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EFFECTS OF THINK-PAIR-SHARE STRATEGY ON SENIOR SECONDARY ONE STUDENTS' ATTITUDE TOWARDS BIOLOGY IN JOS SOUTH, PLATEAU STATE, NIGERIA

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ABSTRACT

The study investigated the effects of think-pair-share strategy on senior secondary one students' attitude to Biology in Jos South, Plateau State, Nigeria. The study adopted pre-test, post-test quasi-experimental research design. The population of this study comprised all SSI students that offer Biology in the 20 public secondary schools in Jos South, Plateau State Nigeria, totaling 1282 students out of which 675 were male while 607 were female students. Simple random sampling technique was used to select two schools from the population. Sample size of 98 students was obtained from two intact classes used, 57 of them were males and 41 were females. The study was guided by two objectives, raised two research questions and two hypotheses were tested at 0.05 level of significance. One instrument was used for data collection, namely: Students' Attitudes to Biology Scale (SABS). The instrument was subjected to three expert's validation and Kendall's coefficient value of 0.83 was obtained. The reliability of the instrument was established using Cronbach alpha method and a coefficient of 0.92 was obtained. Data collected was analyzed using mean, standard deviation and ANCOVA. The findings revealed that 19 (33.3%) of the students in the experimental group had a neutral attitude, while 38 (66.7%) had positive attitude to Biology after exposure to treatment. Also, 28 (68.3%) of the students in the control group had negative attitude, and 13(31.7%) had neutral attitude, while none of them had positive attitude towards Biology at the post-test. Furthermore, the main effect of male yielded (M = 50.89; SD = 6.39 and female (M = 59.09; SD = 5.65); F(1,54) =6.69, p < 0.05, partial η2 = .110, since the p value of 0.012 is less than 0.05 level of significance with an effect size of 11% the null hypothesis was rejected, indicating that there was a significant effect of gender on the attitude of students' taught Biology using think pair-share strategy. The study recommends that Biology teachers should adopt Think-pair-share strategy to teach Biology in secondary schools and workshop and seminars should be organized regularly for teachers.

Key Words: Attitude, Biology, Cellular respiration and Think-Pair-Share.

INTRODUCTION

Biology is defined as the science that deals with the origin, history, physical characteristics, life processes, habits of living organisms, including plants, animals (Robert 2014). It is the science of life and of living organisms, including their structure, function, growth, origin, evolution, and distribution. Biology as a study of life plays a fundamental role in enhancing the quality of human knowledge about life.

The knowledge of Biology prepares students to apply basic scientific concepts in dealing with numerous issues encountered on a daily basis and comprehend the natural world. The study of Biology empowers learners with basic knowledge about their body functionality, inter-relationship with other living things and environmental sustainability. The knowledge of Biology is therefore, indispensable for national development and global competitiveness in areas of Medicine, Agriculture, Physical and Health Education, ports, Environmental studies, among others. It is also aimed at giving the learners at the senior secondary school level of education foundation on which to build further knowledge in Biological Sciences at the tertiary level of education. The Biology curriculum has an in-built flexibility to cater for the interests, abilities and needs of students. This flexibility also provides a means to bring about a balance between the quantity and quality of learning (Kilic, Kaya

& Kurt 2012). To achieve this, the Biology Curriculum emphasises the adoption of cooperative strategies such as think-pair-share strategy in teaching and learning of Biology at all levels of education.

Think-Pair Share is a cooperative learning strategy that allows students to communicate and work together to understand a reading, concept, solve a problem, brainstorm, or answer a question after they individually think (Tanner 2013). Think-Pair-Share strategy allows the learning to be less of teacher centered by giving more interdependence to students for participating in the activities which makes learning more meaningful. Moreover, this technique offers "processing time" and gives students "wait-time", which helps students to go beyond and deeper in their thinking (Owens, Seidel, Wong, Lietz, Perez, & Tanner 2017). The cooperative learning strategy of Think-Pair-Share fostered a classroom learning environment with better effect among student groups (Kwok and Lau, 2015) The goal of the strategy is to engage students' to deal with the unknown and participate actively in the classroom by sharing their thoughts with the class during a session. Research has shown that cooperative learning increases students' understanding and ability to integrate and synthesize new material (Sampsel, 2013). Also, Ozoji (2020) affirmed that cooperative learning strategy enhances the cognitive development of students. This strategy encourages learners to be more active and productive during instruction thereby enhancing students' attitude towards learning of Biology.

Attitude refers to the tendency to respond positively or negatively towards a certain idea, object, person, or situation (Vogel, Bohner, and Wanke (2014). They added that attitude could be negative, positive and neutral. Experience has shown that negative attitude of students' towards science generally and Biology in particular has been recorded over the years. According to Saif, and Aseri (2017). negative attitude could be linked to several factors such as fear of failure, family problem, and emotional state of students among others, leading to the following disposition: 1.Making comparison which is the easiest way students can think bad of themselves. 2. Missing classes and frequent lateness. 3. Self -limited conversation leading to withdrawal from peers and decrease in self-confidence. 4. Negligence to instructions. 5. Playing blame games, holding others responsible for any set back encountered. Literature also showed that, negative attitude of students towards Biology could be as a result of broad nature of the subject, abstract nature of the subject, Biology text not explicitly explaining some concepts, the use of foreign language such as Latin words in Biology and its text and Cellular respiration heavily loaded with Chemistry concepts and terminologies (Can, 2012). From the foregoing, it is obvious that attitude plays an important role in students' behaviour towards Science particularly Biology.

Ajzen and Fishbien (1980) in the Theory of Planned Behavior (TPB) opined that students' behaviour depends on both intention and ability (behavioural control). This theory explains why students' attitude to science particularly Biology is mostly dependent on the innovation and cooperative strategy adopted by Biology teachers during instruction. Attitude construct in this theory emphasizes the individual willingness to display behavior in response to intention and ability.

According to Owoeye and Agbaja (2016) Students' Attitude towards Biology is neutral, they concluded that, adopting cooperative strategy which is students friendly could positively improve attitude of student towards Biology. Similar, Festus and Ekpete (2012), affirms that, students' positive attitudes to science correlate highly with their science achievement. Furthermore reports recorded by Udousoro (2013) stated that, female students' shows more positive attitudes after been exposed to certain learning strategy such as, self-learning device, self- instructed problem- based instruction and think-pair-share. This will enable the students both male and female to take responsibility of their own learning.

Gender has been identified as a major factor that affects students' achievement in Science, Technology and Mathematics examinations (Omiko, 2017). Gender disparity in science achievement still persists in virtually all the schools in Nigeria. It is generally believed that male students tend to achieve higher compared to the female students in sciences, particularly Biology and mathematical-related subjects, even though research findings are inconclusive on the influence of gender on

science achievement. Research finding by Ani, Obodo, Ikwueze & Festus (2021) revealed that male students were superior in science than their female counterparts. They further observed that some of the problems constraining female's achievement in Biology centered on type of instructional strategy adopted by teachers, wide nature of Biology, students interaction to mention a few. It was reported by Meno (2013) that gender affects the way students perceive Biology concept that are considered to be abstract or difficult such as, Genetics, Evolution, Cellular Respiration among others.

Cellular respiration is a chemical activities of the cell in which glucose is broken down by series of reactions controlled by enzymes to release energy Agbo (2018). Cellular Respiration refers to the biochemical pathway by which cells release energy from the chemical bonds of food molecules and provide that energy for the essential processes of life. All living cells carry out cellular respiration which could be through aerobic respiration (in the presence of oxygen) or anaerobic respiration (in the absence of oxygen) to produce ATP.

There are three steps involved in cellular respiration and they always occur in this order: Glycolysis, the Krebs cycles, and the Electron Transport Chain, all which go through a series of redox reactions.

Glycolysis - Glyco means sugar and lysis means break down, hence glycolysis is the breaking down of sugar. The process occurs in the cytoplasm of a cell. Where a 6-carborn compound is broken down into 3-carborn compound called pyruvate, or pyruvic acid (Liu, Zhang, Wang, Chen, Tang, Zhu, & Liu 2019).

Krebs Cycle (The Citric Acid Cycle)

Krebs cycle also called Citric acid cycle **(**CAC**)** or Tricarboxylic acid cycle**,** (TCA) is the second stage next to glycolysis in cellular respiration, The TCA cycle plays a central role in the breakdown, or catabolism, of organic fuel molecules such as, glucose and some other sugars, fatty acids, and some amino acids. eukaryotes In, the citric acid cycle takes place in the matrix of the mitochondria, The citric acid cycle is a closed loop that involves series of reactions for ATP production using the two pyruvates produced at the end of glycolysis (Miguel, Garcia- Ponce, Blanco-Lopez, Quesada, Urdiales, Fajardo, Suarez, & Fransisco, 2022).

Electron Transport Chain

The electron transport chain (ETC) is the third stage in cellular respiration; it is the most important stage from an energy point of view because it produces the most ATP. ETC is a system in which electron carriers are embedded into the inner membrane of a mitochondrion, as electrons are passed from one compound to the next in the chain, their energy is harvested and stored by forming ATP (Rasmusson & Moller 2011). Teaching this concept with a cooperative strategy such as think pair-share enhance the understanding of the students thereby developing, positive attitude in students.

STATEMENT OF THE PROBLEM

Negative attitude of students' towards Biology has been recorded over the years; this negative attitude could be linked to several factors such as fear of failure, family problem, and emotional state of students. Other factors responsible for negative attitude of students' towards Biology could be as a result of broad nature of the subject, abstract nature of the subject, Cellular respiration heavily loaded with Chemistry concepts and terminologies. Teachers of Biology adopted several teaching strategies in an attempt to boost positive attitude of students towards Biology and to change their perception of the subject. Despite the effort of the teachers, the negative attitudes of students' towards Biology still persist. Not addressing this negative attitude of students could lead to consequences such as, difficulty to produce students to pursue careers, and have professionals in various science fields like Medicine, Pharmacy, Nursing, Dentistry, Parasitology, Biotechnology, and Agriculture among others. Again, it would be difficult for Nigeria to take up rightful position in the global world of science and technology. Hence, the fundamental problem of this study therefore,

can be found in these broad questions: 1.What is the effect of Think-pair-share strategy on students' attitude towards Biology? 2. What is the effect of Think-pair-share strategy on male and female students' attitude towards Biology?

AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to determine the effects of Think-Pair-Share strategy on senior secondary one students' attitude to Biology in Jos South, Plateau State, Nigeria. Specifically, the objectives are to:

1. determine attitude directions of SS1 students' to Biology in the experimental and control groups before and after exposure to think-pair-share and lecture method of teaching?
2. find out the attitude of male and female students towards Biology in experimental group after exposure to treatment.

RESEARCH QUESTIONS

The following research questions were answered:

1. What are the attitude directions of SS1 students' towards Biology in the experimental and control groups?
2. What are the post-test attitude mean scores of male and female students' in the experimental group?

HYPOTHESES

The following null hypotheses were tested at 0.05 level of significance

1. There is no significant difference between the pre-test and post-test attitude mean scores of SS1 students towards Biology in experimental and control groups.
2. There is no significant difference between the post-test attitude mean scores of male and female SS1 students towards Biology in experimental group.

METHODOLOGY

The study employed the pre-test, post-test quasi-experimental research design. This is made of two groups, one experimental and the other control. The experimental group was exposed to Think-pair-share strategy while the control group was exposed to lecture method. A pre-test was administered to both experimental and control in order to ascertain the homogeneity in ability before treatment. A post-test was also administered to both groups after treatment to determine whether Think-pair-share strategy has an effect.

Population of the study

The population of this study comprised of all SSI students that offer Biology in the 20 public secondary schools in Jos South, Plateau State Nigeria, totaling 1282 students out of which 675 are male while 607 are female students.

Sample of the study

The sample size was 98 students' consisting of 57 male and 41 females in the intact classes. Out of this, 57 students were in the experimental group consisting of 35 males and 22 females while the remaining 41 students were in the control group consisting of 19 males and 22 females. A simple random sampling technique was adopted for sampling schools from the population. This was done by using the hat and draw method in which the list of all the schools will be written on pieces of paper and two schools picked one after the other, without replacement. This is to ensure that each element in the population has equal chance of being selected for the study.

Instrument for data collection

One instrument was used to collect data for this study, namely: Students' Attitudes to Biology Scale (SABS). SABS was made up of two sections, namely, sections A and B. Section A Consisted of students' personal information, such as, gender and school code while section B consisted of 20 items structured on four point scale namely: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) with 4,3,2, and 1 points assigned to them, respectively, for positive statements while the reversed process was used for negative statements. That is, Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Agree (SA) with 1, 2, 3, and 4 points assigned to them, respectively. Content validity of SABS was ascertained by subjecting to one expert in Psychology and construct validity of the SABS will be established using factor analysis. The reliability of the instrument was ascertained using Cronbach alpha method and a coefficient of 0.92 was obtained.

Method of data analysis

Descriptive statistic using percentages, mean and standard deviation was used to answer the research questions while the hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

RESULTS AND DISCUSSION

Research question one

What is the attitude direction of SS1 students' to Biology in the experimental and control groups before and after exposure to think-pair-share and lecture method of teaching?

Table 1

Attitude Direction of SS1 Students' towards Biology in the Experimental and Control Groups

Group	Test	Attitude			Total
		Negative	Neutral	Positive	
Experimental	Pre-test	57(100%)	-	-	57(100%)
	Posttest	-	19(33.3%)	38(66.7%)	57(100%)
Control	Pre-test	31(75.6%)	10(24.4%)	-	41(100%)
	Posttest	28(68.3%)	13(31.7%)	-	41(100%)

Table 1 the result showed that 57 (100%) students in the experimental group had a negative attitude while none of the students had neutral and positive attitude to Biology before exposure to treatment. The result also showed that 19 (33.3%) of the students in the experimental group had a neutral attitude, while 38 (66.7%) had positive attitude to Biology after exposure to treatment. This implies that think-pair-share strategy can influence the direction of students' attitude towards Biology.

Research question two

What are the pre-test and post-test attitude mean scores of male and female students' in the experimental group?

Table 2

Pre-test and Post-test Attitudes Scores of Male Biology Students' in Experimental and Control Groups

Groups	Gender	N	Pre-test		Post-test		Mean Gain	Post-test Group mean Difference
			Mean	SD	Mean	SD		
Experimental	Male	35	41.23	6.39	50.89	6.39	9.66	8.20
	Female	22	32.91	1.66	59.09	5.65	26.18	
Control	Male	22	27.55	3.64	27.86	3.73	0.31	2.02
	Female	19	24.79	5.31	25.84	3.15	1.05	

Table 2 The result for experimental group showed that male students had pre-test mean score is 41.23 and standard deviation 6.39 and post-test attitude mean scores of 50.89 and standard deviation 6.39 with a main gain of 9.66, while female students in experimental group had pre-test mean score is 32.91 and standard deviation 1.66 and post-test attitude mean score of 59.09 and standard deviation 5.65 with a mean gain of 26.18 which indicates that there was improvement in the females students' attitude towards Biology after treatment. While the group posttest mean score gain of 8.20 in favour of females.

Hypothesis one
There is no significant difference between the posttest attitude mean score of SS1 students' towards Biology in the experimental and control groups.

Table 3
ANCOVA Result on Posttest Attitude Mean Scores of Experimental and Control Groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	18187.692[a]	2	9093.846	284.643	.000	.857
Intercept	9813.760	1	9813.760	307.177	.000	.764
Pre-attitude	419.320	1	419.320	13.125	.000	.121
Group	13258.860	1	13258.860	415.011	.000	.814
Error	3035.084	95	31.948			
Total	199342.000	98				
Corrected Total	21222.776	97				

a. R Squared = .857 (Adjusted R Squared = .854)

Table 4
Result of Sidak Post hoc Comparison of Difference between Posttest Attitude Mean Scores of Students in the Experimental and Control Groups

Experimental	J Control	X-diff. (I – J)	Std. Error	P value
55.53	24.70	30.83	1.51	0.000

P<0.05

Table 3 shows that $F(1,95) = 415.01$, $p < 0.05$, partial $\eta 2 = .814$, since the p value of 0.000 is less than 0.05 level of significance with an effect size of 81% the null hypothesis was rejected, indicating that there was a significant effect of think pair strategy on students' attitude to Biology. The result further reveals an adjusted R squared value of .854 which means that 85.4 percent of the variation in the dependent variable which is attitude is explained by variation in the treatment of think-pair strategy, while the remaining is due to other factors not included in this study. The Sidak post hoc test in Table 4 confirmed that the corrected difference between experimental group and control

group was statistically significant, (I - J) = 30.83. Hence, one can say that think-pair strategy can help students' develop positive attitude to Biology.

Hypothesis Two
There is no significant difference in the post-test attitude mean scores of male and female SS1 students towards Biology in experimental group.

Table 5
ANCOVA Result on post-test attitude mean scores of male and female SS1 students' towards Biology in experimental group.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1080.926[a]	2	540.463	15.459	.000	.364
Intercept	4738.273	1	4738.273	135.529	.000	.715
Pre-attitude	171.445	1	171.445	4.904	.031	.083
Gender	233.986	1	233.986	6.693	.012	.110
Error	1887.916	54	34.961			
Total	169505.000	57				
Corrected Total	2968.842	56				

a. R Squared = .364 (Adjusted R Squared = .341)

Table 6
Result of Sidak Post hoc Comparison of Difference on effect of Gender on attitudes of Experimental Group

I Male	J Female	X-diff. (I – J)	Std. Error	P value
51.99	57.33	5.34	2.06	0.012

P<0.05

Table 6 showed that the main effect of male yielded (M = 50.89; SD = 6.39 and female (M = 59.09; SD = 5.65); F(1,54) =6.69, p < 0.05, partial η2 = .110, since the p value of 0.012 was less than 0.05 level of significance with an effect size of 11% the null hypothesis was rejected, indicating that there was a significant effect of gender on the attitude of students' taught Biology using think pair-share strategy. The result further revealed an adjusted R squared value of .341which means that 34.1 percent of the variation in the dependent variable which is attitude to Biology was explained by variation in the treatment of think-pair-share strategy, while the remaining was due to other factors not included in this study. The Sidak post hoc test in Table 7 confirmed that the corrected difference between male and female students was statistically significant, (I - J) = 5.34. Hence, one can say that think-pair strategy can helped develop positive attitude towards Biology in favour of female students.

DISCUSSION OF FINDINGS

The findings from research question one showed that the majority of students' in both the experimental and control groups had negative attitude to Biology before exposure to think-pair-share strategy. The result also showed that the attitude of students to Biology in the experimental group was changed from neutral to positive after exposure to treatment. This finding is in line with the findings of Owoeye and Agbaja (2016) who opined that student attitude to Biology is neutral but can be enhanced positively by adopting cooperative strategy. The findings further indicated that there was improvement in the female students' attitude towards Biology after treatment. This is consistent with the findings of Udousoro (2013) who stated that, female students' shows more

positive attitudes after exposure to certain learning strategy such as, self-learning device, self-instructed problem- based instruction and think-pair-share. Furthermore, the result revealed that there was a significant improvement in the attitude of students' towards Biology after exposure to treatment; this indicated that think-pair-share strategy has the ability to enhance students' attitude significantly. This is in line with the findings of Festus and Ekpete (2012), who affirmed that, students' positive attitudes to science correlate highly with their science achievement.

CONCLUSION

The research findings concluded that; students taught Cellular respiration with think-pair-share strategy showed significantly positive attitude than those taught with lecture method. The findings also concluded that; attitude of male and female students' can be enhanced positively when think-pair-share strategy is adopted in teaching Biology.

RECOMMENDATIONS

The result of the findings has the following recommendations.

1. Teachers of Biology should adopt Think-pair-share strategy to teacher Biology at all levels of education.
2. Workshops and seminars should be organized from time to time to update their knowledge.

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