



Original article

# Effect of Cooperative Teaching Strategy and Instructional Materials Utilization on Mathematics Learning Achievement of Senior Secondary School Students in Fika Local Government Area, Yobe State, Nigeria

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## Abstract

This study determined the effect of cooperative teaching strategy and instructional material utilization on Mathematics learning achievement of senior secondary school students in Fika LGA, Yobe State, Nigeria. Two (2) objectives were stated and two (2) null hypotheses were tested. Quasi-experimental design was adopted. The population comprised of one hundred and forty (140) students selected from the four senior secondary schools in the study area. Thirty five (35) students were purposively selected from each of the four senior secondary schools. Achievement Test in Mathematics was adapted for the study. Three stages were used in collecting the data: pre-treatment, treatment and post-treatment phases. Independent sample t-test was used to analyze the two (2) null hypotheses. The results were considered at  $P < 0.05$  level. The finding of the study showed that cooperative teaching strategy had significant effect on mathematics learning achievement of senior secondary school students. It is further discovered that instructional material utilization had significant effect on mathematics learning achievement of the students. It is recommended among others that effective use of cooperative teaching strategy and instructional material utilization in teaching mathematics in schools should be used by teachers to enhance student learning achievement in mathematics.

**Keywords:** Cooperative Teaching Strategy, Instructional Material Utilization and Mathematics Learning Achievement.

**Received:** 21 January 2022 \* **Accepted:** 09 March 2022 \* **DOI:** <https://doi.org/10.29329/ijiape.2022.437.3>

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## **INTRODUCTION**

The process of imparting knowledge and skills of Mathematics to Students will provide them with the breakthrough and logics to understand the subject very well. The Federal Republic of Nigeria through the Federal Ministry of Education in its 6<sup>th</sup> revised version of National Policy on Education NPE (2013) has stipulated that the objectives of teaching mathematics in schools is to: inculcate the right type of value and attitude for survival of the individual and the Nigeria society; to provide necessary mathematical background for higher learning; acquisition of appropriate skills abilities and competencies both mental and physical equipped for the individual to live and contribute to the development of his society; to develop precisely logical and abstract thinking; to encourage creativity; to develop the ability to recognize problem and to solve them with related mathematical knowledge; to foster the desire and ability to be accurate to a degree relevant to the problem at hand; to develop interest for mathematics and provide a solid foundation for everyday living.

In many years past, Mathematics as subject has been widely accepted by different countries all over the world for scientific and technological advancement (Owoyele & Muraina, 2016). Despite the relevance that the subject posit in the area of science and technology, the process that is involved in its teaching is appropriately characterized by so many gaps. It has been evidences that teachers are not adequately equipped with instructional materials utilizations to enhance their teaching, which has affected the process of the teaching and learning (Muraina & Yunisa, 2018). Therefore, teachers should cultivate the right attitude of improvising and innovative behaviour of using appropriate teaching methods that will enhance their teaching at all level of education (Joe, 2004; Adu & Galloway, 2015).

Teaching and learning process is a give-and-take interaction where the teacher sends out the message while the students acknowledge through feedback (Mayer, 2003; Muraina & Yunisa, 2018). However, this process of give and take could only be effective when the teaching strategy applied is appropriate. According to Adu and Galloway (2015) Teaching Method or Teaching Strategy refers to the process of conveying facts, skills, information and knowledge by the tutor (teacher), so as to involve students in meaningful activities for learning and to achieve the purpose of the lesson. Similarly, in the word of Madugu (2005) teaching methods consist of arrangement of series of activities involved in teaching students. Moreover, Ajoma (2009) explained that teaching method is the proficient practice in which tutors embrace frequently in giving out teaching during classroom discussions with students to facilitate them, impact useful content, experiences and skills to the learner. Since teaching involves both the teachers and the learners, therefore, the learners should be allowed to cooperate with his colleagues and actively partake in the teaching-learning processes.

Succinctly, there are three basics ways students can interact with each other as they learn. They can compete to see who is “best,” they can work individually towards a goal without paying attention to other students, or they can work cooperatively with a vested interest in each other’s learning as well

as their own (Macpherson, 2009). Even though these three interaction patterns are not equally effective in helping students learn concepts and skills, it is important that Students learn to interact effectively in each of these ways (Çolak, 2015). Colak (2015) further explained that students' will face situations in which all three interacting patterns are operating and they will need to be able to effective in each. However, the fact that working together to achieve a common goal produce higher achievement and greater productivity than does working alone is so well confirmed by so much research that it stand as one of the strongest principles of social and organizational psychology.

Cooperative Teaching is indicated whenever learning goals are highly important, mastery and retention are important, a task is complex or conceptual, problem solving is desired, divergent thinking or creativity is desired, quality of performance is expected, and higher-level reasoning strategies and critical thinking are needed (Çolak, 2015). Cooperative learning is a relationship in a group of students that requires positive interdependence (a sense of sink or swim together), individually accountability (each of the students has to contribute and learn), interpersonal skills (communication, trust, leadership, decision making, and conflict resolution), face to face promote interaction and processing (reflective on how well the team is functioning and how to function even better) cooperative teaching method act as a motivator to help students overcome difficulties, in which student by themselves help each other to study, and provide reasonable answers to questions asked. (Hermann, 2013). However, there is a difference between simply having students' works in a group and structuring groups of students to work cooperatively. A group of students sitting at the same table doing their own work, but free to talk with each other as they work, is not structured to be a cooperative group, as there is no positive interdependence. Perhaps it could be called individualistic learning with talking. For this to be cooperative teaching strategy; there needs to be an accepted common goal on which the group is rewarded for its efforts.

Instructional Material can be described as all items and equipment used by teachers during lesson presentation to enhance teaching by simplifying difficult concepts and ideas through the use of pictures, charts, diagrams, real objects, projected material and non-projected materials, etc. (Usman & Dahiru, 2016). Material should consists of use of pleasurable objects and method for the students while at the same time the teacher tries to appeal to their sense of seeing, hearing, smelling, testing and feeling (Abifarin, 2004). Therefore, in order to appeal to all the senses above the teacher needs to adequately utilize instructional materials.

The most common reason advanced for not using instructional material are that, they are difficult to obtain and expensive to buy. Both reasons can be overcome when the teacher make the use of instructional materials using available materials. A few simple materials, a moderate imagination and a lot of care are needed to improvise and produce for teacher to produce his own instructional materials (Abimbade, 1997). The influence of instructional materials in promoting students' academic

achievement and teaching of any subjects not only mathematics is undeniable (Oshadumi, 2003). The process and techniques that should be used when teaching mathematics to students needs to be handled properly, this is because of the immense contributions of Mathematics to the scientific and technological development of a country (Owoyele & Muraina, 2016).

Moreover, different researchers have conducted several researches on the use and relevant of instructional materials in enhancing students' academic achievement. In the work of Muraina and Yunisa, (2018) who correlated the use of Instructional Materials with students' academic performance in economic had found a significant effect. In a similar vein, Isola (2010) conducted a research in Kwara State and found that the use of instructional materials has a positive relationship when compared with students' achievements among 10 different subjects with mathematics included. Therefore, in order to the filled gaps in the previous studies and add more to the existing literature, this study investigated the efficacy of cooperative teaching strategy and instructional materials utilization on mathematics learning achievement of senior secondary school students in Fika LGA, Yobe State, Nigeria

### **Statement of the Problem**

The West African Examinations Council Results Statistics 2016-2018 according to National Bureau of Statistic (2019) reflected that a total of 1.57 million candidates sat for WAEC in 2018 as public students as against 1.56m candidates in 2017. The report shows that 1.06m had 5 credits and above including Mathematics while 756,726 of the candidates had 5 credits and above including Mathematics & English Language. The percentage of candidates with 5 credits and above including Mathematics & English Language is put at 48.15% all over the country. On the other hand, Yobe State had a total of 13,378 candidates in 2016 and only 13.9% of the students passed credit in both English and Mathematics. In 2017, the total number of students decreased to 13,297 candidates and the percentage of the student who passed English and Mathematic stood at 26.70%. Similarly, in 2018, the total number of the student was 16,898 and the percentage of the student who passed credit in Mathematics and English was 15.82%. The abysmal academic achievement of senior secondary schools student in Yobe State was clearly shown in the WAEC results of the 2016-2018. This therefore, has called for teaching strategies to be improved upon to bring about increase in students' academic achievement. However teachers are supposed to understand the complexity of Mathematics and know which appropriate teaching strategy to use at that point in time (Adu & Galloway, 2015).

Following the interactions between the researcher and mathematics teachers and students in secondary schools in the state, some teachers attributed the problem of poor performance to teaching methods used in teaching the subject. According to them, the lecture, discussion and demonstration teaching methods have dominated their teaching methods. Some complained that there is little or no time to complete the syllabus in the schools and as such some topics are left untouched or carried over

to the next term or even the next session. On the other hand, some students complained that the subject was too difficult to assimilate as it required a lot of memorization of formulas and calculation.

From all the interactions so far stated, it is glaring that student poor achievement in Mathematics is the problem that prompted this study, and as such addressed using empirical evidences. In spite of the remarkable efforts been put in by researchers and other educational experts in finding a lasting solution to the problems of low academic achievement in Mathematics, little studies have concentrated on the effect of cooperative teaching strategy and instructional materials utilization. In order to filled the gaps in the previous studies and add more to the existing literature, this present study investigated the efficacy of cooperative teaching strategy and Instructional materials utilization on mathematics learning achievement of secondary school students in Fika LGA, Yobe State, Nigeria

### **Objectives of the Study**

The objectives of this study are to:

1. Find out the difference in the senior secondary school students' learning achievement in Mathematics, between students who are exposed to cooperative teaching method and those exposed to lecture method.
2. Investigate the difference in senior secondary school students' learning achievement in mathematics, between students who are taught with instructional materials and those without instructional materials.

### **Research Hypotheses**

The following null hypotheses were tested at 0.05 level of significance

**HO<sub>1</sub>:** There is no significant difference between the Mathematics learning achievement of secondary school students exposed to cooperative teaching method and those exposed to lecture Method

**HO<sub>2</sub>:** There is no significant difference in the mean learning achievement scores of students taught with instructional materials and those without instructional materials

## **METHODOLOGY**

### **Design of the study**

The study adopted the pretest-posttest, control group quasi-experimental design with a 2X2 factorial matrix. In essence, the row consists of cooperative teaching method and the control group. The row was crossed with instructional materials utilization varied at two levels (with instructional materials utilization and without instructional materials utilization).

## **Population and Sample**

The population for the study was three thousand six hundred and fifty four (3654) senior secondary students in Fika Local Government Areas (LGAs) of Yobe State, Nigeria. Purposive sampling technique was used to select thirty five (35) secondary school students proportionately in each school. On the whole, 140 secondary school students were drawn for the study. However, the whole samples were grouped into two, one group formed experimental class while others were used as the control group.

## **Instrument for Data Collection**

The instrument used for data collection was Achievement Test in Mathematics developed by Jayanthi (2014). The instrument constituted one hundred and fifty (150) items under each chapter, that is 20 items from Sets and Functions, 20 items from Sequences and Series of Real Numbers, 25 items from Algebra, 10 items from Matrices, 15 items from Coordinate Geometry, 10 items from Geometry, 10 items from Trigonometry, 10 items from Mensuration, 5 items from Practical Geometry, 5 items from Graphs, 10 items from Statistics and 10 items from Probability. There were four options in each item. The reliability coefficient was calculated as 0.888 and validity coefficient is calculated as 0.942 as reported by the author.

However, face and content validation was done to make sure the instrument is valid to measure what it supposed to measure. During the validation, the items were reduced from one hundred and fifty (150) to seventy (70) after the instrument was re-validated by three (3) Mathematics teachers in secondary schools for scrutiny; furthermore, the items that were deemed fit for carrying out the investigation on the achievement test were administered to fifty (50) students.

Kuder–Richardson (KR20) was used to establish the reliability coefficient and an overall coefficient of .89 was ascertained. Factorial analysis was used to analyze and ascertain the difficulty index and discriminatory power of the test. The analysis was done using students with higher achievers and lower achievers in Mathematics. The difficulty and discriminating indices of each of the test items were computed and .55 difficulty and .82 discrimination index were obtained. Moreover, the instrument was administered to one hundred and forty (140) participants and one hour thirty minute (1hr 30min) was allocated for students to answer the questions.

## **Procedure for Data Collection**

The study was conducted in three different phases viz:

1. The first stage was preliminary activities stages, were preliminary meeting and familiarization by participants of the experimental process. Similarly, the stage witnesses the administration of Achievement Test in Mathematics to the students as the pre-test.

2. The second stage witnesses the treatment phase in which Students' in the experimental group were exposed to 14 sessions of treatment using cooperative teaching method and instructional Material Utilizations. For each session, a total of 60 minutes was used on the average while participants in the control group were exposed to normal lecture method.
3. The third stage witnesses the administered of post-test to see the effect of the treatment.

### Method for Data Analysis

Independent Sample t-test statistical analysis was used to analyze the data collected for the study. Independent sample T-test was used so as to see if there was any significant difference in the Achievement Test in Mathematics of participant in treatment group and control as well as those with instructional materials utilization and those without instructional material utilization.

## RESULTS

**HO<sub>1</sub>:** There is no significant difference between the Mathematics Learning Achievement of secondary school students exposed to cooperative teaching method and those in the control group

**Table 1.** An independent t-test of Students Exposed to Cooperative teaching method and those exposed to Lecture Method

Groups	N	Mean	SD	df	t-cal	P-value	LS
Cooperative Teaching Method	67	28.54	1.25	118	55.82	0.000	0.05
Lecture Method	73	10.45	0.98				

\*Significant at  $p < 0.05$

The result in table 1 showed that a significant different exist between the Learning Achievement of secondary school students in Mathematics who were exposed to cooperative teaching method and those in the control group ( $t\text{-cal}=55.82$ ;  $p < 0.05$ ). The mean value of the table further revealed that the students taught with cooperative teaching method had higher Mathematics Learning Achievement than their counterpart taught with lecture method. This further meant that cooperative teaching method had significant effect on Mathematics Learning Achievement of secondary school students.

**HO<sub>2</sub>:** No significant difference exist between secondary school students Learning Achievement in Mathematics who were taught with instructional materials and those without instructional materials

**Table 2.** Summary of t-test of Secondary School Students with and without Instructional materials utilization

Groups	N	Mean	SD	Df	t-cal	P-value	LS
With Instructional Material Utilization	66	56.83	23.64	118	36.71	0.002	0.05
Without Instructional Material Utilization	74	25.69	10.37				

\*Significant at  $p < 0.05$

Table 2 revealed that there was significant difference between the Mathematics Learning Achievement of secondary school students taught with instructional materials and those that were taught without instructional materials ( $t\text{-cal}=36.71$ ;  $p<0.05$ ). The mean value of the table further revealed that the students who were exposed to instructional materials when teaching had a higher Mathematics Learning Achievement than their counterpart taught without instructional materials. This further meant that instructional materials utilization had significant effect on Mathematics Learning Achievement of secondary school students.

### **Discussion**

The result in Table 1 presented that a significant different exist between Mathematics Learning Achievement of secondary school students exposed to cooperative teaching method and students in the control group. The mean value of the table further showed that the students taught with cooperative teaching method had higher Mathematics Achievement than their counterpart taught with lecture method. This further meant that cooperative teaching method had significant effect on Mathematics Learning Achievement of secondary school students. This is in line with the study of Macpherson (2009) and Mayer (2003) whose findings reveals that the use of cooperative teaching put students at the center stage where they are encourages other students to engage and fully participate in taking a more central and active role in their learning process by answering series of questions or solving problems designed to introduce a general concept. Similarly, Hermann (2013) pointed out that cooperative teaching method act as a motivator to help students overcome difficulties, in which student by themselves help each other to study, and provide reasonable answers to questions asked. Cooperative teaching method enables learners to create their own learning experience, through their colleagues. This method has recently been emphasized in modern teaching. It has been identified as providing meaningful learning and thus teachers are encouraged to use them. Cooperative teaching method involves an unstructured exploration in some problem-solving experiences in which students can draw general conclusions from data gathered through measuring, classifying, inferring, predicting, communicating, analyzing, clarifying, describing and formulating relevant questions (Adu and Galloway, 2015).

The result of Table 2 also discovered that a significant difference exist between the Mathematics Learning Achievement of secondary school students who were introduced to the use of instructional materials during teaching and those without instructional materials. The mean value of the table further indicated that students taught with instructional materials had higher Mathematic Learning Achievement than their counterpart taught without instructional materials. This further explained that instructional materials utilization had significant effect on Mathematics Learning Achievement of secondary school students. This is in line with the findings of Agina-obu (2005); Usman and Dahiru, (2016) and Owoyele and Muraina (2016) whose findings showed that instructional materials provide comprehensive, visual or both to the sense organs during teaching-learning process. The effect of instructional materials in



promoting students' academic achievement and teaching of Mathematics is undeniable. There have been several studies on instructional materials and academic achievement of students. For example, Muraina and Yunisa (2018) correlated instructional materials usage with academic achievement of students in economics. In the same manner, Isola (2010) carried out a research in Kwara State and found that the use instructional materials are related to students' achievements in each of the selected subjects.

### **Conclusion**

Based on the findings of the study, it was concluded that secondary school students taught with cooperative teaching method and instructional materials performed better than their counterparts taught using lecture teaching method and without instructional materials. Teachers should therefore adopt the use of cooperative teaching method and instructional materials to enable students develop interest in Mathematics, understand the subject better and perform excellent in both internal and external examinations. Persistent low-slung of Mathematics Learning Achievement of Nigerian secondary school students need not to continue forever. There is hope that with the improvement of instructional materials utilizations and cooperative teaching method, the situation can be changed for the better. The study found that instructional materials utilizations and cooperative teaching strategy affect the Mathematics Learning Achievement of secondary school students.

### **Recommendations**

Based on the findings from the study, the following recommendations were propelled:

1. Educational stakeholders should strengthen their effort to organize seminars/conferences on the implications of cooperative teaching method as effective teaching method in enhancing Mathematics Learning Achievement of secondary school students.
2. Teachers and other stakeholders in the school system are to be trained on how to improve on the instructional materials utilizations. This will serve to argument the efforts in overcoming the challenges of low use of Instructional Materials.
3. The school management should always deepen their efforts in making appropriate instructional materials available for the teachers in the school. This will make the teachers to effectively utilize the materials in teaching in order to enhance academic performance of the students.

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