost their achievements.

Educationally, achievement may be defined as "the mastering of major concepts and principles, facts, skills and strategic knowledge. More systematically, achievement is sometimes fractionated into knowledge components (Ruiz-primo, 2011). Douglas and Kristin (2000) observed that students can learn both new concepts and skills while solving problems. They explained further that student's achievement improves when they are given the opportunity to discover and invent to be able to practice what they have learnt.

Retention, according to the Oxford advanced learners dictionary (7th edition) is the ability to remember a piece of information acquired over a period of time. The longer the period a student remembers what has been learnt the better the retention and vice-versa. Over the years, a number of methodological problems confront researchers who have tried to investigate the trace decay theory. One of the major problems of researchers is controlling for the events that occur between learning and recall. Clearly, the time between learning something and recalling it could be filled with all kinds of different events which makes it difficult to ascertain that any amount of forgetting which takes place is as a result of the decay in knowledge rather than a consequence of other intervening variables. Teaching methods or approaches, especially in the learning of science and technology are expected not only to enable students acquire knowledge but to retain same over a long period of time and discovery learning can assist in improving the understanding, critical thinking skills, problem solving skills, communication skills of

learners, increase the involvement of learners, both individually and socially, in exploring and critically solving problems.(Brown, 2004)

Several researchers have found that students' motivation to learn science tends to decrease during adolescence (Vedder-Weiss & Fortus, 2011). They stated that this decline is not an inevitable trend, since it is apparent only in traditional schools, but not in democratic ones in which students are allowed to make more choices about their learning. This finding can be explained by the Self-Determination Theory (SDT) (Deci & Ryan, 1985) claiming that self-determination foster motivation. According to Deci and Ryan's SDT, motivation can be distributed along a continuum from high to low levels of self-determination. The most self-determined style of motivation is intrinsic motivation. In addition, several types of extrinsic motivation have been proposed each with a different degree of self-determination. From a high to a low degree of self-determination, there is identified regulation where the individual's behavior reflects conscious values and is internalized as personally important. Moreover, regarding science education more particularly, it has been found that the more self-determined students' science motivation, the more likely they should consider an education and a career within a scientific field. More recent SDT-based research recommends a person-centered approach identifying four motivational profiles (Vansteenkiste and Lens, 2009): a good quality motivation group (i.e. high autonomous, low controlled motivation); a poor quality motivation group (i.e. low autonomous, high controlled motivation); a low quantity motivation group (i.e. low autonomous, low controlled motivation); and a high quantity motivation group (high autonomous, high controlled motivation). It has been found that high school and college students in the good quality motivation display the most optimal pattern of education outcomes and score highest on perceived-need supportive teaching (Vansteenkiste et al., 2009).

This finding stresses the importance of teaching and instruction which is able to better meet the satisfaction of three basic needs of motivation, i.e. 1) students' need for autonomy, 2) competence, and 3) relatedness (Deci & Ryan, 2000; Vansteenkiste et al., 2009). Teachers remark that students are more attentive, more collaborative, and more intellectually engaged in science when they are using Inquiry-based strategy and moreover some teachers indicate that students whose interest in science had been minimal in the past made impressive contributions using inquiry method and took science more seriously (Slotta & Linn, 2009).

In view of these; we should therefore continue to seek strategies which would improve students' mastery of the subject as well as their academic performance in schools.

## II. STATEMENT OF THE PROBLEM

The poor performance of some junior secondary school students in Basic science has been widely reported. However, one cannot shun the fact that, some schools are been deprived from well experienced teachers, who constantly face the challenges of the most effective methods of instruction that could enhance academic achievement and match the diversity

among students. It has also been observed by the researcher that many students, after learning about science concepts through activities that address the various intelligences and learning styles, still choose not to participate in classroom discussion. These situations seem to be hindering effective teaching and learning processes especially the issue of inappropriate instructional strategies which do not allow the students to be actively involved in the lectures. The students just listen to teachers without concentration or distracted by some factors that may result in reduced assimilation and low achievement. It is against these mentioned observations that this research was carried out to investigate the effects of Inquiry-based strategy in motivating students' learning outcome in basic science in junior secondary schools in Ondo State.

### PURPOSE OF THE STUDY

The purpose of this study was to examine the effect of Inquiry-based strategy in motivating students' learning outcome in basic science in junior secondary schools in Ondo State. In addition, the study will find out the achievement and retention levels of students exposed to inquiry method and those exposed to conventional method. The outcome of this effort will be used to suggest steps that can motivate and improve students' learning outcome in science.

### RESEARCH HYPOTHESES

- The following null hypotheses were generated and tested;
- ✓ There is no significant difference between the posttest achievement mean scores of students exposed to the inquiry-based strategy and conventional strategy
  - ✓ There is no significant difference between the posttest retention mean scores of students exposed to inquiry-based strategy and conventional strategy.
  - ✓ There is no significant difference between the posttest achievement mean scores and retention mean scores of students exposed to conventional strategy.
  - ✓ There is no significant difference between the posttest achievement mean scores and retention mean scores of students exposed to inquiry-based strategy.

### III. METHODOLOGY

The study was a quasi-experimental pre-test, post-test, control group design. The pre-test was to establish the knowledge base line of the students that was used for the study while the post-test will measure the level of academic performance of the students after treatment. The design of the study is represented as follows: Experimental Group =  $O_1 X_1$   $O_2$ , Control Group =  $O_3 X_2 O_4$ .

Where  $O_1, O_3$ , represent pre-test.  $X_1$ = inquiry-based strategy,  $X_2$ = Conventional method. Also,  $O_2, O_4$ , represent post-test.

The target population for this study was made up of all the public Junior Secondary School II Basic Science students in Ondo State. The sample for this study comprised 120 junior secondary school II Basic Science students selected from the

three senatorial districts in Ondo state using the multistage sampling technique. The first stage involved the selection of three local government areas across the three senatorial districts through random sampling technique. The local government selected were; Akure south, Owo and Okitipupa. The second stage also involved selection of one school from each local government area through random sampling technique, while the next stage involved the selection of forty (40) students from each of the sampled schools using stratified random sampling technique to ensure gender equality. Intact classes were used in each of the sampled schools. The instrument that was used for this study is Basic Science Achievement Test (BSAT). It is a self-designed instrument. Section A of the BSAT consisted of information on bio-data of the respondents while Section B consisted of 40 multiple-choice items that covers all the content of the chosen topics used as achievement test. Expert judgements were used to ensure face and content validity. Test-retest method was used to determine the reliability and reliability Coefficient of 0.72 was obtained.

### IV. RESULTS

*H1:* There is no significant difference between the posttest achievement mean scores of students exposed to the inquiry-based strategy and conventional strategy.

In testing this hypothesis, the mean total scores and standard error obtained from the posttest achievement mean scores of students exposed to the inquiry-based strategy and conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Group	N	Mean	SD	df	t-cal	t-table	Result
Inquiry-based method	60	11.46	3.71	119	14.41	1.98	Significant at $p < 0.05$
Conventional	60	7.66	2.85				

Table 1: The t-test showing the posttest achievement mean scores of students exposed to the inquiry-based strategy and conventional strategy

Table 1 shows that the achievement mean score of students exposed to inquiry-based strategy is 11.46 with standard deviation of 3.71, while the achievement mean score of students exposed to conventional method is 7.66 with standard deviation of 2.85. The t-calculated is 14.41, while the t-table is 1.98. Thus the t-calculated is greater than the t-table value; therefore, the null hypothesis is rejected.

*H2:* There is no significant difference between the posttest retention mean scores of students exposed to inquiry-based strategy and conventional strategy.

In testing this hypothesis, the mean total scores and standard errors obtained from posttest retention mean scores of students exposed to inquiry-based strategy and conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Group	N	Mean	SD	df	t-cal	t-tab	Result
Inquiry-based method	60	31.08	3.06	119	2.52	1.98	Significant at $p < 0.05$
Conventional method	60	31.40	3.14				

Table 2: the t-test showing the posttest retention mean scores of students exposed to inquiry-based strategy and conventional strategy

Table 2 shows that the retention means score of students exposed to inquiry-based strategy is 31.08 with standard deviation of 3.06, while the retention mean score of students exposed to conventional method is 31.40 with standard deviation of 3.14. The t-calculated is 2.52 while the table value is 1.98. Thus, the t-calculated is greater than t-table value, therefore, the null-hypothesis is rejected. This implies that there is a significant difference between posttest retention means scores of students exposed to inquiry-based strategy and conventional strategy.

H3: There is no significant difference between the posttest achievement mean scores and retention mean scores of students exposed to conventional strategy.

In testing this hypothesis, the mean total score and standard error obtained from the posttest achievement mean scores and retention mean scores of students exposed to conventional strategy were subjected to t-test analysis at 0.05 level of significance.

Group	Variable	N	Mean	SD	df	t-cal	t-table	result
Conventional Method	Achievement Retention	30	29.74	2.80	59	1.47	1.98	Not Significant at p<0.05
		30	27.54	2.84				

Table 3: The t-test showing the posttest achievement mean scores and retention mean scores of students exposed to conventional strategy

Table 3 shows that the posttest achievement mean score of students exposed to conventional strategy is 29.74 with standard deviation of 2.80, while the retention mean score of students exposed to conventional method is 27.54 with standard deviation of 2.84. The t-calculated is 1.47 while the t-table is 1.98. Thus the t-calculated is less than the t-table value; therefore, the null hypothesis is not rejected. This implies that there is no significant difference between the posttest achievements means scores and retention mean scores of students exposed to conventional strategy.

H4: There is no significant difference between the posttest achievement mean scores and retention mean scores of students exposed to inquiry-based strategy.

In testing this hypothesis, the mean total score and standard error obtained from the posttest achievement mean scores and retention mean scores of students exposed to inquiry-based strategy were subjected to t-test analysis at 0.05 level of significance

Group	Variable	N	Mean	SD	df	t-cal	t-table	result
Inquiry method	Achievement Retention	30	27.33	10.40	58	4.39	1.98	Significant at p<0.05
		30	13.63	16.24				

Table 4: The t-test showing the posttest achievement mean scores and retention mean scores of students exposed to inquiry-based strategy

Table 4 shows that the posttest achievement mean score of students exposed to inquiry-based strategy is 27.33 with standard deviation of 10.40, while the retention mean score of students exposed to inquiry-based method is 13.63 with standard deviation of 16.24. The t-calculated is 4.39 while the

t-table is 1.98. Thus the t-calculated is greater than the t-table value; therefore, the null hypothesis is rejected. This implies that there is a significant difference between the posttest achievement means scores and retention mean scores of students exposed to inquiry-based strategy

## V. DISCUSSION

The finding of the study revealed in hypothesis1 that there is significant difference between the posttest achievements mean scores of students exposed to the inquiry-based strategy and conventional strategy. The study also revealed in hypothesis 2 that there is a significant difference between the posttest retention mean scores of students exposed to inquiry-based strategy and conventional strategy. This is in accordance to the submission of Brown ((2004) who was of opinion that, teaching methods or approaches, especially in the learning of science and technology are expected not only to enable students acquire knowledge but to retain same over a long period of time and discovery learning can assist in improving the understanding, critical thinking skills, problem solving skills, communication skills of learners, increase the involvement of learners, both individually and socially, in exploring and critically solving problems. In hypothesis 3 there was no significant difference between the posttest achievement mean scores and retention mean scores of students exposed to conventional strategy. In hypothesis 4 there was a significant difference between the posttest achievement mean scores and retention mean scores of students exposed to inquiry-based strategy. This was also supported by Slotta & Linn (2009)., who asserted that teachers remark that students are more attentive, more collaborative, and more intellectually engaged in science when they are using Inquiry-based strategy and moreover some teachers indicate that students whose interest in science had been minimal in the past made impressive contributions using inquiry method and took science more serious and achieve overall improvement in motivation and learning outcome. It was therefore found from the study that students exposed to inquiry-based strategy performed better than those exposed to conventional method.

## VI. CONCLUSION

Based on the findings of this study, it was found that Inquiry-based strategy was more effective in teaching Basic Science than the conventional method. The Inquiry-based instructional strategy allows students to construct their own meanings and scaffold what they are learning with their peers, therefore has the potency of producing higher students' learning outcome. It is also concluded that a positive students' motivation through more active instructional strategy will go a long way in improving their achievement and retention in Basic Science. Therefore, teachers must assist their students in this direction to further enhance better learning outcome towards the subject.

## VII. RECOMMENDATIONS

Based on the findings, the researcher considers the following recommendations necessary:

- ✓ The curriculum planners should introduce some collaborative packages into the methodologies of teaching sciences to update teachers' knowledge on the application of the Inquiry-based strategy.
- ✓ Basic Science teachers should adopt Inquiry-based strategy in classrooms to enable students participate actively and interact to arouse their interest and improve their achievement and retention.
- ✓ Government should provide enabling environment for teachers and making the school conducive for participatory studentship.

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