

# Effects of Instructional Analogy (IA) and Lecture Method (LM) On Basic Science (BS) Students' Achievement and Attitude in Delta Central Senatorial District (DCSD)

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**Abstract:** *IA and LM's effects on achievement and attitude of students to BS in DCSD were investigated using 3x2 factorial quasi-experimental design. The population was 12,163 JSII Public Secondary schools' students in DCSD. 214 JSII Basic Science students in six intact classes participated in the study. Experts validated Basic Science Achievement Test (BSAT) and Basic Science Attitude Scale (BSAS) were used for the collection of data. BSAT and BSAS had 0.88 and 0.78 reliability coefficients. Analysis of Covariance was used to analyse the data that were acquired. The findings revealed a substantial difference in favour of IA between the mean achievement and attitude ratings of students who were taught BS using IA and LM. The study came to the conclusion that IA improves students' performance and attitude toward BS more than LM. It was recommended that BS teachers should use IA when instructing BS at the junior secondary level, among other things.*

**Keywords:** Instructional Analogy (IA), Lecture Method (LM), Achievement, Attitude

## Introduction

The world today and Nigeria in particular is undergoing great transformation as a result of advancement in science and technology. The multifaceted global transformations have an impact on human communities' technological, economic, social, cultural, and political advancement, particularly on those in emerging nations like Nigeria. In a general and global framework, education is a tactical tool for societal and economic change (Dike, 2004). Improvement of human capital necessary to face the existing and future difficulties of globalisation and economic knowledge is the main focus of educational systems all over the world. The nation (Nigeria) has undergone significant curriculum revision at the Basic Education level in order to accomplish this goal.

Following the Federal Government of Nigeria's decision to introduce the Universal Basic Education (UBE) programme in September, 1988, Igbokwe (2015) claims that the Nigerian Educational Research and Development Council (NERDC) realigned and reorganised all existing primary and Junior Secondary School (JSS) curricula into a 9-Year Basic Education Curriculum for implementation in Nigerian schools as of September, 2008 (Igbokwe, 2015). Basic Science and Technology (BST) is one of the subjects covered by the Universal Basic Education programme. BST is the new name for Integrated Science, formerly known as Junior Secondary School science. The 2012 revision of the Junior Secondary School (JSS) Basic Education Curriculum (BEC), which includes Basic Science, Basic Technology, Physical and Health Education, and Information Technology, resulted in the Basic Science and Technology Curriculum (BSTC) (IT). According to Igbokwe (2015), it was vital to integrate these science curriculum for the following reasons: the necessity of promoting novel approaches to teaching and learning that stimulate learners' creativity and critical thinking; the recommendation to lessen the number of disciplines given in junior secondary schools made by the Presidential Summit on Education in 2010; the need to promote the holistic view of science at all levels of education, and feedback from the implementation of the curricula in schools that identified repetition and duplication of topics as the principal cause of curricular overload.

The implementation of an effective teaching strategy is one of the conditions for the achievement of Basic Science and Technology (BST) objectives. Four subjects—Basic Science, Basic Technology, Information Technology, and Physical and Health Education—are combined to constitute the topic of BST. BS, a subset of BST, was the only topic of this study. As a result, the teaching approach used by teachers may either improve or hinder students' progress in basic science. Therefore, the purpose of this study is to investigate the effects of the teacher's chosen teaching style on academic performance and attitudes of students to BS, one of the courses included in the BST curriculum.

Teaching is the dynamic, well-organized, and methodical presenting of information to pupils with the goal of maximising learning opportunities. The foundational requirement for an effective teaching/learning process is the choice of the most appropriate teaching methods. Because learning scientific concepts and techniques needs conceptual comprehension and the linking together of multiple scientific representations, teaching science requires more specialised teaching, learning, and instructional practises (Ainsworth, 2016). In order for students to connect scientific theories and concepts to practical goals and practises in the world they live in, these teaching/learning techniques must provide the appropriate provisions for their active engagement with explanatory ideas and evidence. Problem-solving, inquiry-based instruction, project-based learning, hands-on activities, laboratory, and demonstration techniques are the most advised methods/strategies for teaching science. But regrettably, teachers still instruct students using the traditional lecture method (LM) (Agboghroma, 2014), and this condition has persisted for a long time. Because of this stereotype, students rely on memorization rather than having a thorough comprehension of scientific phenomena, concepts, and theories.

The students' subpar performance on the Basic Education Certificate Exam may be caused by the continued use of the LM. Researchers have been quite concerned about the high rates of failure reported by children in Junior Schools in Delta State (Delta State Ministry of Basic & Secondary Education, 2020). Consequently, the employment of LM, which disregards the students' participation during instruction, could be linked to the low achievement in BS. As a core science subject, BS is anticipated to provide students with a foundation in science and technology understanding that would enable them to integrate into the scientifically and technologically advanced society. BS certification is anticipated of a sizable portion of students doing scientific and science-related subjects in senior high schools and higher education institutions. Despite this expectation, student achievement in BS appears to have remained low, which is sometimes attributed to teachers' poor teaching practises. Poor teaching practises always result in poor student performance and attitude, and it has become difficult to apply what is learned in real-world situations. Most of the time, students cannot apply what they learn in school to real-world situations. It would be important in this regard for BS teachers to implement effective teaching strategies that would help students comprehend fundamental ideas and concepts. The use of IA has been recommended to improve students' comprehension of BS ideas. Therefore, the purpose of this study was to determine whether using IA would improve students' academic performance and attitude toward BS compared to using conventional LM.

IA has also been shown to promote students' understanding of learnt concepts. A comparison between two sets of terms that are related to one another in the same way that another two terms are related to one another is stated through an analogy. As an illustration, the mayor of a city and the governor of a state are both examples of elected heads of government. This analogy can be used to illustrate the comparison (Ahmad & Samara, 2016). Analogies are studied and made by students to assist them understand words and concepts as they build their critical thinking and reasoning abilities. An analogy can help others grasp something, but it can also cause misunderstandings. Analogies can be challenging for students to comprehend because the nature of the relationship might not be immediately obvious. This is why it's vital that when using an example, teachers and students explicitly state what the relationship is.

IA improves students' comprehension of fundamental ideas, helps them understand the specific vocabulary and ideas used in analogies, develops their critical thinking skills, and enables them to find connections between new material and their prior knowledge (Nwankwo & Madu, 2014). Analogies as a teaching approach greatly improve students' understanding of scientific concepts and aid in their successful information integration, according to numerous studies (Aybuke & Omer, 2012; Kawthar, 2012; Nwankwo & Madu, 2014). Therefore, this study compared the effect of IA on students' academic achievement and attitude to BS.

Academic achievement refers to a student's progress in terms of knowledge gained and abilities developed during their academic career, as measured by school officials using teacher-created or standardized assessments. It, also, refers to the level of student accomplishment or proficiency in a certain academic subject. It encourages the students to work hard and learn more. Studies have shown that IA enhances students' academic achievement. Will IA also promote positive attitudinal change in students? Attitude can be defined as a pre-disposition to respond in a favourable or unfavourable manner with respect to a given object. Attitude towards BS denotes interests or feelings towards studying BS. When students' attitude towards a subject is positive, it will enhance their motivation to learn the subject and reverse is the case when students' attitude is negative. The method of teaching adopted by the teacher could mar or make the attitude of students. In light of this, this study examined how IA and LM affected BS students' academic performance and attitude in DCSD.

### **Statement of the Problem**

The achievement of students in BST has fallen below standard over the years. Analyzing BST performance of students in the 2020 Basic Education Certificate Examination (BECE) revealed that students perform poorest in BS compared to the other subjects that made up the BST curriculum. The Delta State Ministry of Basic and Secondary Education (2020) attributed students' poor performance in BS to poor teaching method. From personal observation, LM is the widely used teaching method in secondary schools in Delta State.

LM encourages rote learning and regurgitation of learned concepts. LM is theoretical, didactic, and teacher-centred, with students remaining passive throughout the teaching and learning process. Since the lecture method does not encourage students to participate actively, it is possible that students memorize BS concepts without having a basic grasp of them. The use of the LM may be responsible for students' poor academic achievement in BS. With emphasis on meaningful learning and conceptual understanding the use of IA may be a viable alternative to the LM. The problem of the study, therefore is; will IA enhance students' academic achievement and positive attitudinal change than LM?

### **Purpose of the Study**

The aim of the study was to evaluate the effect of IA and LM on the academic achievement and attitude of students to BS. Particularly, the study determined:

1. the variation in mean achievement scores between students taught BS using IA and LM; and;
2. the variation in mean attitude scores between students taught BS using IA and LM.

### **Hypotheses**

1. The mean achievement scores of students who were taught Basic Science using IA and LM did not significantly differ.
2. The mean achievement scores of students who were taught Basic Science using IA and LM did not significantly differ.

### **Methodology**

The study's design was 3x2 factorial quasi-experimental. 12,163 JSII students in Public Secondary schools in DCSD, was the study's population. 214 JSII BS students, in 6 intact classes, took part in the study. The schools for the study were selected using simple random sampling technique. Basic Science Achievement Test (BSAT) and the Basic Science Attitude Scale (BSAS) were used to collect data. Kuder-Richardson formula 21 was used to determine the BSAT's reliability. This was accomplished by giving the BSAT to 45 JSII BS students who were not involved in the study and then calculating the reliability index. The instrument's reliability coefficient was discovered to be 0.88. Cronbach-alpha test was used to determine the Basic Science Attitude Scale's (BSAS) reliability. In a school outside the sampled institutions, in Ughelli North Local Government Area of Delta State, the instrument was given to 35 JSII BS students. The 35 students' responses were graded, and Cronbach alpha was applied to the results. A reliability coefficient of 0.78 was found after analysis with SPSS.

The treatment involved teaching the students assigned to the experimental group some BS concepts with the use of IA and those students assigned to the control group with LM. Pretests were administered before the treatment and posttest thereafter. The scores obtained were collated and analyzed using ANCOVA to accommodate pretest scores as covariates.

### Results

- The mean achievement scores of students who were taught Basic Science using IA and LM did not significantly differ.

**Table 1**

*ANCOVA Summary of Achievement Scores of Students Taught BS Using IA and LA*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	18379.621 <sup>a</sup>	2	9189.811	101.869	.000
Intercept	28102.230	1	28102.230	311.514	.000
Pretest	7225.570	1	7225.570	80.096	.000
Methods	9403.290	1	9403.290	104.236	.000
Error	19034.659	211	90.212		
Total	588128.000	214			
Corrected Total	37414.280	213			

a. R Squared = .491 (Adjusted R Squared = .486)

The mean achievement scores between students who were taught BS via IA and LM are significantly different, as shown in table 1,  $F(1, 211) = 104.236$ ,  $P(0.00) < 0.05$ . The null hypothesis is therefore disproved. As a result, IA significantly outperformed LM in terms of students' mean achievement scores when teaching BS.

- The mean achievement scores of students who were taught Basic Science using IA and LM did not significantly differ.

**Table 2**

*ANCOVA Summary of Attitude Scores of Students Taught BS Using IA and LA*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	543.007 <sup>a</sup>	2	271.503	2.731	.067
Intercept	38796.547	1	38796.547	390.309	.000
Pretest	157.074	1	157.074	1.580	.210
Method	386.521	1	386.521	3.889	.050
Error	20973.334	211	99.400		
Total	881119.000	214			
Corrected Total	21516.341	213			

$F(1, 211) = 3.889$ ,  $P(0.050) = 0.05$ , shows a significant difference in the mean attitude scores between students taught BS using IA and LM. The null hypothesis is therefore disproved. As a result, IA significantly outperformed LM in terms of students' mean attitude scores when they were taught BS.

### Discussion

The research revealed a considerable gap between students who were taught BS using IA and LM, favouring IA. The differences in achievement scores between the groups may be due to the variations in the instructional methods adopted in two groups which might have influenced students' achievement scores in BS. The result indicated that students taught BS using IA outscored those taught using LM. This implies that the students IA groups may have been more active in the learning process and thus aided their comprehension of BS concepts than those in the LM group. This finding also agrees with that of Ukoh and Adejimi

(2018) who reported that IA improve students' achievement in BS than conventional LM. The reason for this finding could be that the students in the IA groups linked learnt concept to familiar analogy related to the topic. This may have contributed to the higher achievement scores of students. The low achievement scores of students taught with LM may be as a result of students' non-active involvement during instruction.

The study, once more, revealed a substantial difference in the mean attitude scores of students who were taught BS using IA and LM, favouring IA. This finding is in line with that of Ukoh and Adejimi (2018) who study showed that IA contributed more to students' attitude in BS than LM. This implies that students taught with IA developed more positive attitude towards BS than their counterparts in the lecture group. The fact that students in IA group were active during instruction may have accounted for their higher positive attitude scores compared with their counterparts in the lecture group who were spoon fed. In other words, the teachers in the lecture group passed knowledge to the students in the final form. The students in the lecture group only listen to the teachers and were given little opportunity to ask questions during the teaching and learning process. In addition, BS concepts were linked to real life phenomenon in form of analogy during the teaching and learning processes in the IA group. This could have facilitated students' development of positive attitude than the lecture method.

### **Conclusion**

As a result of the findings of the study, it was concluded that IA was more effective in boosting students' achievement and attitude towards BS. IA enhance students' academic achievement and attitude towards BS more than LM.

### **Recommendations**

The study recommended the following:

1. BS teachers should use IA as an alternative teaching method at the Secondary School level.
2. BS teachers should strive at all time link BS concepts to real life phenomenon as a form of analogy to enhance students' understanding.

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