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Effects Of Cooperative Strategy, Class Size And School Location On Students' Achievement In Basic Science In Potiskum Yobe State

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ABSTRACT
This study investigated the effects of cooperative strategy class size and school location on students achievement in Basic Science in Potiskum, Yobe State. A true experimental research design was used for this study. The study also employed the use of proportionate stratified sampling technique to draw 256 students of JSSII basic science, from 14 junior secondary schools in Potiskum educational zones. The sample was drawn from urban and rural dichotomy and gender wise to ensure uniformity. One instrument consisting of Basic Science Achievement Test (BSAT) was administered to students' to ascertain the effects of cooperative strategy class size and school location and the achievement of basic science students'. The Basic Science Achievement Test (BSAT) consisted of 20 multiple choice questions drawn from two basic science concepts. The questions were adopted from placement examinations in basic science from 2010-2014, of Yobe State Ministry of Education. T-test of independent sample was used to test the Null hypotheses at 0.05 level of significance. The result indicated that there was significant difference in the mean scores of students' exposed to cooperative strategy than those exposed to lecture method. There was no significance in the mean scores of the male and female students exposed to cooperative strategy; there was a significant difference on the school location on students' achievement in basic science in favor of urban schools. And there was no significant difference on the class size in urban and rural school the study therefore recommended that teachers should employ cooperative strategy method so as to help or assist students' to improve their achievement in basic science, Curriculum planners should examine the effectiveness of cooperative strategy and consider its suitability for the teaching of basic science concepts since it has the potential of bringing about meaningful learning and improved students' achievement, Professionals and research organizations like the science teachers association of Nigeria (STAN) and the Nigerian Educational and research Development Council (NERDC) that carry out seminars, workshops and conferences should incorporate cooperative strategy in their curricula at the lower basic secondary level.
Keywords: cooperative strategy, class size, school location and achievement.

INTRODUCTION

Nations all over the world are facing serious challenges which have significant implications for human development. Some of these challenges are universal while others are unique to developing nations such as Nigeria. Onadeko (2009) states that these challenges have brought about serious questions on the mode and operation of education and are leading to political, structural, institutional and instructional approaches. Adekgoke (2011) observes that there is poor achievement of students' in basic science. This is in spite of the recognition given to basic science by the federal government as a core science subject at a junior secondary school level of education as contained in the National Policy on Education (FRN, 2009).The national policy on education as enunciated by the Federal Ministry of Education is rooted on five key statements expressing the overall philosophy and objectives of the nation. They are the building of a:

1. free democratic society;
2. just and egalitarian society;
3. united, strong and self-reliant nation;
4. great and dynamic economy;
5. land of bright and full opportunity for all.

In realization of vision 2020, Nigeria must strive for optimum achievement in basic science not just average achievement. The realization of this vision entails rapid production of the workforce that is versatile in the development of modern technologies which are based on science method. In line with this vision, the Yobe State government in collaboration with Science Teachers Association of Nigeria (STAN) has organized conferences, seminars, and workshops for science teachers. Also, the government gives allowance to science teachers to motivate the teachers to put in their best. The governments in order to develop positive attitude of students' towards science subjects has come up with programmes, such as junior engineer's technicians (JET) and quiz, and the best science students in the State are given scholarships. All these are geared towards improving students' achievement in basic science and to change their attitude toward science subjects, generally.

In cooperative teaching /learning strategy, students' work as a team in small groups while they share ideas and experiences in the process (Johnson and Johnson 2002;Olorukooba(2001) citing Davidson and Kroll opined that students of small groups are allowed to work together, assisting one another and the conclusions reached are generally adopted by all members. Keys (2005) pointed on the uniqueness of cooperative teaching/ learning strategy as an effective style because of the collaboration, discussion and group work that exist among the students in science classrooms who use such strategies. Johnson and Johnson (2002) further outlined some advantages of cooperative teaching and learning thus, it establishes inclusion, creating learning atmosphere in which learners feel respected and connected to one another. Cooperative teaching and learning strategy also creates a strong social support system and it develops students' social interaction skills when cooperative teaching / learning is used. It also promotes positive societal responses, reduces violence in any setting, eliminates fear and blame, and increases honor, friendliness and consensus. Researchers on cooperative teaching / learning (Olorukooba 2001 and Slavin 2007) opined that when cooperative teaching / learning strategy is used, students tend to exhibit higher achievement outcomes, critical thinking skills and deeper understanding of learned materials, among others. This study is aimed at investigating the effects of cooperative teaching /learning strategy, class size and school location on students' achievement in basic science. Although studies have been conducted on the effects of cooperative teaching/learning strategy on science achievement, none of the studies available to the researcher included the combined effects of the variables of class size and school location. Large class size is defined as the student population of 50-70 students to one teacher (Molner, 2008 and Shaibu, 2003). They further posits that large class size can negatively affect two significant and interrelated aspects of teacher practice, namely, instructional time and classroom management. Findings from Titun (2002) have shown annual budgets in Nigeria do not take into consideration the issue of large class size especially with dwindling and inadequate funding of schools.

In Nigeria today, the society, parents and students seem to associate better achievement in basic science to a variety of factors for which school location is critical. School location simply describes the settlement or

area in which a school is situated. This settlement could either be urban or rural. Students' achievement may be greatly influenced by the area in which the students live or where the school is situated. Brown and Swanson (2001) assert that the reasons for variation in achievement can be as a result of geographic location of a school. They also identified that low achieving youths are mostly in public rural schools. Lackney (2009) stated that school buildings, classroom housing the students, the physical and environmental conditions, could cause poor students' achievement in basic science. He further points out that school building which are located near factories, poorly ventilated, having large class size, school size and failure of embedding schools within their community, can cause poor achievement in basic science.

On the issue of gender and science education, Anaso (2006) noted that there is a number of conflicting conclusions about gender-related differences in achievement of students in science. Some researchers view gender as a relevant factor in achievement while others find no difference existing between males and females in terms of achievement. Indolp (2009) in his studies expressed concern that girls were not achieving as much as their male counterparts in science. Tobin (2004) and Tallin (2006) reported that there was no significant difference in achievement of girls and boys in science subjects. In this study the researcher is determined to investigate the effects of cooperative strategy class size, and school location on students' achievement in basic science in Potiskum Educational Zone of Yobe State of Nigeria. It is against this backdrop that the researcher intends to investigate the effects of cooperative strategy class size and school location on students' achievement in basic science.

Statement Of Problem

The issue of students' underachievement in science at all levels of education in Nigeria has been a source of concern to teachers, curriculum planners, the government, parents and other stakeholders in education. A lot of factors have been advanced as being critical to poor achievement of students in science, such as large class size.

The problem of large class size in Nigeria and other developing countries of the world are tied to two interrelated trends, namely global initiatives for universal education and rapid population growth (UNESCO, 2006). Olumide, and Okebukola, (2006) point out that one of the problems arising from enhanced access to education is that of increased number of students, school location and this has resulted in inadequacy of infrastructure, teaching /learning materials, inadequate provision of classrooms leading to high teacher-students ratio. According to Mclead (2001), one of the problems of increased number of students in the class is limited range of teaching method and inability of the teachers to provide for the specific learning needs of the individual students and this has resulted in poor achievement of students in school subjects.

Usman (2002) in supporting this view reported the seriousness of the deplorable infrastructures in secondary school on students' academic achievement in basic science. He identified persistent use of the lecture method and school location as factors that have affected students' achievement in Basic Science. Ogunlede (2003) reported that many students developed negative attitudes to the study of science probably due to the fact that teachers' modes of instruction are inadequate and ineffective. Teaching strategies thus appear to influence the attitude of students positively or negatively to science. The search for improved strategies for teaching and learning of science in order to stem the tide of student's poor achievement is a continuous process. A review of literature shows that a handful of studies have investigated the effects of cooperative strategy on achievement of students in science at different levels of education in the country. However, no study available to the researcher investigated the combined effects of cooperative strategy, class size and school location of basic science achievement of students' at the basic level of education. The study therefore seeks to investigate the effects of cooperative strategy class size and school locations on students' achievement in basic science.

Purpose Of The Study

The purpose of this study is to investigate the effects of cooperative teaching/learning strategy class size, and school location on students' achievement in basic science.

The objectives of the study are to:

i. determine the class sizes of JSS II basic science students.

ii. determine the association between cooperative strategy and class size.
iii. find out the association between class size and students' achievement in basic science in urban schools.
iv. determine the association between school location and students' achievement in basic science.
v. Investigate the effect of cooperative strategy on students' achievement in basic sciences in rural schools
vi. find out the difference between the achievement scores of male and female students' in basic science.

Research Questions

The study was guided by the following research questions:

1. What are the mean achievement scores of students' taught basic science using the cooperative learning approach in urban and rural schools?
2. What are the mean scores of students' taught with the lecture method in urban and rural schools?
3. What are the mean achievement scores of boys and girls taught with cooperative strategy in urban schools?
4. What are the mean achievement scores of boys and girls taught with cooperative strategy in rural schools?
5. What are the achievement mean scores of boys and girls taught with lecture method in urban schools?
6. What are the achievement mean scores of boys and girls taught with lecture method in rural schools?

Hypotheses

The following null hypotheses were tested for significance at 0.05 level.

1. There is no significant difference between the basic science achievement mean scores of students' in large classes and those of students' in small classes exposed to cooperative strategy.
2. There is no significant difference between the basic science achievement mean scores of male and female student's exposed to cooperative teaching/learning strategy.
3. There is no significant difference between the basic science achievements mean scores of students exposed to cooperative learning strategy in urban schools and their counterparts in rural schools.
4. There are no interaction effects of cooperative strategy, class size and school locations on the basic science achievement mean scores of students in basic science.

METHOD

This section describes the procedures that were used in carrying out the study. It focused on the design for the study sample and sampling technique, the population, instrument, validation, reliability of the instrument, data collection and data analysis of the study

The researcher used the true experimental design, the aim of the design according to Awotunde and Ugodulunwa (2004), is to compare the gain scores of the two groups. Specifically, the experimental group is to be taught cooperative teaching / learning while control group is to be taught the same concept using the conventional lecture method. The use of true experimental research design study is aim at the sample group must be assigned randomly, there must be a viable control group, and only one of the variables can be manipulated and tested. It is possible to test more than one, and the tested subjects must be randomly assigned into control or experimental group. This design is frequently used when it is logistically feasible or ethical to conduct a randomized controlled trial.

Additionally utilizing true experimental design provide adequate and complete controls for all sources of internal invalidity as natural environment do not suffer the same problem of artificiality as compared to a well control certain. Since true experiment is a natural experiment findings in one may be applied to other subjects and certain allowing for generalization to be made about a population. The design is illustrated as follows:

R O_1 X O_2..... Experimental group
RO_3 O_4……Control group

Where:
$O_1$and$O_3$are pre-test and scores for the experimental and control groups respectively,
$O_2$and O_4 are post-test scores for the experimental and control groups respectively,
R stands for randomization, while
X stand for the treatment.

The population for this study was comprised all the co-educational junior secondary school(JSS II) students' in Potiskum Local Government Area of Yobe State of Nigeria that teaches basic science. In the educational zone, there are fourteen schools; some of the schools are in urban while others are in rural areas. Co-educational schools were used for the study in order to accommodate the gender variables as indicated in section one. Record of enrolment shows that there were 2200 students in the target population comprising 1,149 boys and 1,051 girls.

The sampling technique that was used in the study was the simple random sampling technique and the proportionate stratified sampling technique.

The instrument that was used for collecting data for this study was the Basic Science Achievement Test (BSAT).

The data for the study were gathered through the administration and scoring of instruments, namely BSAT. The researcher personally visited the four schools selected for the study, and obtained permission from the principals to conduct the study there.

Important information was collected from the basic science teachers in those schools, who were "trained" by researcher and eventually served as research assistants. Such information include the number of periods of basic science allotted to JSSII classes per week, basic science concepts outline in the scheme of work for the term, population of JSSII students in the schools, qualifications and experience, of basic science teachers, etc.

Where the contents outlined in the scheme of work for the term was different from the ones selected for the study, necessary adjustment was made with the research assistants to accommodate the researcher's own.

RESULTS

The data collected for this study was used to test the research question and the hypothesis stated in section one. The scores from the pre-test and post-test was subjected to statistical analyses. Each of the research question and the hypothesis is re-stated below along with the description of the statistical technique used. The level of significance for rejection or retention of the stated hypothesis is set at 0.05 levels.

Hypothesis 1

Ho_1: there is no significant difference in the Basic Science achievement mean scores of students' in large classes and those of students' in small classes exposed to cooperative strategy.

To test this hypothesis the post-test scores of students from the achievement test of experimental and control group were collected. These were then analyzed using t-test statistical technique to investigate if there is any significant difference in the mean scores at alpha ≤ 0.05. The result is presented in table 4.1.

Table 4.7: t-test Analysis of mean scores of experimental group and control group in large classes and there counterpart in small class size.

Variable	N	X	SD	T-value	Df	P-value	Remark
Experimental	94	58.315	8.291	6.646	186	.0001	*significant
Control	94	49.634	9.584				

*significant at p≤ 0.05.

The result in table 1 shows that the p-value obtained is 0.001 at alpha ≤0.05 with df=186. This implies a significant difference in the mean scores of experimental group exposed to cooperative strategy and that of the control group exposed to lecture method. This reveals that cooperative strategy enhanced achievement of students' in large classes. The mean score value of 58.315 for the experimental group and

49.634 for the control group further confirmed this. Thus, the null hypothesis which stated there is no significant difference is rejected.

Hypothesis 2:

Ho_2 there is no significant difference between the basic science achievement mean scores of male and female basic science students' exposed to cooperative teaching /learning strategy in large classes.

To test this hypothesis, the post-test achievement scores of the male and the female students' in the experimental group were compared accordingly. The mean scores of students' were tested using t-test statistics. The results are presented in table 2.

Table 4.8: t-test Analysis of mean scores of male and female students' of experimental group in large class

Variable	N	X	SD	T-Value	Df	P-value	Remark
Male	94	54.77	10.392	1.087	186	.279	Not significant
Female	94	53.20	9.399				

Not significant at p≤0.05

From the result of table 2, the mean scores of male are 54.77 while that of the female is 53.20. A p-value of .279 tested at p≤0.05 significant levels with df=186 was also obtained. This means there is no significant difference between the post-tests means score of the male and female students when exposed to cooperative strategy. Thus, the null hypothesis which stated there is no significant difference is retained. This indicates that gender does not play a significant role in the achievement of subjects when exposed to cooperative strategy. Therefore, cooperative strategy in large class is gender friendly.

Hypothesis 3:

Ho_3: there is no significant difference in the basic science achievement mean scores of students' exposed to cooperative learning strategy in urban areas and their counterparts in the rural areas.

To test this hypothesis, the mean scores of Students' from urban and rural areas exposed to Cooperative Learning Strategy were analyzed using t-test statistical tool. The results are presented in table 3.

Table 4.9:t-test Analysis of students' achievement in urban and rural areas thought using cooperative learning strategy.

Location	N	X	SD	t-value	Df	P-value	Remark
Urban	108	54.02	9.934	16.53	186	0.00	*significant
Rural	80	38.09	8.702				

*significant at p≤0.05.

The result in table 3 shows that at 0.05 level of significant difference P-value obtained is 0.00 it was revealed from the above table that students in urban schools with a mean of 54.02 effectively utilized the cooperative learning strategy as compared to those in rural schools with mean scores of 38.09. They result could be aligned with the findings of William (2005), Suzanne and Lauren (2012) who have it that students' from urban schools achieve better than those in the rural schools because of the level of federal funding and socio- economic background. The fact that urban schools have access to more funding, they may also be able to equip the basic science laboratories with more instructional aides, more qualified teachers better ventilated class rooms and better physical and environmental conditions which will motivate them to concentrate and achieve better in cooperative learning class. Therefore it is suggested that rural schools can also achieve better in basic science if government (state and federal) gives proper attention to the funding of schools in these areas, provide necessary infrastructure and post more qualified teachers to those areas. Thus, hypothesis3 which stated there is no significant difference is rejected.

Hypothesis 4:there are no interaction effects of cooperative strategy, class size and school location on the basic science achievement mean scores of students' in basic science.

To test this, the mean scores of students' of small class size from urban and rural schools exposed to cooperative strategy were analyzed using ANOVA statistical tool. The results were presented in table four:

Table 4.10: ANOVA Analysis of students' interactive effects of cooperative strategy, class size and school location on the basic science achievement mean scores.

Scores sum of squares	df	mean square	f	significant
Between groups 489.7	2	244.84	2.269	.111
Within groups	7768.3	72	107.89	
Total	8258.00	74		

*significant at $p \leq 0.05$

The result in table 4 shows that at 0.05 of significant difference which has an f-value of 2.269 is significant it then mean that the null hypothesis is rejected which state that there is no interaction effects of cooperative strategy, class size and school location on the basic science achievement mean scores of students' in basic science and the alternative hypothesis is accepted this indicate that the interaction effects of cooperative strategy, class size and school location on the basic science achievement mean scores have effects on students when the class size is small. The school locations also have effects on students' achievement in basic science base on the mean square score of between and within group of 244.84 and 107.89.

DISCUSSION

The main objective of this study was to investigate effects of cooperative strategy class size, and school location on students' achievement in basic science, after analysis the findings are discussed below. Table 6 revealed that male students' achieved higher than their female counterpart in rural schools. (Ekpo, 2006) opine that homes are not left out as responsibilities are assigned differently to males and females, the society frown at seeing males cooking or female climbing a tree. The male are also assigned leadership positions and the females are to assist or to follow. Gender role differentiations are also encouraged in pictorial illustrations in textbooks which usually portray males as Doctors, Lawyers, Engineers while the female are seen as Nurse, cooks, mothers etc this creates mental picture in the mind of the readers of the role expectation from the society.

From the analysis of Table 4.7 it is empirically confirmed that there was significant difference in the mean scores of students' in the experimental group and the control group when tested with BSAT. They result indicates that the experimental group that were exposed to cooperative strategy performed significantly better than their counterparts in the control group who were taught using lecture method. The higher the achievement which favors the experimental group suggests that cooperative strategy was greatly effective over the lecture method of instruction.

The findings of this study are in conformity with other studies conducted on cooperative strategy. Olorukooba (2001) found that cooperative strategy is more superior over the traditional lecture method in enhancing students' higher achievement. He emphasized that the higher the achievement obtained from the use of cooperative strategy might have been due to the students' active participation and discussing freely with one another within the group members.

The process of cooperative strategy stimulates higher cognitive skills. Similarly, effectiveness of peer instruction approach over traditional approach was also reported by Belcher (2003) that students' taught using peer instruction approach showed dramatic gain in achievement compared to those in the same course taught in traditional lecture method. He pointed out that sharing ideas by students' help them to identify their ideas, which leads to greater understanding and enable teachers plan activities to guide them, become more comfortable in their own ability to understand and explain scientific concepts. Supporting this views and in a similar findings with basic science students' of large class, the better achievement obtained in this study might have been due to the fact that collaborative team effort of the students' resulted in participants striving for each other efforts through explanation of the concepts and

principle by sharing ideas and experiences, in the process. Under these conditions, students learn more effective and achieved better.

The findings of this study also revealed that there was no significant differences in the post test mean scores of male and female students' when exposed to cooperative strategy. This implies that the use of cooperative strategy is gender friendly, meaning that both male and female benefit equally from the use of cooperative strategy. The findings are in agreement with the findings of Udousoro, (1999) that gender and ability of students' failed to have any significant effect in the cooperative group. Similar findings have also been reported by Tobin (1993) and Tallin (1996) who independently reported that boys are not better than girls in terms of educational achievement, after they had independently carried out studies on gender differences and students' achievement at secondary school levels. On the contrary, Aigboman (2002) and Njoku (2007) independently reported that boys achieved significantly better than the girls in science, technical and mathematical subjects. These have been attributed to the method of instruction used in teaching such subjects. A major importance of these findings is that cooperative strategy is gender friendly.

The findings from the analysis of the school location in Table4.8revealed that there is no significant difference in the basic science achievement means scores of students' expose to cooperative learning strategy in urban and rural junior secondary school as measured by the result. This means that geographical location of school has effect on the achievement of students'. This finding agreed with the works of Onah (2011) and Owoeye and Tara(2011) who reported that students' in urban schools achieved significantly better than students' in the rural schools. From the findings of the study, the use of cooperative strategy with basic science students' of large class size was observed to generate a change in behavior and enhance students' achievement in the subject. Consequently, this strategy holds a viable promise for improving teaching and learning process of basic science in large class size at the junior secondary school level.

The findings from the analysis of the school location in Table 4.9 shows that there is an interaction effects of cooperative strategy, class size and school location on the basic science achievement mean scores of students in basic science as measured by the result. This mean that despite the small class size in both urban and rural schools the achievement of students' in basic science is high when cooperative strategy is employ.

CONCLUSIONS

The following conclusions were drawn based on the findings from this study. Students exposed to cooperative strategy achieved significantly better in basic science than those exposed to lecture method of instruction. Also cooperative strategy is gender friendly in enhancing the achievement of male and female students' in basic science. School locations have effects on students' achievement in basic science. And small class size does not have effects on students' achievement in basic science.

Generally, cooperative strategy has the potential of enhancing basic science students' achievement and attitude in large class size using this teaching strategy for the improvement of science education at the JSS level is therefore a welcome idea.

RECOMMENDATIONS

Based on the conclusions from this study, the following recommendations are made:

1. Cooperative strategy is effective in teaching basic science. For this reason, teachers should employ this method so as to help or assist students' to improve their achievement in basic science.
2. Curriculum planners should examine the effectiveness of cooperative strategy and consider its suitability for the teaching of basic science concepts since it has the potential of bringing about meaningful learning and improved students' achievement.
3. Professionals and research organizations like the science teachers association of Nigeria (STAN) and the Nigerian Educational and research Development Council (NERDC) that carry out

seminars, workshops and conferences should incorporate cooperative strategy in their curricula at the lower basic secondary level.

4. The Federal and State Ministry of Education should sponsor Basic Science teachers for refresher training on cooperative strategy required to improve students' achievement in the subject.
5. Based on the issues and problems associated with large class size. Cooperative strategy should be employed as it's seemed to enhance students' achievement in basic science at JSS level, despite the large class size.

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