

# Effect of cooperative learning method on the retention of physics students in senior secondary schools at Ondo West Local Government Area of Ondo State

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## Introduction

Nigeria, like other developing countries of the world seems to be eager, to develop her scientific and technological potentials, so as to attain a measure of self-efficiency in the production of goods and services. The poor achievement of students in science especially Physics has continued to be a major concern to all and particularly those in the main stream of science Education (Ariyo, 2006). Killen (2007) defines cooperative learning as an instructional design that stimulates peer interaction and learner-to-learner cooperation with the aim of fostering successful learning by all. Van-Wyk (2010) reports that cooperative learning is a practical teaching strategy, offering students more active learning experiences, equal access to learning and a more supportive social environment. When cooperative learning techniques are used properly, achievement benefits appear to be one of the results that can be anticipated. Bernaus and Gardner (2008) and Van-Wyk (2007) observed increases in academic achievement and motivation gains when cooperative learning replaced the traditional form of instruction (i.e. Competitive Learning Method). To avert the problem of poor academic achievement of student in Physics, the mode of dissemination of physics to the students' need to be looked into so as to help the learners. Science (physics) teachers have a unique opportunity to use cooperative learning strategies. In the National Policy on Education (2007), Physics is one of the leading core and compulsory science subjects of the senior secondary school curricular.

The importance accorded physics in the school curriculum reflects accurately the recognitions of the vital roles it plays in contemporary society. In spite of the prominence given to physics as a school subject, students' achievement in the subject is not encouraging globally. In Nigeria, even though the different Governments have provided materials for the study of physics, it is disheartening to note that senior secondary school students still perform poorly in the subject. This poor performance in Senior Secondary School Certificate Examination calls for serious concern by stakeholders. This is evidenced in the cumulative statistics of 2014 NECO result. Cooperative learning technique that has been extensively researched and assessed specifically on academic achievements, attitudes, retention, social interactions and inter personal relationships (Bernaus & Gardner, 2008 & Tarimand, 2008).

Cooperative learning method has many ways of application and they vary in view of educational philosophy adopted, the cooperation and evaluation and reinforcement processes. During cooperative learning activities, researchers developed many methods in order to create positive learning environment, contribute to the success of students and help teachers. Among these, commonly used methods can be summed up as learning together, team-game-tournament, reading-writing-application, jigsaw, group investigation, cooperative-cooperative, students team achievement Division (STAD) and academic controversy (Hines, 2008; Doymus, Simsek & Karacop, 2009). Science subject at senior level in Nigeria is divided into specific subject areas; physics and chemistry. These subjects are commonly taught by two different teachers who are specialists in these areas. Physics teaching encompasses the method of transmitting knowledge, skills and values on the scientific study of matter and energy to a learner (MuzuMara, 2009). It deals with abstract concepts. Reveles, Cordova, and Kelly (2009)

indicated that physics dealt with abstract concepts and students found these concepts difficult to grasp. The difficulties of many students with physics science subject can be traced back to the way they were introduced to this area of science course at primary school, and now it had been refueled by the way the subject is taught at secondary school, which always depend on the foundation laid by teachers at the lower level of Education. Smithers (2010) noted that the study of physics in schools at universities was spiraling into decline, as many teenagers believe it was too difficult and 'boring'. They further observed that the major reason for students finding physics uninteresting are that it is seen as difficult and irrelevant. Thus, this calls for strengthening of teaching science subjects by using different methods, which will activate motivational levels of pupils and thereby enhance quality performance. To avert the problems faced by many students in physics, the mode of dissemination of physics to the students' must be looked into to help the learners. Science teachers have a unique opportunity to use cooperative learning strategies (Bello, 2011).

Affectionate (2008) was of the opinion that the children born with a silver spoon (children from rich home) tend to make it faster in development and achievement compared to the under-privilege. Chiu (2008) has shown that students who work in cooperative groups do better in tests, especially with regard to reasoning and critical thinking skills than those that do not and that tended to perform better. Fui & Ho (2008) revealed that the cooperative Learning group outperformed the competitive Learning group.

A critical look at the contents of Physics curriculum in Nigeria indicates that the Traditional Teacher centred approaches are not relevant and appropriate to promote efficient learning of the content of the programme. Dubey (2007) stated that "no other agents of socialization is as important to the total make-up of the child as his family. The child home should provide a good environment and facilities for a child to learn and develop early education experiences. According to Akinbobola (2006), the selection of appropriate and most effective strategies of instruction is very important to the success of any lesson. In Nigeria, Akinbobola (2008) affirmed that the changes in the aims and objectives of physics curriculum have not been accompanied by corresponding changes in the teachers' Educational practices. A critical look at the contents of physics curriculum in Nigeria indicates that the Traditional Teacher centred approaches are not relevant and appropriate to promote efficient learning of the content of the programme. However, there is a need for strategies that will not only maximize meaningful understanding of concepts in physics but would provide students the opportunity to interact with their environment and will also make students and the teachers to clarify their misconceptions examples of such strategies include Cooperative Learning Method (CLM) and competitive learning method.

The studies on attitudes whether positive or negative, affect learning in science and physics. However, it is well known that a negative attitude towards a certain subject makes learning difficult. Therefore, helping students develop positive attitudes towards physics courses should be considered an important step in science education. Moreover, conventional teaching and traditional teaching methods have negative effects on the ability of learning physics for the majority of the students. Evaluation activities chart the progress of students toward the objectives outlined for them by the teacher and by themselves, therefore evaluation is an essential aspect of instruction at all levels. It is a means whereby the quality of tasks can be constantly maintained and improved (Kolawole, 2005). Evaluating a student's achievement is a primary duty of a teacher. It is a time consuming and cumbersome task because of the clerical work involved. At the same time, it requires a highly technical proficiency and it involves teacher's professional value judgement. Despite its enormity, evaluation is an indispensable task and a task that must be done at the end or during any instructional activities in order to ascertain the level of understanding of the concept taught. Scholars in student learning have shown a growing interest in using student Teams

Achievement Divisions (STAD) as a cooperative learning technique in classroom teaching. Killen (2007) defines cooperative learning as an instructional design that stimulates peer interaction and learner-to-learner cooperation with the aim of fostering successful learning by all. Van-Wyk (2010) reports that cooperative learning is a practical teaching strategy, offering students more active learning experiences, equal access to learning and a more supportive social environment.

The poor achievement of students in science especially Physics has continued to be a major concern to all and particularly those in the main stream of science Education (Ariyo, 2006). Eryilmaz (2004) observed that gender contributes to poor achievement of students in physics. The poor achievements of students in science especially physics has continued to be a major concern to all and particularly those in the main stream of science education (Ariyo, 2006). Tinto (2005) indicated that individual attributes such as age, gender and ethnicity impact student Performance. Illiya (2007) noted that gender difference seems to be most pronounced in the physical science; that is, chemistry and physics with the concern that girls are not achieving as much as they should as compared to boys when they are taught using cooperative learning method. Some reasons have been advanced for the difference in retention in physics in this regard. Olorunkooba (2008) noted that group work positively influences the retention particularly of female pupils. Age is considered as one of the factors that may likely affect the academic achievement of students. Cognitive development and maturity which are associated with age are necessary for a worthwhile performance of students. Age of the individual, as it increases, usually affects the various developmental changes. It also affects every area of human performance (Ukueze, 2007). Al-Mutairi (2011) mentioned that younger students had a tendency to perform better than mature students in a cooperative Learning setting. In addition, Coldwell, Craig, Colorado and Eberle (2010) and Paterson and Mustard (2008) revealed that student age was not related to academic performance, Age is considered as one of the factors that may likely affect the academic achievement of students. Cognitive development and maturity which are associated with age are necessary for a worthwhile performance of students. Age of the individual, as it increases, usually affects the various developmental changes. It also affects every area of human performance (Ukueze, 2007).

Science subject at senior level in Nigeria is divided into specific subject areas; Physics, Biology and Chemistry. These subjects are commonly taught by three different teachers who are specialists in these areas. Basically, physics teaching encompasses the method of transmitting knowledge, skills and values on the scientific study of matter and energy to a learner (MuzuMara, 2009). It deals with abstract concepts. Reveles, Cordova & Kelly (2009) indicated that physics dealt with abstract concepts and students found these concepts difficult to grasp.

The difficulties of many students with Physics as a science subject could be traced back to the way Physics were introduced to this area of science course in primary school, and now it had been refueled by the way the subject is taught at secondary school which always depend on the foundation laid by teachers at the lower level of Education. Smithers (2010) noted that the study of physics in schools and universities was spiraling into decline as many teenagers believe it was too difficult. Sillitto and Mackinnon (2011) noted that physics had an image of being both 'difficult' and 'boring'. Furthermore, It was observed that the major reason for students finding physics uninteresting are that it is seen as difficult and irrelevant. Thus, this calls for strengthening of teaching science subjects by using different methods which will activate motivational levels of pupils and thereby enhance quality performance. The mode of dissemination of physics to the students' must be looked into so as to help the learners. Science (Physics) teachers have a unique opportunity to use cooperative learning strategies (Bello, 2011). Therefore, this study will examine the effect of Gender and age of the student in relation with cooperative learning method on the retention of Physics students.

## Statement of the Problem

In spite of all the advantages derived and the recognition given to physics as one of the core science courses and a pivot to technological and economic development, there are wider gaps between curriculum planner, the implementers, that is, physics classroom teachers and what goes on in the classroom. This has led to the perception of students that physics is a difficult subject. Hence this study seeks to find out whether the following cooperative learning parameters has anything to do with the Academic achievements and retention of Physics students in senior secondary school.

## Research Questions

1. Is there any significant difference between the retention of Male and female Physics students taught with cooperative learning method?
2. Is there any significant difference between the retention of Male and female Physics students taught with competitive learning method?
3. Is there any significant difference between the retention of Physics students within and above the age range of 12-14 years taught with cooperative learning method?

## Hypotheses

- H<sub>01</sub>**. There is no significant difference between the retention of Male and female Physics students taught with cooperative learning method.
- H<sub>02</sub>**. There is no significant difference between the retention of Male and female Physics students taught with competitive learning method.
- H<sub>03</sub>**. There is no significant difference between the retention of physics students within and above the age range of 12-14 years taught with cooperative learning method.

## Methodology

This study is a quasi-experimental design. The population of this study includes physics students in senior secondary school One (SSI) in Ondo west local government Area of Ondo State. A total number of two hundred students were picked from four secondary schools as sample of the study. The researchers used four secondary schools among the entire secondary schools in Ondo west local government Area of Ondo State in order to facilitate detail findings. These schools are:

- St. Monica's Unity Secondary School, Ondo,
- Saint Stephen Anglican Secondary School, Ondo,
- Ondo Boys' high school, and
- Demonstration Secondary School, Ondo.

The procedure used by the researcher in selecting the sample was basically simple random selection of the various schools in the sub-region (Ondo town). Fifty (50) physics students were picked from senior secondary school I (SS1) and subdivided into two subsection teams using a simple random technique and each group comprises of twenty five (25) students including the group leader. A total of two hundred (200) senior school students were used for the study.

The main instruments designed of the study are:

- (a) **Physics Retention Tests**:- The first was a 25-question multiple choice test with items derived specifically from the objectives students worked on, at two weeks ago. The second physics test was similar in nature and the results were used to compute the grade. At each testing period, students had ten minutes to complete on the concept of matter.
- (b) **Students' Assessment Questionnaire (SRQ)**:- Fifty questionnaires were administered per school in all the six schools after obtaining due permission of the authorities concerned. The researcher did that with the help of research assistant.

Results

**Table 1: t-test Analysis of The Retention of Male and Female Physics Students Taught with Cooperative Learning Method**

Gender	N	X	SD	Df	t-cal.	t-tab.	Decision
Male	25	27.10	11.43	48	0.26	2.01	Not Significant
Female	25	26.30	10.38				

Table 1 above shows that the t-calculated value (0.26) was less than the t-table value (2.01) at 0.05 level of significance. The null hypothesis which stated that; there is no significant difference between the retention of Male and female Physics students taught with cooperative learning method was therefore accepted.

**Table 2: t-test Analysis of the Retention of Male and Female Physics Students Taught with Competitive Learning Method**

Gender	N	X	SD	Df	t-cal.	t-tab.	Decision
Male	25	39.12	14.57	48	2.32	2.01	Not Significant
Female	25	30.25	12.32				

Table 2 above shows that the t-calculated value (2.32) was greater than the t-table value (2.01) at 0.05 level of significance. The null hypothesis which stated that; There is no significant difference between the retention of Male physics student and female Physics students taught with competitive learning method was therefore rejected while the alternative hypotheses was accepted. This implies that: there is significant difference between the retention of Male and female Physics students taught with competitive learning method.

**Table 3: t-test Analysis of the Retention of Physics Students within and above the Age Range of 12-14 years Taught with Cooperative Learning Method**

Gender	N	X	SD	Df	t-cal.	t-tab.	Decision
12-14 years	25	22.30	9.13	98	3.00	1.98	Significant
Above 14 years	25	27.70	8.87				

Table 3 above shows that the t- calculated value (3.00) was greater than the t- table value (1.98) at 0.05 level of significance. The null hypothesis which stated that; There is no significant difference between the retention of physics students within the age range of (12-14 years) and Physics students that are above 14 years of age, taught with cooperative learning method was therefore rejected, while the Alternative Hypothesis was accepted which implies that; There was a significant difference between retention of physics students within the age range of (12-14 years) and those physics students that are above 14 years of age taught with cooperative learning method

## Discussion

The analysis in table 1 showed that there is an improvement in the retention level of male Physics students and female Physics students when they are taught using cooperative Learning method. This study is in agreement with Illiya (2007) noted that gender difference seems to be most pronounced in the physical science; the chemistry and physics with the concern that girls are not achieving as much as should as compared to boys when they are taught using cooperative learning method. The analysis in table 2 showed that there was a wide gap in the mean retention level of male Physics students and female Physics students when they are taught using competitive Learning method. This study is in agreement with Olorunkooba (2012) noted that group work positively influences the retention particularly of female pupils. The studies by Ugwuanyi (2012) on the influence of gender on students' academic achievement in Chemistry, science process skills and physics respectively showed that boys performed better than girls. The analysis in table 3 showed that the mean retention value (27.70) of mature physics students (above 14 years) was greater than the mean retention value (22.30) retention of young physics students retention (12-14 years) when they are taught using cooperative learning method. This study correlates with Normal and Salleh (2006) who indicated that students' attitudes and interest could play a substantial role among pupils studying science. (Gonen & Basaran, 2007) report that students positive attitudes towards science highly correlate with their achievement in science. Killen (2007) defines cooperative learning as an instructional design that stimulates peer interaction and learner-to-learner cooperation with the aim of fostering successful learning by all. The result is against Al-Mutairi (2011) who mentioned that younger students (12-years) had a tendency to perform better than mature students (above years) in a cooperative learning setting. Age of the individual as it increases, usually affects the various developmental changes. It also affects other area of human performance (Ukueze, 2007). This implies that the academic achievement of physics student varies with their age range when they are taught using cooperative learning method.

## Conclusion

There is no superiority between the retention of male students and female students when they are taught using cooperative learning method than when they are taught using competitive Learning Method. There was a wide gap in the mean retention level of male Physics students and female Physics students when they are taught using competitive Learning method. Students between 12-14 years have greater retention level in Physics than those that are above 14 years of age when they are taught using cooperative Learning method.

## Recommendations

1. Cooperative learning method should be introduced in teaching our secondary schools physics to improve social interaction skills and foster meta-cognition among students irrespective of their gender.
2. Further research should also focus on comparisons between large number of students and small number of Physics students' retention level in a mixed cooperative learning group.
3. Teachers should give equal treatment to all students in the cooperative learning groups and make sure that every student participates actively in the class irrespective of their age groups and age differences.

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