EFFECT OF STAD STRATEGY ON STUDENTS' PERFORMANCE IN 3-D SHAPES AMONG SECONDARY SCHOOL STUDENTS WITH VARIED ABILITY LEVEL IN KADUNA STATE, NIGERIA

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ABSTRACT

This study examined the Effect of Student Team Achievement Division (STAD) Strategy on Students performance in three dimensional-shapes among Secondary School Students with varied ability level in Kaduna state, Nigeria. STAD is a teaching strategy under cooperative learning in which students are work in group of four or five in regard of their background or ability. Assignment were given to each group follow by presentation by group leaders of each group. The study was carried in Sabon Gari Local Government Kaduna State Nigeria using a sample size of 122 Senior Secondary School students two (SS2). The sample size was sampled using simple random sampling techniques using balloting. The study employed Quasi-experimental and control of pre-test and post-test group design. Two intact classes were used as experimental and control groups. The experimental group was taught using Student Team Achievement Division strategy while the control group taught using conventional method. Two research questions were raised to guide the study. Three-Dimensional Shapes Performance Test (TDSPT) with reliability co-efficient 0.95 was used. Mean and Standard deviation were used to answer the research question. The results revealed that significance difference existed between the performances of students with varied ability in 3D-shapes taught using STAD and those taught using conventional method indicating the effect of the treatment using STAD Strategy. The researchers recommend that curriculum planners should include the use of STAD Strategy in the curriculum for teaching mathematics in general and 3D-shapes in particular.

Keywords: Student Team Achievement Division, Performance, 3D-shapes, Ability level

INTRODUCTION

Mathematics is one of the subjects that every secondary school student offer and passes with at least a credit at the ends of the secondary school. The compulsory nature of mathematics may be, has to do with it application in the feature academic endeavor and the daily life of an individuals. Features education is build base on the background individuals gotten from primary and secondary school. Base on Nigeria policy on education mathematics serve as a prerequisite subject in getting admission in to any higher institutions. Because, for any students to be admitted into higher institutions

most at least have credit in mathematics and follow byother subject for all science, art and commercial students.

Mathematics has a lot of utilitarian values. Mathematics is the science of counting, addition, subtraction, multiplication and division which has a vital role in human daily life. Jekayinfa and Darojaiye (2015) said that at a psychological level, exposing to mathematics helps in developing an analytic mind and assists in better organization of ideas and accurate expression of thought. At the stage we are, almost everyone has depending their life on application of science and technology which background is mathematics. Mathematics is around us Jekayinfa and Durajaiye (2015), but it is presented in different forms: right from getting up in early hours of the day to ringing of an alarm, reading time on the watch, rounding a date on the calendar, picking up the phone, manage the money travel from some places and many more other things. With all this application of mathematics, the performance of student is not that much encouraging. Some researchers have attributed the poor performance of students in mathematics with many factors which include students' ability level and teaching strategy used by the teachers. The common teaching strategy use by the teachers in teaching mathematics at secondary schools is conventional method. In this method the student is only passive listener but not involve in the teaching and learning the concept in discussion. The role of the student in this kind of setting is to copy note only which in turn discourages them from attending the class. Because some concept in mathematics is abstract in nature and teachers are making it more abstract to the students through the use of bad teaching strategy like conventional method. This method denied student right to participate in the class.

Normal mathematics class settings constitute of different types of students with different cognitive ability level, social and economic background. Anaso (2008) have identified academic achievers to be of different types and further outlined three categories as high ability average ability and low ability students. In view of Adodo and Agbayewa, (2011), said that high ability students are those students who perform well in test, exam and assignment. Yurnettic (2017) further describe the high ability as students whose academic potentials one above class average and their performance described as good. The second class called average ability students, Anyanwu, Ezenwa and Gambari (2018), describe the average students as their students whose scores averagely not because they are not capable of doing better but partly because they cannot put in extra effort to attain better achievement. They are therefore, contented to remain average. For this reason, they content themselves with the classroom learning with trying to reach to their information. Low ability students are those students who perform poorly in tests, examination and also easily distracted and less able to set about test in an organized manner Andersen and Cheri (2016). In view of Yurnetti, (2017) describe the under activities/low ability student as students whose academic potentials are judge below average while their performance is described as poor. The low ability students' needs freedom in learning constant study, evaluation and help them to reverse their learning materials.

One of the importance mechanisms that improve the students' performance in mathematics is the use of good teaching strategy that motivate students to learn such as cooperative learning strategy. Because cooperative learning strategy does not consider the ability of the students, but the students are divided into small groups to work together as friends and colleague having common objectives. To improve students' performance in mathematics, a teaching strategy that are capable of improving performance through the use of student critical thinking ability social interaction and freedom in learning has to be introduce such students team achievement strategy (STAD).

Student Team Achievement Division (STAD) strategy is a type of cooperative learning developed by Slavin in John Hopkins, University in 1978 and is known as "student team learning" (Sharan, 2012). Student Team Achievement Division is one of the most significant aspects of cooperative learning approaches, which has been influential in bringing about positive effects in multiple grades and subjects. Slavin (2011) enumerated three main concepts of Students Team Achievement Division Team reward, individual accountability and equal opportunity for success. Team rewards are certificates or other awards which are given if a Student Achievement Division group achieve higher than a predetermined level. In this way, the spirit of positive competition is reinforced and all or none of the groups would be rewarded based on how they score. In terms of individual accountability, the individual learning of each of the group member determines the success of the teams.

Students tutor one another ensuring that all group members are ready for quizzes that students take individually. As for equal opportunities for success individual improvement of the students specifies their contributions to the groups. In this way, it is guaranteed that all group members with different ability levels or sex are equally motivated to do their best. Cooperative learning strategies like Student Team Achievement Division are supported by multiplicity of theories from a variety of academic disciplines which includes: psychological theories of motivation, social cohesion, individual and cognitive development as well as socio -cultural theory, cognitive apprenticeship, and situated cognition (Slavin, 2011).

However, Slavin (2011) mentioned four steps of STAD for implementation in the classroom. First, teaching in which the teacher introduces new material through a lecture, class discussion, or some forms of a teacher presentation. Second, team study in which heterogeneous team members cooperate on worksheets designed to extend and help boost the material taught by the teacher. Third, tests are individual quizzes students take on the assigned materials. Teammates are not allowed to help one another during these quizzes. And finally, team recognition stage where quiz scores are juxtaposed to past averages; points are given based on improvement from the past performance.

High scoring team is awarded by gifts or putting their names on bulletin board by granting certificates to them. Slavin (2012) viewed that well-structured cooperative learning approach like STAD can ensure that all group members participate in the learning process actively. STAD has taken into consideration as one of the key components of any teaching method which is motivation. According to him, by rewarding top teams, both intrinsic and extrinsic motivations are reinforced. He also

counts group work as an essential teaching strategy and also an important learning style. Student Team Achievement Division strategy fosters collaboration when working together to achieve a common goal or solve problems. With respect to the views of previous researches, it has been observed that the Students Team Achievement Division (STAD) strategy makes impact on students' performance in different subjects in some part of the world. Francis and Tunde (2009) conducted a researched-on effect of Student Team Achievement Division and Mathematics knowledge of learning outcomes in chemical kinetics. Mathematics ability had significant main effect on achievement and attitude. He recommended that, mathematical background of students should be taken into consideration before allowing them to enroll in Chemistry at senior secondary school level. Also, Student Team Achievement Division strategy should be used to teach Chemistry at this level.

Tran (2013) investigates the effect of STAD on academic achievement and attitude of grade 9 secondary school students towards mathematics. He concludes that STAD was effective in improving students' academic achievements and promote positive attitudes of students towards mathematics in Vietnam high schools. Michael (2012) conducted a researched-on effect of Student Team Achievement Division strategy on student achievement, attitude and motivation in Economics education. The result revealed that students exposed to Student Team Achievement Division strategy compared to direct instruction promoted positive attitude, show better achievement and motivated students to learn Economics education. Ehsan (2012) conducted a researched-on effect of Student Team Achievement Division technique on English achievement of Iranian third grade junior high school students. The result showed that the differences between the classes were significant and the experimental group was superior to the control group in terms of English achievement. VanWyk (2013) conducted a research on effect of STAD as a teaching strategy on grade 10 learners' economics knowledge, pre-test-post-test design of quasi experimental was employed by the researcher. The results revealed the students exposed to STAD increase learners' knowledge of contemporary issues statistically as compared to the direct instructional strategy. Aliyu (2017) conducted research on effect of STAD as a teaching strategy on interest and performance in trigonometry. He concludes that students taught using STAD strategy performed better than those taught using conventional. Also, the strategy bridges the gap in performance of male and female meaning that the strategy is gender friendly.

With respect to present poor performance of students towards learning of three-dimensional shapes in Sabon Gari, Local Government the researcher is motivated to use the strategy to find out if it can make positive impact on students' performance with varied ability level in 3D-shapes in Sabon Gari, Local Government of Kaduna State. To achieve this, the following research questions were stated to guide the research.

Research Questions

1. What are the differences in the performance of students with varied ability level in3D-shapes taught using Student Team Achievement Strategy and these taught using Conventional method?

2. What are the differences between the performance in 3D-shapes of male and female students with varied ability level taught using Student Team Achievement Strategy and these taught using Conventional method?

METHODOLOGY

The study adopted quasi experimental and control groups of pre-test and post-test design. The sample size of this study is 122 students of SS2. The sample size was sampled from two Senior Secondary School from Sabon Gari Local Government using simple random sampling techniques using balloting. One instrument was used for the purpose of data collection; that is Students Three-Dimensional Shapes Performance Test (STDSPT). The instrument was constructed by the researchers and validated by senior colleagues in the Department of Science Education in Ahmadu Bello University Zaria. The reliability of the instrument was also determined and found to be 0.89. The treatment was done for the period of six (6) weeks. Intact classes were used. One of the classes was assign as experimental and were taught 3D-shapes using Student Team Achievement strategy while the other group was taught using conventional lecture method. Before the treatment, a pre-test was carried out and found that the two groups were homogenous. After the treatment, a post-test was administered to determine the effect of the treatment and the differences between the performances of the groups. The scripts were collected and marked by the researchers. The scores were recorded and analyzed using analysis of variance (ANOVA) and Analysis of Covariance (ANCOVA) statistic. The result of the analyses was tabulated and recorded as follows.

RESULTS

Research Question 1: What are the mean differences in the performance of students with varied ability level in3D-shapes taught using Student Team Achievement Strategy and these taught using Conventional method?

Table 1.0: Analysis of Performance in 3D-shapes of students with varied ability level between Experimental and Control Groups

Ability level	Groups	N	Mean	S. D	M.D
	Experiment	18	32.67	10.32	
Low	Control	21	19.20	7.52	13.47
	Experiment	24	41.53	14.39	
Medium	Control	25	21.03	10.41	20.5
	Experiment	16	52.42	53.31	
High	Control	18	23.54	12.01	28.88

Table1.0 showed that the mean performance of experimental and control groups for low ability were found to be 32.67and 19.20, for medium ability, their mean was found to be 41.53 and 21.03 and high ability, their mean was found to be 52.42 and

23.54. The experimental groups of low, medium and high ability level perform almost twice than the control group by comparing their mean.

Research Question 2: What are the mean differences between the performance in 3D-shapes of male and female students with varied ability level taught using Student Team Achievement Strategy and these taught using Conventional method?

Table 2.0: Analysis of Performance in 3D-shapes of male and female students with varied ability level between Experimental and Control Groups

Ability level	Groups	Gender	N	Mean	S.D	M.D
	Experimental	Male	8	21.38	3.07	
		Female	10	20.47	1.87	0.91
Low	Control	Male	11	16.01	1.91	5.74
		Female	10	10.27	1.03	
	Experimental	Male	13	30.27	5.47	1.26
		Female	11	29.01	5.21	
Medium	Control	Male	10	19.47	3.32	7.15
		Female	15	12.32	1.42	
	Experimental	Male	9	37.41	6.92	
		Female	7	36.92	6.31	0.49
High	Control	Male	9	25.31	4.50	
		Female	9	24.53	3.97	0.78

The result in table 2.0 shows that, the mean difference between male and female of experimental group of low, medium and high ability level were found to be 0.91,1.26 and 0.49. Also mean difference between male and female of control group of low, medium and high ability level students were found to be 5.74,7.15 and 0.78. The mean difference in performance of low, medium and high ability students in control group are higher than corresponding mean difference in the experimental group.

DISCUSSION

At the initial for this research a pre-test was conducted in order to determine the homogeneity of the groups. The result for the pre-test obtained for the two groups used in this research is that, the means for the groups consider as the experiments for low ability level was 1.32, medium ability level was 9.91 and 10 for the high ability level.

The mean for the control group was obtained as for low ability level, was 8.99 while medium ability was 9.89 and high ability was 10.32 respectively. After the treatment a post test was conducted to observe the effect of the treatment. The result of the analysis was presented in table 1.0 the descriptive analysis presented in table 1.0 shows that, there in an improvement in the performance of low, medium and high ability level in the experiment group due to the treatment given using STAD strategy. This is because the students in the experimental group was divided into sub groups which comprises low, medium and high ability students to work together as friends and brother which reduce anxiety and tension by the low ability students. The finding was in line with the finding of Ehsan (2012) and Aliyu (2017) who found that students working in STAD strategy had significance higher performance compared to the students working in conversational method.

The result of hypothesis two in table 2.0 shows no different in the performance of male and female of low, medium and high ability level student. The descriptive analysis was indicating an effective improvement in the performance of male and female students' base on their mean. The improvement was occurred as a result of the treatment given to the experiment group using STAD strategy. This result corresponds or is line with the finding of jaji (2012) and Aliyu (2017) who stated that there is no gender different when good teaching strategy in used in any mathematical concept but the findings in contrary with the finding of Vale (2009) who report that female student are weaker in 3D-shapes aspect of mathematics than the male students. The gap in performance between male and female students was due to the equal right given to the male and female students to participate in learning 3-D shapes through the use of STAD strategy. Therefore, the strategy is gender friendly.

CONCLUSION

This research might conclude base on the result that, using Student Team Achievement Division Strategy enhance more active students' involvement in learning process than conventional method. This is in turn results in better understanding of 3D-shapes concept reading to better academic performance among varied ability level students. Also, there was no significance difference in the mean performance in three dimensional shapes (3D-shapes) of male and female students with varied ability level.

RECOMMENDATIONS

The following recommendations were made base on the result of the study.

1. Mathematics teacher should enhance teaching effectiveness by enriching instruction method with Student Team Achievement Division (STAD) strategy.
2. Regular workshop, seminar and conference should be organized by stakeholders of Education for mathematics teacher for update of new discoveries of teaching strategy Student Team Achievement Division (STAD).
3. Curriculum planners should include the use of Student Team Achievement Division (STAD) strategy when designing curriculum for teaching mathematics in general and 3D-shapes in particular.

REFERENCE

Adodo, S.O and Agbayewa. J.O. (2011). Effect of homogenous and heterogeneous ability grouping class teaching on students' interest and achievement in integrated science. *International journal of psychology and counseling, 3(3),48-54*

Aliyu, S.A. (2017). *Impact of Student Team Achievement Division (STAD) strategy on interest and performance in trigonometry among secondary school students in Kaduna state, Nigeria*. Unpublished thesis, Department Science education Ahmadu Bello University Zaria

Anaso, J. N. (2008). *Effect of class size on the academic achievement and retention of different ability group among chemistry student at secondary school level in Zaria Education Zone*. PhD, Unpublished Thesis, Faculty olf education, Ahmadu Bello University Zaria

Anyanwu, C. R., Ezenwa, V.I., and Gambari, A. (2018). Bridge the gap between the low, medium and high ability students through the use of computer – base multimedia instruction, *Journal of Information Education Science and Technology (JIEST), 1(1), 105-121*

Anderson, I., and Chem, J. A. (2016). Do High ability students dis-identify with science? descriptive study of U.S. *Ninth Graders in 2009, science education, 100: 57-77.*

Anyanwu, C.R., Ezenwa, V.I., and Gambani, A. (2018). Bridge the gap between the low, medium and high ability students through the use of computer-based multimedia instruction, *Journal of information, Education, Science and Technology (JIEST), I, (1), 100-114*

Ehsan, A. (2012). Effects of Student Team Achievement Division Technique on English Achievement of Iranian EFL Learners. *Journal of theory and practice in Language studies, 1,* 1971-1975

Francis, A.A., and Tunde L.T. (2001). Effects on Student Team Achievement Division Strategy and Mathematics Knowledge on Learning Out come in Chemical Kinetics. *Journal of International Social research,* 6, 13-25.

Jaji, G. (2012). High school students' attitudes towards mathematics. *Journal of research*, 9, 27-43

Jekayinfa, O.J., and Durojaiye, D.S. (2015). *Mathematics: solution to human challenges and catalyst for national development*. A paper presented at conference of National Mathematical Association held at University of Nigeria.

Micheal, V. (2012). *Effects of student Team Achievement Division on student Achievement*.Retrieved from http://tsg.icmell.org/document /gate/169

Sharan, S. (2012). *Cooperative learning*. New York. Praeger.

Slavin, R. E. (2008). *Cooperative Learning: Theory, Research and practice* (2nded.). *Boston: MA: Allyn & Bacon.*

Slavin, R. E. (2010). *Cooperative learning in Mathematics:* A Handbook for Teachers *62-102 Menlo Park CA: Addison- Westley.*

Tran, V.D., and Lewis, R. (2013). Effects of cooperative learning on student at An Giang University in Vietnam. *International education study, 5(1), 86-99.*

Vale, C. (2009). Trends and factors concerning gender and Mathematics in Australia. literacy? A quasi-experimental design. *Journal of social science, 23(2):83-89*

Vanwyk, M. M. (2013). Do Student Team Achievement Division strategy enhance economic Attitude and Motivation in Economics education, *Journal of social science* 33(2):261-270

Yurnelti, Y. (2017). Analysis of student learning ability in science teaching Based on mid semesters examination, International conference on mathematics and science education (ICMSE) *Journal of physics conference series, 2, 89-105*