

**EFFECT OF COMPETITIVE AND COOPERATIVE LEARNING STRATEGIES ON SENIOR SECONDARY TWO STUDENTS' ACHIEVEMENT IN PHYSICS, WITHIN LAFIA METROPOLIS IN NASARAWA STATE.**

By

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**Abstract:**

This study investigated the effects of the cooperative and competitive learning strategies on the academic performance of senior secondary II students in physics within Lafia metropolis. A pre-test-post-test control group design was adopted for this study. A random sampling was used, and five (5) secondary schools were selected out of eight (8) secondary schools within Lafia metropolis, in Nasarawa state. All the students offering physics within the five (5) selected secondary schools constituted the population of the study, and a total of two hundred (200) students (i.e., forty students from each school) constituted the sample of the study. Instruments for data collection were pre-test Physics Achievement Test and post-test Physics Achievement Test. The questions used for the pre-test and post-test were collected from WAEC past questions, which have been tested for validity and reliability, and were proven to be standard. The data collected were analysed using the t-test method of data analysis and were used to test the hypothesis at a 0.05 level of significance. It was found among others that a competitive learning strategy is good, but a cooperative learning strategy is more effective in the teaching and learning of physics because it increases social interaction between the students. Students actually like sitting for a pre-test as this gives them an idea of what to expect from the topic, and thereby makes the topic easier for them to understand. Based on the findings and conclusions of this study, recommendations were made for the enhancement of students' achievement in secondary school physics, such as inculcating a cooperative learning strategy into the school curriculum; adaptation of the cooperative learning strategy by both the teachers and students for effective teaching, learning, and understanding of physics.

**Key words:** Physics, Senior Secondary Schools, Cooperative, Competitive, Learning strategies

**Introduction**

Evaluation activities chart the progress of students toward the objectives outlined for them by the teachers 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 the teacher's professional judgment. 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. Teachers usually use several approaches to influence effective teaching and learning processes. In typical classes, students are given a lecture, complete assignments outside of class, and take an examination to demonstrate their degree of understanding and retention of the subject. The examinations are returned, and new material is covered, repeating the process over and over. There is little time for reflection and discussion of students' errors and misconceptions. According to Akinbobola (2006,) our current educational system is based upon competition among students for grades, social recognition, scholarship, and admission to top schools. He stated that in our society and current educational framework, competition is valued over cooperation. In a traditional competitive classroom, student are concerned with their grades and where they fit into the grade curve. (Stahle, 1986: cited in Kolawole, 2007) opined that emphasis is placed on doing better than everyone else. Competition fosters a win-lose situation where superior students reap all rewards and recognition, and mediocre or low-achieving students reap none. Typical teaching paradigms consist of individual students' effort, characterized by competitive testing to assess student competence and create an evaluation hierarchy based upon grades. This approach leads to a performance goal as the desired outcome of the educational experience. Competitive learning is most appropriate when students need to review learned materials. It can be interpersonal (between individuals) or intergroup (between groups). When competition occurs between well-matched competitors, is done in the absence of a norm-referenced grading system, and is not used too frequently, it can be an effective way of motivating students to cooperate (Cohen, 1994).

learning can only be formed by learners in their minds using a competitive learning strategy. Competitive learning strategy occurs when one student's goal is achieved, and all others may fail to reach that goal. Competitive learning strategy can be used or applied between individuals or groups, where a group setting is appropriate. This strategy is most appropriate when students are reviewing learned materials. Typical teaching paradigms

consist of individual students' effort characterized by competitive testing to assess their competencies and create an elevation hierarchy based on grades. This leads to a performance goal as the desired outcome of the educational experience. Based on this fact, a competitive learning strategy can be used to teach physics in our secondary schools since the primary goal of every educational institution is to achieve effective teaching and learning. This could be possible if efforts are put in place to ensure that students actively participate in the learning process. Competition exists when there is a scarcity of a desired learning outcome, and students are then positioned to compete for the attainment of that outcome (Webster, 2007). Teachers in the schools prepare students for the real world by putting them in artificially constructed competitive situations, which makes them think about others and treat one another well. The act of using a competitive learning strategy in learning creates a sense of external urgency and drama in students. Competitive learning strategy, as contended by Johnson and Johnson (2006), brings a variable into the equation that shifts the participants' attention to the cost of their performance. In teaching, for example, if the tasks were to assemble a model of the periodic table with a declaration to see the group could finish the task first. The purpose of the activity moves from the learning goals to efficiency, speed, and the outcome relative to others. Furthermore, introducing a competitive learning strategy into the classroom brings a shift in students' attitudes. It gives students an air of importance and motivates them to perform better, especially when rewards are attached to it (Emmer & Gerwels, 2006). In using a competitive learning strategy, the grouped students tend to place increased value on the outcomes of their efforts and tend to decrease their focus on the process. That is, students will increase attention on what it takes to outshine others and decrease attention on learning for its own sake. Competitive element affects a group dynamic because it is often motivated by a competition that develops creativity and problem-solving skills. In this study, the competitive learning strategy used is where students work in subgroups. Members of each subgroup work strictly on their own, striving to be the best in the subgroup. The competitive learning strategy in teaching physics provides a combination of learning opportunities and a chance to have fun on the part of students. Students do not fear the potential consequences, which is a good indicator that a competitive learning strategy initiates social skills and managerial abilities. Competitive learning strategy is about teaching students how to learn without fear of failure or letting their egos become too involved. Students can access the joy of the moment, involvement, challenge, adventure, and suspense

can be fun if students feel free, and the situation supports fun over comparison. Fun during this learning strategy occurs when students see competition as a game, the fleeting reality, and the learning relationships, and self-respect as the lasting reality. In the era of what is called the information society, one of the most important skills is cooperation.

In the early days, studying with someone else was defined as an indicator of dependency, but today, learning together and asking for help is considered among the best strategies for learners to learn (Chen, 2002). Producing information, theorizing, or developing models in a field requires more complicated information and skills. Therefore, the common mind is better than the single best mind. The common mind is more effective for the mentioned novelties or, in other words, in creating acceptable change in society. All the systems from health to economics, law to education, information industry to service industry consider cooperative working among priorities to keep up with the times and make a difference in society. The output of the education system provides the labour force input for other systems. For this reason, the efficiency, and productivity of the education system are proportional to its ability to raise the desired labour force for other systems. Under these circumstances, cooperative working habits should be instilled into students at all levels of the education system (Johnson & Johnson, 1999, as cited in Altun, 2015).

Cooperative learning cannot be taught through verbal instruction; students can adopt cooperative learning through a process that involves working together in groups, developing a product at the end, and examining both the product and cooperative learning skills. The cooperative learning method emerges in the literature as a method that assists instructors in carrying out this process. Cooperative learning emerges when students gather together in order to achieve a common purpose or to reach a specified goal. Each member of the group reaches his or her goal only when all the members reach their own goals. Acikgoz (2002) defines cooperative learning as working of students working in small groups and helping each other in the learning process.

What makes cooperative learning strong in the literature is its strong theoretical foundation. The method is based on Bandura's social dependency theory, Behavioural learning theory, and Vygotsky's "Zone of Proximal Development" Theory (Altun, 2015). Social Dependence Theory assumes that the way to form social dependency is about how social dependency

develops, how individuals interact, and what the result will be as a result of the interaction. Accordingly, positive interdependence (cooperative approach) results in such an interaction that the group members encourage, support, and improve the efforts of the individuals. Behavioural Learning Theory focuses on the effect of group consolidation and rewards on learning. According to this theory, behaviour, which is rewarded externally, is repeated. External “group rewards” are needed in order to motivate the individuals to learn in groups based on cooperative learning (Sabon, 2005). According to Vygotsky’s Zone of Proximal Development Theory, a student can take his or her learning to the optimum level by asking for help when he/she is stuck. It is stated that individuals have benefited from science and technology instruction in using these scientific processes and principles for decision-making and in participating in scientific decisions affecting society. They have also developed their skills to produce ideas on a subject (Akçay & Yager), 2010). According to another approach, science, and Technology instruction is an easy and tangible instruction and should be conducted with proper methods and techniques by taking the interests, requirements, level of development, desires, and environmental facilities of students ( Hancer, Sensoy & Yildirim, 2003). As can be understood from the explanations, for an effective Science and Technology instruction, students’ sense of curiosity should be enhanced, and an active environment in which students can discover and produce information should be created. The complicated structure of Science and Technology course requires cooperation for students to learn the subjects (Yagci, Kapti & Beyaztas, 2012). It is thought that the use of a learning plan prepared in line with cooperative learning in the Science and Technology instruction provides students with more efficient thinking and problem-solving skills and cooperative working habits. It also develops students’ cooperation skills, enables them to present more extensive studies by making use of their shared experiences, and supports long-lasting learning by supporting peer learning.

The major aim of teaching – learning process is achievement in terms of grades, as it is the sole measure of learning in many cases. Achieving this aim has resulted in more emphasis on teaching through diverse methods in order to improve learning and understanding. One of these methods is the cooperative learning method, which presumes that the team effort of students towards a single goal of learning a particular aspect results in more understanding than solo efforts. Cooperative learning can be defined as a teaching method that involves

students in the learning process in order to understand and learn the content of the subject (Slavin, 2011). Cooperative learning has the edge over other teaching methods in terms of its effectiveness for improved cognition, social skills, and motivation. Cooperative learning is distinguished from traditional learning by its interdependence(positive) as well as its accountability, as each member of the group is important for success. Its competence in terms of augmenting academic achievement has been proven (Nicholas, 2002). Cooperative learning also improves positive attitudes towards learning as well as positive social relations (Johnson & Johnson, 2008), and it also improves high self-esteem and cohesiveness (Salin, 2010). It can also be stated in terms of instructional strategy in which students work together to achieve the learning target (Abrami, Paulsen & Chambers, 2004). Cooperative learning method, when used as a teaching activity, improves motivation, class participation, and academic achievement of students. Igbal (2004) conducted a study where he examined the effect of cooperative learning on academic achievement in secondary school students in the subject of mathematics. He reported that there was a significant difference between the achievement scores of the students taught by the cooperative and traditional methods. The students who were taught by the cooperative method show high scores. The study carried out by Arbab (2003) for two weeks on general science students also proved that students taught with the cooperative learning method had improved results than the control group.

Cooperative learning is a mode of learning in which students of different levels of ability work together in small groups to achieve a purpose (Akinbobola, 2006). It involves the use of a variety of learning activities to improve their understanding of a subject. Students in a group interact with each other, share ideas and information, seek additional information, and make decisions about their findings for the entire class. Cooperative learning is student-centered versus teacher-centered, leading to a stronger emphasis on the goal of learning instead of performance goals. It encourages teachers to use alternative assessment techniques, further reducing the emphasis on competitive examinations. Cooperative learning helps to improve student achievement and retention, increase self-esteem and intrinsic motivation, and develop a more positive attitude towards learning skills and social skills (Kolawole 2007).

**Statement of the Problem:**

Most of our current educational system is based upon competition among students for grades, social recognition, scholarship, and admissions to schools. The cooperative learning strategies are sparsely used in our educational system, though researchers are in support of the use of cooperative learning in our educational system nowadays, since it has been found that the cooperative learning strategy helps in increasing retention, fostering team building/work, and developing higher-level thinking skills. The main problem investigated by this study is finding out which of these learning strategies will give better achievements for the senior secondary school II physics students within Lafia metropolis?

**Purpose of the Study:**

The purpose of this study is to determine the effect of competitive and cooperative learning strategies on senior secondary school II students' Achievement in physics, within Lafia metropolis in Nasarawa state, Nigeria. Specifically, the study sought to:

- (1) Determine the effect of competitive learning strategy on the pre-test achievement score of the control group and the experimental group of secondary school II physics students.
- (2) Determine the effect of the cooperative learning strategy on the post-test achievement score of the control group and experimental group of secondary school II physics students.

**Research Questions:**

The study was guided by the following questions:

- (1) What is the difference in the pre–test achievement score of the control group and the experimental group?
- (2) What is the difference in the post–test achievement score of the control group and the experimental group?

### **Research Hypotheses:**

Based on the aforementioned questions, the following hypotheses were generated:

- (1) There is no significant difference in the pre–test achievement score of the control group and the experimental group.
- (2) There is no significant difference in the post–test achievement score of the control group and the experimental group

### **Significance of the Study:**

The results or findings obtained from this study will enable students to work together for effective learning and understanding of physics and its concepts, and even other subjects, in order to move higher in their academic pursuit. It will enable teachers to handle larger classrooms and achieve excellent performance from their students. It will enable educational planners to understand other ways through which students can learn and improve their performance in both physics and other subjects.

### **Research Methodology:**

The research design adopted for this research is pre–test–post–pre-test-post-test control group design. This was adopted because the researcher tends to compare a particular group with another, and find out their effects and differences on students. This research design was also adopted because it collected and analyzed data from students that form a representative sample of the entire population.,

The study was carried out within Lafia metropolis, in Nasarawa State, Nigeria. It was restricted to five (5) Government secondary schools out of eight (8) Government secondary schools within the area of study. Random sampling method was employed in the selection of the five (5) secondary schools, the students offering physics in the selected schools constituted the population of this study, and a total of two hundred (200) students constituted the sample size.

The instrument for data collection was the pre–test Physics Achievement Test and post–test Physics Achievement Test. The instrument (i.e., the test questions) was collected from WAEC past questions, which have been tested for validity and reliability and were proven to

be standard. The questions were selected based on the topic and concepts covered during lessons. The pre-test was administered first in order to test the homogeneity of the two groups (i.e., the control and experimental groups), and it was administered to all the students before treatment. – post-test physics achievement test was administered after treatment. The pre-test Physics Achievement Test and the post-test Physics Achievement Test were two equivalent tests of multiple-choice items, comprising twenty (20) items.

In the procedure for data collection, the researcher used a ballot technique to select the five (5) secondary schools, the researcher also made personal visit to the five (5) selected secondary schools, met the principal and then the physics teachers, after proper explanations to them, the researcher with the help of the physics teachers selected the number of students needed for the study, a total number of forty (40) students were selected using ballot techniques. After explaining the exercise to the selected students, the pre – test was administered to the students, after which the students were selected into control group and experimental group, and the experimental group was sub selected into four (4) groups of five (5) students each, all using ballot techniques, the students were taught for five (5) weeks by the researcher, after which they were asked to study on their own and in groups respectively for one (1) week, at the end of the one week study, the post – test Physics Achievement Test was administered to the students. The scripts were collected after each test in one bundle. This was done to remove bias while marking, and after marking, the scripts were then separated, and the marks were recorded for data analysis. This procedure was carried out in all five (5) selected Government secondary schools used for this study.

The data collected were analyzed using the t-test method, and this was used to test the hypothesis at a 0.05 level of significance.

**Results:**

**Research Question 1:** What is the difference in the pre-test achievement score of the control group and experimental group?

Source of variation	n	Mean	Standard Deviation
Control group	100	50.5	10.7
Experimental group	100	33.0	13.4

The table above shows the mean score and the standard deviation of pre-test achievement scores of the control group and the experimental group. The mean score of the control group (50.5) is higher than the mean score of the experimental group. (33.0). While the standard deviation of the control group and the experimental group are 10.7 and 13.4, respectively.

**Hypothesis 1:** There is no significant difference in the pre-test achievement score of the control group and the experimental group.

**Table 1: t-test analysis of pre-test score of control and experimental groups.**

Source of variation	n	Mean	Standard Dev.	Df	tcal	tcrit	Result
Control group	100	50.5	10.7				
Experimental Group	100	33.0	13.4				
					199	8.73	1.69
Significant							

The above table shows that  $t - t$ -calculated is greater than the  $t$ -critical value, hence the null hypothesis is rejected at the 0.05 level of significance. This implies that there is a significant difference between the mean achievements of physics students in the pre-test scores of control and experimental groups in favour of the control group (individualistic learning strategy).

**Research Question 2:** What is the difference in post-test achievement score of the control group

And experimental group?

Source of Variation	N	Mean	Standard Deviation.
Control group	100	63.9	12.33
Experimental Group	100	78.4	11.12

The table above shows the mean score and the standard deviation of the post-test achievement scores of the control group and the experimental group. The mean score of the experimental group (78.4) is higher than the mean score of the control group (63.9). And the standard deviation of the experimental group and the control group are 11.12 and 12.33, respectively.

**Hypothesis 2:** There is no significant difference in the post-test achievement score of the control group and the experimental group.

**Table 2: t–test analysis of post–test score of control and experimental groups.**

Source of Variation	n	Mean	Stad.Dev.	Df	tcal	tcrit	Result
Control group	100	63.9	12.33				
Experimental Group	100	78.4	11.12				
				119		10.23	1.96
Significant							

The table above shows that the t-calculated is greater than the t-critical, hence the null hypothesis is rejected at the 0.05 level of significance. This means that there is a significant difference between the mean achievement of physics students in post–test scores of control and experimental groups in favour of the experimental group.

### **Discussion of Findings:**

#### **Competitive learning strategy and the pre-test achievement score of the control group and the experimental group**

This study investigated whether the cooperative learning strategy (students – Team Achievement Division), to be precise, would increase students’ achievements in physics at the secondary school level. Results obtained from Table 1 showed that students using a competitive learning strategy (control group) performed better than those in the experimental group, in the pre–test administered before instructions were given. This result can be attributed to the fact that every student was struggling for position, recognition, higher grades, etc., and placing more emphasis on doing better than everyone else. In this case, students perceive or believe that they can only obtain or achieve their goals only when the other students fail to achieve theirs; students engage in a win – lose struggle to determine who is the best; this type of learning can in one way or the other, influence students’ knowledge, attitude, and interactions with other students. This result was in line with Akinbobola (2006), who stated that our current educational system is based upon competition among students for grades, social recognition, scholarship,s and admission into top schools. He also stated that in our society and current educational framework, competition is valued over cooperation, and in a traditional competitive classroom, students are concerned with their grades and where they fit into the grade curve. This approach leads to a performance goal as the desired outcome of the educational experience (Kolawole, 2007).

#### **Cooperative learning strategy and the post-test achievement score of the control group and the experimental group.**

On the difference in achievements between the post–test of control and experimental groups. The result showed that students who used a cooperative learning strategy (experimental group) performed better in their post-test physics achievement test than those students who used a competitive learning strategy (control group). This result could be attributed to the fact that students worked together for one purpose or goal (i.e., everyone must pass). This type of learning helps students to develop positive interdependence face–to–face promotive interaction, individual and group accountability, interpersonal and small skills, and group processing. This provided opportunities for students to develop skills in

group interactions and in working with others, which are needed in the world today; it also promoted a more positive attitude towards the instructional experiences; it also positively promoted students' achievement, understanding of concepts, and retention of information. This result is in line with Kolawole (2007), who stated that the cooperative learning strategy is more effective than the competitive learning strategy in teaching mathematics at the secondary school level. Ho and Boo (2007) in their study on cooperative learning; exploring its effectiveness in physics classroom found that cooperative learning strategy contribute to higher students' academic achievement about physics topics, promote students understanding of physics concept and motivate the students to learn. This implies that the cooperative learning strategy helped the lower achievers to achieve higher, and also helped the higher achievers to increase their level of achievement. This also helps students to improve in their achievements and retention, increases their self-esteem and intrinsic motivation, and they also develop a more positive attitude towards learning skills and social skills. This result is in line with Howard (2001), who stated that there is a statistically significant difference between the cooperative learning strategy and the normal strategy in favour of the cooperative learning strategy, where students with even low learning abilities performed higher.

### **Conclusion:**

It is an obvious fact that no Nation can survive technologically if its future generations are performing poorly in science and science-related subjects. Physics, being one of the core science subjects, is the bedrock of science and technology, and if neglected, the related courses will suffer. Therefore, any effort to improve the teaching and learning of physics should be encouraged and adopted. The findings of this study lead to the following conclusions: competitive learning strategy is good but cooperative learning strategy is more effective in the teaching and learning of physics at secondary school levels because cooperative learning increases students' academic achievement; help students to achieve better understanding of physics concepts and increase students' motivation to learn. Cooperative learning strategy is more effective than competitive learning strategy in the learning of physics because even the students with low learning abilities were able to learn, understand, and also perform better. It was discovered that, all the students s gained a better understanding of the concepts, and on the process of writing both the pre – test and the post – test, it was also discovered that students love sitting for a pre – test as this gave them an idea

and insight of what to expect from the topics and in some ways, made the topics easier to understand.

### **Recommendations:**

Based on the findings and conclusions reached in this study, the following recommendations were made:

- (1) Curriculum planners and school Administrators should try and incorporate cooperative learning strategies into the school curriculum as a way of helping students, especially those with low learning abilities, to develop a positive attitude towards learning and understanding physics.
- (2) Government, as well as school managements should give group rewards to students to motivate them to work and learn in groups based on cooperative learning.
- (3) Physics teachers as well as other science teachers, should adopt a cooperative learning strategy as an effective teaching and learning method in order to improve students' performance, achievements, and social interaction among students. And to also foster their meta-cognition.
- (4) Good students (the exceptional students) should adopt a cooperative learning strategy as a means of carrying those with lower learning abilities along with them.

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