

APPLICATION OF TWO ACTIVE LEARNING STRATEGIES FOR PROMOTING ANTI-CORRUPTION CRUSADE ON JUNIOR SECONDARY SCHOOL STUDENTS' LEARNING OUTCOMES IN BASIC SCIENCE AND TECHNOLOGY IN OSUN STATE

OLAJIDE S. O. and AJEWOLE O. N.

Institute of Education, ObafemiAwolowo University, Ile-Ife, Nigeria

olajidesolayinka@gmail.com

ajenewton4455@yahoo.com

Abstract

The study investigated effects of guided discovery and jigsaw instructional strategies on junior secondary school students' learning outcomes (academic achievement, interest and retention) in Basic Science and Technology in Osun State with the ultimate goal of promoting anti-corruption crusade in the state educational system towards improving students' learning outcomes in the subject. The study employed the non-equivalent groups' pre-test, post-test control group quasi experimental research design involving 92 junior secondary II students in three intact classes selected from three schools in three selected Local Governments in Osun State using simple random sampling technique. Two instruments; Basic Science and Technology Achievement Test (BSTAT) and Students' Interest Questionnaire (SIQ) were used to collect data for the study. Data collected were analysed using mean, standard deviation and Analysis of Covariance (ANCOVA). The results of the study showed significant effect of the learning strategies on students' academic achievement in Basic Science and Technology ($F = 6.250, p < 0.05$) with guided discovery strategy having the higher mean score ($\bar{x} = 18.0625$). The results further revealed significant effect of the strategies on students' interest towards Basic Science and Technology ($F = 21.268, p < 0.05$) with students taught with guided discovery strategy exhibited higher positive interest ($\bar{x} = 23.0937$) and finally, the results revealed a significant effect of the strategies on students' retention ability ($F = 14.184, p < 0.05$) with guided discovery strategy having the higher mean ($\bar{x} = 22.4375$). The study concluded that the two active learning strategies could be used as anti-corruption crusade in Osun State educational system in this 21st century since students' achievement, interests and retention were well captured.

Keywords: Anti-corruption, Basic Science and Technology, Guided Discovery, Jigsaw, Academic Achievement, Interest, Retention.

Introduction

The power of any nation depends on her capacity and capability to make use of science and technology for socio-economic development. Therefore, it is interesting to say that science and technology are the pivot upon which national development revolve. The growth in the field of science and technology encourages a better economy of every nation especially a developing country like Nigeria. Any nation that needs to grow maximally and be at the peak of nation development must rely heavily on science and technology (Olajide & Aladejana, 2019). As important as science and technology are, the federal government of Nigeria introduced the teaching of science and technology into her schools right from primary schools to tertiary institutions so as to attain a scientific and technology literate nation (FRN, 2014). Science education plays an important role in the lives of individuals and the development of a nation scientifically and technologically (Alebiosu & Ifamuyiwa, 2008).

As a matter of fact, it is widely and generally acknowledged that the gateway to the survival of a nation scientifically and technologically is scientific literacy which can only be achieved through science education. Without science and technology education, Information and Communication Technology (ICT) would almost be impossible, since the valuable role of science and technology in the development of a nation cannot be overlooked. Science and technology as a subject in schools must be taught in such a way that it will promote students' interest and their generic skills if we are to achieve the national objectives of education for all in the 21st century (Olajide & Aladejana, 2019). Science and technology teaching in our primary and up to junior secondary schools are taught as Basic Science and Basic Technology respectively in the universal basic education curriculum.

The teaching of these basic subjects in our primary and junior secondary schools over the years had been through the teacher expository method. The method that had made the teaching of the subjects a tedious work for the teachers and students no longer develop interest in learning the subjects any longer and this had led to poor achievement in science subjects like Physics, Chemistry, Mathematics and Biology both in public examinations such as Senior School Certificate Examinations (SSCE), Joint Admissions and Matriculation Board (JAMB) etc, and internal examinations (Aladejana, 2008; Adeyemi, 2011; Ojedokun & Aladejana, 2013; Olajide & Aladejana, 2016; Olajide, 2017; Olajide & Aladejana, 2019). This inappropriate

method of science instruction in our schools had forced students to involve in various means of examination malpractice in order to pass in various sciences and technology subjects (Physics, Chemistry, Mathematics and Biology) in public examinations so as to gain admission into tertiary institutions at all means. This eventually had led to students' under achievement in various science disciplines they may enroll for in tertiary institutions and had eventually constitute social menace in the society since the interest in learning science is not well developed right from the basic education level.

In order to curb this menace, an anti-corruption crusade that would arouse students' interest in learning science through Basic Science and Technology in our schools at the basic level of education in the state need to be urgently put in place. Perhaps, learning strategies such as guided discovery and jig saw could be an antidote in curbing this social menace since these two learning strategies had been applauded in literature as innovative and effective in improving students' performance, interest and attitude in developed nations like United States of America, British, Spain and the rest. There is therefore the need to empirically investigate the effects of the two learning strategies on students' achievement, interest and retention in the learning of Basic Science and Technology in junior secondary schools in Osun State.

Guided discovery is an instructional strategy that employs exploration, manipulation and experimentation to find out new ideas. It is regarded as convergent thinking. The instructor conceives a succession of declarations or questions that guide the learner, step by step, making a series of information that leads to a single predetermined goal. Summarily, the teachers initiate a stimulus and the learners react by engaging in an active inquiry thereby discovering the appropriate response (Alabi&Lasisi, 2015).

Jigsaw is one of the newest methods created by Timothy Hedeem under the cooperative learning techniques used in classroom settings. The jigsaw technique in the cooperative learning methods uses a small group structure to facilitate group discussion through which the learning takes place. The jigsaw method focuses on student's comprehension of the instructor's material and the participant's interpretations such as perceptions, judgments through a very active discussion. This method was mainly created to cater for the higher class students. It is best advised to give an explanation before the discussion on the topics take place. This not only ensures that the learners are more effective in their discussion but also saves time. In jigsaw

technique, students in the expert groups teach the whole class rather than return to their home groups to teach the content (Heeden, 2003).

Achievement is the action of accomplishing an academic task successfully. Its purpose is to find out the stand of a student at a given moment (Akani, 2017). It has to do with testing the knowledge acquired by student which helps the teacher and students to evaluate and predict the degree of learning attained. It is useful in testing the retention of information and skill. It is also a determinant of the efficacy and efficiency of a given instruction (Kabutu, Oloyede&Bande, 2015).

Mayer (2004) defines retention as learning that lasts beyond the testing and is assessed with tests administered two or more weeks after the subject has been taught and tested. He further explained that retention of learning is measured with two tests; namely the initial test and the delayed retention tests. The initial test is the test employed at the time of instruction or immediately thereafter while the delayed retention tests are those ones administered two or more weeks after instruction so as to measure retained knowledge. According to Mintzes (2000), retention was defined as a preservative factor of the mind. The mind acquires the materials of knowledge through sensation and perception. These materials are preserved in the form of images for knowledge to develop and whenever a stimulating situation occurs, retained images are reproduced to make memorization possible.

Statement of the Problem

Previous studies have revealed that junior secondary school students performed poorly in Basic Science and Technology as a result of inappropriate instructional strategies adopted by teachers who teach the subject. However, the extent to which guided discovery and jigsaw instructional strategies could enhance students' learning outcomes (academic achievement, interest and retention ability) in the subject to have conceptual understanding of it requires investigation, hence this study.

Purpose of the Study

The study aims at investigating the application of guided discovery and jigsaw learning strategies on junior secondary school students' learning outcomes in Basic Science and Technology in Osun State. The specific objectives of the study are to:

- i. investigate the effects of guided discovery and jigsaw learning strategies on junior secondary school students' academic achievement in Basic Science and Technology in Osun State;
- ii. examine the effects of guided discovery and jigsaw learning strategies on junior secondary school students' interest towards Basic Science and Technology in Osun State; and
- iii. assess the effects of the two learning strategies on junior secondary school students' retention ability in Basic Science and Technology in the study area.

Hypotheses

Ho1. There is no significant effect of guided discovery and jigsaw learning strategies on junior secondary school students' academic achievement in Basic Science and Technology.

Ho2. There is no significant effect of guided discovery and jigsaw learning strategies on junior secondary school students' interest towards Basic Science and Technology.

Ho3. There is no significant effect of the two learning strategies on junior secondary school students' retention ability in Basic Science and Technology.

Methodology

The study adopted the non-equivalent pre-test, post-test, control group quasi-experimental research design. The design for the study is represented structurally below:

X ₁	O ₁	X ₂	X ₃
X ₄	O ₂	X ₅	X ₆
X ₇	O ₃	X ₈	X ₉

Where; X₁, X₄ and X₇ represent the pre-tests in the three groups;

X₂, X₅ and X₈ represent the post-tests in the three groups;

X₃, X₆ and X₉ represent the retention tests in the three groups.

While O₁ represents the experimental treatment group for guided discovery;

O₂ represents the experimental treatment group for jigsaw; and

O₃ represents the control group that uses the teacher expository method.

The population for the study comprised all junior secondary school students in Osun State. Three schools were selected randomly from all the junior secondary schools in three local government areas of the state using simple random sampling technique. From the three schools

selected, three intact classes of JSS II students were randomly selected using simple random sampling technique. The three schools were randomly assigned to two experimental groups and one control group respectively. Experimental group A was taught using guided discovery learning strategy, Experimental group B was taught using jigsaw technique while the control group was taught using the teacher expository method. Two instruments were used for data collection. They are: Basic Science and Technology Achievement Test (BSTAT) and Students' Interest Questionnaire (SIQ). The two instruments were then pilot tested on a random sample of 30 students who were selected from JSS II in a school outside the scope of the study. The reliability of the instruments was achieved through the use of test-retest method which yielded reliability coefficients of 0.78 and 0.81 respectively. Data collected were analysed using mean, standard deviation and Analysis of Covariance (ANCOVA).

Results

Hypothesis One: There is no significant effect of guided discovery and jigsaw learning strategies on junior secondary school students' academic achievement in Basic Science and Technology.

In order to test this hypothesis, data collected on academic achievement of students taught with guided discovery learning strategy (GDLS), jigsaw learning strategy (JLS) and teacher expository method (TEM) in Basic Science and Technology were subjected to descriptive statistics and Analysis of Covariance (ANCOVA) and the results are presented in Tables 1 and 2 respectively.

Table 1: Descriptive analysis of the effect of GDLS, JLS and TEM on students' academic achievement in Basic Science and Technology

S/N	Strategies	N	Mean	Standard Deviation
1.	GDLS	32	18.0625	1.93337
2.	JLS	30	17.5333	1.35782
3.	TEM	30	15.9333	0.98027
Total		92	17.1957	1.73039

Results in Table 1 showed that students taught with guided discovery learning strategy have a mean score of ($\bar{X}=18.0625$) performed better than their colleagues exposed to jigsaw learning strategy with a mean score of ($\bar{X}=17.5333$) and teacher expository method with a mean score of ($\bar{X}=15.9333$) in Basic Science and Technology. Table 2 presents the ANCOVA results of the effects of the learning strategies.

Table 2: Analysis of covariance (ANCOVA) of the effects of GDLS, JLS and TEM on students' academic achievement in Basic Science and Technology

Tests of Between-Subjects Effects						
Dependent Variable: PostTest						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	76.031 ^a	3	25.344	11.353	.000	.279
Intercept	304.541	1	304.541	136.421	.000	.608
PreTest	.761	1	.761	.341	.561	.004
Strategies	27.906	2	13.953	6.250	.003	.124
Error	196.447	88	2.232			
Total	27476.000	92				
Corrected Total	272.478	91				

R Squared = .279 (Adjusted R Squared = .254)

(F = 6.250, p < 0.05)

Result in Table 2 showed that there is significant effect of guided discovery and jigsaw learning strategies on the academic achievement of junior secondary school students in Basic Science and Technology at (F = 6.250, p < 0.05). Therefore, the null hypothesis that states that there is no significant effect of guided discovery and jigsaw learning strategies on students' academic achievement in Basic Science and Technology is hereby rejected. The partial eta squared value of 0.124 accounted for the effect size of 12.4%.

Hypothesis Two: There is no significant effect of guided discovery and jigsaw learning strategies on junior secondary school students’ interest towards Basic Science and Technology. In order to test this hypothesis, data collected on the interest of students taught with guided discovery learning strategy (GDLS), jigsaw instructional strategy (JIS) and teacher expository method (TEM) towards Basic Science and Technology were subjected to descriptive statistics and Analysis of Covariance (ANCOVA) and the results are presented in Tables 3 and 4 respectively.

Table 3: Descriptive analysis of the effect of GDLS, JLS and TEM on students’ interest towards Basic Science and Technology

S/N	Strategies	N	Mean	Standard Deviation
1.	GDLS	32	23.0937	2.24843
2.	JLS	30	21.9667	2.28161
3.	TEM	30	19.6000	1.86806
Total		92	21.5870	2.57696

Results in Table 3 showed that students taught with guided discovery learning strategy have higher interest with a mean score of ($\bar{X}=23.0937$) than their colleagues exposed to jigsaw learning strategy with a mean score of ($\bar{X}=21.9667$) and teacher expository method with a mean score of ($\bar{X}=19.6000$) towards Basic Science and Technology. Table 4 presents the ANCOVA results of the effects of the learning strategies.

Table 4: Analysis of covariance (ANCOVA) of the effects of GDLS, JLS and TEM on students’ interest towards Basic Science and Technology

Tests of Between-Subjects Effects						
Dependent Variable: Interest						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared

Corrected Model	195.419 ^a	2	97.709	21.268	.000	.323
Intercept	42699.263	1	42699.263	9294.130	.000	.991
Strategies	195.419	2	97.709	21.268	.000	.323
Error	408.885	89	4.594			
Total	43476.000	92				
Corrected Total	604.304	91				

R Squared = .323 (Adjusted R Squared = .308)

(F = 21.268, p < 0.05)

Result in Table 4 showed that there is significant effect of guided discovery and jigsaw learning strategies on the interest of junior secondary school students in Basic Science and Technology at (F = 21.268, p < 0.05). Hence, the null hypothesis that states that there is no significant effect of guided discovery and jigsaw learning strategies on students' interest towards Basic Science and Technology is hereby rejected. The partial eta squared value of 0.323 accounted for the effect size of 32.3%.

Hypothesis Three: There is no significant effect of the two learning strategies on junior secondary school students' retention in Basic Science and Technology.

In order to test this hypothesis, data collected on the retention of students taught with guided discovery learning strategy (GDLS), jigsaw learning strategy (JLS) and teacher expository method (TEM) in Basic Science and Technology were subjected to descriptive statistics and Analysis of Covariance (ANCOVA) and the results are presented in Tables 5 and 6 respectively.

Table 5: Descriptive analysis of the effect of GDLS, JLS and TEM on students' retention in Basic Science and Technology

S/N	Strategies	N	Mean	Standard Deviation
1.	GDLS	32	22.4375	2.61432
2.	JLS	30	21.1333	2.83735
3.	TEM	30	18.8667	2.52891
Total		92	20.8478	3.02348

Results in Table 5 showed that students taught with guided discovery learning strategy have a retention meanscore of ($\bar{X}=22.4375$)had better retention ability than their counterparts exposed to jigsaw learning strategy with an interest mean score of ($\bar{X}=21.9667$)and teacher expository method with an interest mean score of ($\bar{X}=18.8667$)in Basic Science and Technology. Table 6 presents the ANCOVA results of the effects of the learning strategies.

Table 6: Analysis of covariance (ANCOVA) of the effects of GDLS, JLS and TEM on students’ retention in Basic Science and Technology

Tests of Between-Subjects Effects						
Dependent Variable: Retention						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	201.061 ^a	2	100.531	14.184	.000	.242
Intercept	39813.870	1	39813.870	5617.292	.000	.984
Strategies	201.061	2	100.531	14.184	.000	.242
Error	630.808	89	7.088			
Total	40818.000	92				
Corrected Total	831.870	91				

R Squared = .242 (Adjusted R Squared = .225)

(F = 14.184, p < 0.05)

Result in Table 6 showed that there is significant effect of guided discovery and jigsaw learning strategies on the retention of junior secondary school students in Basic Science and Technology at (F = 14.184, p < 0.05). Thus, the null hypothesis that states that there is no significant effect of guided discovery and jigsaw learning strategies on students’ interest in Basic Science and Technology is hereby rejected. The partial eta squared value of 0.242 accounted for the effect size of 24.2%.

Discussion of Findings

Findings of the study showed that guided discovery and jigsaw learning strategies had significant effect on academic achievement of junior secondary school students in Basic Science and Technology. The result supports the findings of Olajide, Ajewole and Amusat (2018) when they found out that students performed better when they were taught with appropriate and innovative instructional strategies.

Results of the study further indicated that guided discovery and jigsaw learning strategies had significant effect on interest of junior secondary school students in Basic Science and Technology. The result corroborates the findings of Agboola and Oloyede (2013), Olajide and Aladejana (2016) and Olajide (2017) where they discovered that effective and innovative teaching strategies arouse students' interest in science subjects in secondary schools.

Conclusion

The study concluded that guided discovery and jigsaw are two active learning strategies that could be used to promote anti-corruption crusade in the learning of science subjects in Osun State educational system in the 21st century.

Recommendations

Based on the findings of the study, the following recommendations were made:

- (1) Government should ensure that educational policies are well implemented.
- (2) Workshops, seminars and conferences should be organized for science teachers on the appropriate and innovative instructional strategies for teaching science subjects most especially Basic Science and Technology.
- (3) Curriculum planners should involve active and innovative methods such as guided discovery and jigsaw instructional strategies in junior secondary school curriculum.

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