

Effect of Cooperative Learning Strategy and Academic Achievement of Physics Students with Learning Disabilities in Aninri Local Government Area in Enugu State, Nigeria

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Abstract

The purpose of this study is to investigate the efficiency of learning plan implementation prepared with the cooperative learning method, within Aninri L. G.A. The cooperative learning strategy used was Students – Team Achievement Division (STAD), and a pre – test – post – test control group design was adopted for the study. A random sampling was used and four (4) secondary schools were selected among all the secondary schools within the area of study. All the students offering physics within the four (4) selected secondary schools constituted the population of the study, and a total of eighty (80) students constituted the sample of the study. Instrument 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 was collected from WAEC past questions which have been tested for validity and reliability, and were proved to be standard. The data collected were analysed using t – test method of data analysis and was used to test the hypothesis at 0.05 level of significance. The result showed that cooperative learning strategy is more effective in the teaching and learning of physics, among students with learning disabilities, than competitive learning strategy, and it also increased social interaction between them and the normal students, Based on the findings and conclusions of this study, recommendations were made for the enhancement of students with disabilities' achievement in secondary school physics, such as inculcating cooperative learning strategy into school curriculum; adaptation of cooperative learning strategy by both the teachers and students (especially students with disabilities) for effective teaching, learning and understanding of physics.

Keywords: cooperative learning strategy, experimental group, control group. Learning disabilities.

Introduction

In the era of what is called information society, one of the most important skills is cooperation. In 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, 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 in order to keep up with the times and make a difference in the 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 is proportional to its ability to raise the desired labour force for other systems. Under these circumstances, cooperative working habit should be brought into students at all levels of education systems (Johnson & Johnson, 1999, as cited in Altun, 2015). Acikgoz (2002) defines cooperative learning as working of students 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 individual interacts 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 are rewarded externally, are repeated. External "group rewards" are needed in order to motivate the individuals to learn in groups based on cooperative learning (Sabon, 2005).

According to the 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 stuck. It is stated that individuals have benefited from science and technology instruction in using these scientific process and principles for decision – making and in participating in scientific decisions affecting the society and developing their skills to producing 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 method and techniques by taking the interests, needs, 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 habit, 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.

Cooperative learning can be defined as a teaching method that involves students in learning process in order to understand and learn content of the subject (Slavin, 2011). Cooperative learning has 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 proved (Nicholas, 2002). Cooperative learning also improves positive attitude towards learning as well as positive social relation (Johnson & Johnson, 2008), it also improves high self-esteem cohesiveness (Salin, 2010). It can also be stated in terms of instructional strategy in which students work together to achieve learning target (Abrami, Paulsen & Chambers, 2004). (2001) stated that 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 examines the effect of cooperative learning on academic achievement on 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 method, 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 cooperative learning method has improved results than control group.

Recently, teaching the individual with special needs has greatly increased. Paying attention to them has become a challenge for communities because disability is comprehensively prevalent within them. Results indicates that (10%) of the community members suffer from disability, thus, it's essential to provide them with special learning programs and to use teaching method and strategies appropriate for them (Ellala *et al.*, 2013). Special Education distinctively focused on individual differences, convenience of learning environment and teaching strategies to enable the students to do their best according to their potential. Teaching delivered for students with special needs is different from that delivered for students without special needs who are in the same age and grade (Kauffman & Hallahan, 2006). Various definitions of learning disabilities have emerged; the most famous one is that of the Federal Government in the USA; they are disorders in one or more of basic psychological processes involved in grasping and using written or spoken language which expresses itself through lack of the capability of listening, thinking, speaking, writing, spelling or doing mathematical operations.

The definition also involves cases of cognitive disability, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. It doesn't involve learning problems that result from sensory, motor and mental disability, emotional disorder and environmental, cultural and economic disorder (Smith, 2006). Although the individuals with special needs represent heterogeneous groups, they suffer from the same problem; they can't learn efficiently

as their normal peers. They have normal mental capabilities, but their academic performance is remarkably lower than their normal mental capabilities. Learning disabilities is classified into developmental learning disabilities and academic learning disabilities. Developmental learning disabilities stand for cognitive processes, such as attention, perception, memory thinking and language, which involve the most significant bases on which the individual's cognitive mental activity is based. Thus, any disorder that occurs in one process or more, results in several academic disabilities (Sartaway & Al Sartaway, 2001). Academic learning disabilities; this refers to reading disabilities which results from lack of concentration and attention, thereby approximately 85% of students were classified as individuals with learning disabilities (Ziyad, 2017). Paying more attention to learning reading rather than the other courses resulted in this high rate. Characteristics of students with learning disabilities includes:

- (i) Academic Achievement Problem: They are noticeable problems among students with learning disabilities, if it weren't for them, there wouldn't be a group suffering from learning disabilities. Students have learning disabilities in reading, written and spoken language and arithmetic. Reading problem is the biggest for these students, they often face main problems related to reading process, such as reading comprehension, disassembling characters and fluency (Al Natour, 2010). Written language problems involve problems related to handwriting, spelling and dictation (Kauffman & Hallahan, 2006). Spoken (oral) language – students with learning disabilities have problems with grammar of language as well as grasping meaning of some words (Al Wakfi, 2011). Arithmetic problems – Students with learning disabilities substantially face problems related to quantitative thinking which is essential for finding out quantities, concepts and significance of numbers. They also have problems with doing mathematical operations, defining ascending and descending order of numbers and distinguishing between similar numbers with different direction such as (2, 6) (Abo Neyan, 2001).
- (ii) (ii) Cognitive and memory problems: Botrus (2016) indicates that students with learning disabilities have memory problems, so they can't remember a lot of information, assignments and facts.
- (iii) (iii) Emotional and social problems: Students with learning disabilities have problems with defining social customs, refusing peers and making friends (Kauffman & Hallahan, 2006).
- (iv) (iv) Motivational problems: Those students show learned helplessness which stands for tendency to despair, submission and optimism because they see that they will certainly fail if they try (Al Natour, 2010).

Recent studies indicated that cooperative learning greatly and significantly affects the conditions that make inclusion programs, designed for students with special needs at normal schools, successful (Ziyad, 2017). Elkhateeb & Elhadedy (2010), indicates that it is normal for

special education educators to use cooperative model instead of competitive one because it is appropriate for students with special needs and normal ones. Shihab (2011) aimed at investigating the impact of using cooperative learning strategy on the achievement of students with learning difficulties in mathematics in Ammam, the result showed that there are differences in the students' achievement test favouring experimental groups which applied to cooperative learning strategy. Al Hassan (2005) aimed to identify the impact of peer teaching as supportive and additional method to the traditional one used by teachers in classroom on learning, memorizing and generalizing the most frequent words in language among the first elementary grade students, results showed that there is functional relation between peer teaching and learning words, students learned more words during peer teaching stage and this method helped to memorize and generalize them. Obidat (2003) investigated the impact of using cooperative learning strategy on the achievement of students with low achievement in mathematics and their social interactions, results showed that there are differences in the mean of students' achievement and social interaction between the experimental and control groups favouring students applying cooperative learning strategy. Kuntz, Mclaughlin & Howard (2001) aimed to compare the impact of using cooperative learning versus the normal strategy on the performance of students with difficulties in answering mathematics problems, result revealed that there are satirically significant differences between both methods in favour of cooperative one where students' performance was higher.

Statement of the Problem

Physics, the foundation of other science subjects in senior secondary school which deals with the promotion of scientific literacy is one of the perceived difficult subjects by both students and teachers in senior secondary school in Nigeria. How students understand physics and the methods used in presenting it to them moves in regular procession all through their time in school. This implies that, the teaching method used by the teacher in presenting physics to the students all the years of schooling most affect and influence the students understanding and mastering of the subject matter and how they understand science generally. There is considerable evidence in the literature to show that traditional physics instruction is predominantly based on conventional lectures and manipulation of formulae, to teach concepts is ineffective. In typical classroom setting, if students are involved in only passive learning, it would lead to limited knowledge retention, let alone engaging them in critical thinking or promoting functional understanding. Research works have shown that involving students directly and actively in the learning process promotes meaningful learning. Good performance of students in physics is very eminent and necessary as it prepares the students for advanced scientific studies and economic development of the country.

Unfortunately, the current trend in the teaching and learning of physics, where materials for teaching are not available in public schools (Onwioduokit, 2001), has forced most teachers to use the traditional lecture method in teaching physics. This has made it difficult to realize the importance of physics in our national development. From the foregoing therefore, the

difficulty students have in understanding concepts in physics, especially those students with learning disabilities/difficulties, and the quest for better ways of effectively teaching the concepts in physics was the drive for this study.

This research work therefore explores cooperative learning strategy, particularly, student's team achievement division cooperative learning strategy in enhancing students' understanding in physics. And the problem of this study therefore is to find out whether cooperative learning strategy has effect on students with learning disabilities' understanding and performance in mechanics and physics in general.

Our current education system is based upon competition among students for grades, social recognition, scholarship and admission to top schools (Akinbobola, 2006). He also stated that in our society and current educational framework, competition is valued over cooperation. On the other hand, the cooperative learning strategies are sparsely used in our education system (Kolawole, 2007). It is normal for special education educators to use cooperative model instead of competitive one because it is very good for both students with special needs and normal ones (Elkhateeb & Elhadedy, 2010).

Based on these, this study is designed to investigate the effect of cooperative learning strategy on academic achievement of students with learning disabilities within Aninri Local Government Area in Enugu state, Nigeria.

Purpose of the Study

The study sought to determine the effect of cooperative learning strategy on academic achievement of students with learning difficulties in physics:

- i. To determine the control group achievements in pre – test and post – test.
- ii. To determine the extent of achievement made by the experimental group in pre – test and post – test.
- iii. To determine the extent of achievement made by students with learning disabilities in their post – test.

Research Questions

The study was guided by the following questions:

- i. What is the difference in achievement between the pre – test of the control group and the experimental group?
- ii. What is the difference in achievement between the control group and experimental group's post – test?
- iii. What is the difference in achievement between the control group and experimental group, post – test of students with learning disabilities?

Research Hypotheses

Base on the aforementioned questions the following hypotheses were generated:

- (1) There is no significant difference between the mean achievement of students in pre – test of control and experimental groups
- (2) There is no significant difference between the mean achievement of students in post – test of control and experimental groups
- (3) There is no significant difference between the mean achievement of students with learning disabilities in post – test of control and experimental groups.

Significance of the Study

The result 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 on their performances in both physics and other subjects. Most importantly, it will help students with learning disabilities to be able to learn and understand better, interact with their peers and in making friends.

Methodology

The research design adopted for this research is pre – test – post – test control group design, this was adopted because the researcher tend to compare a particular group with another, and find out their effects and differences on students, this research design was adopted also, because it collected and analyzed data from students that form a representative sample of the entire population, it was adopted because the researcher was interested in finding out the effect of cooperative learning strategy on academic achievement on students with learning disabilities/difficulties among physics secondary school students in mechanics, using Students – Team Achievement Division (STAD) cooperative learning strategy.

The study was based in Aninri Local Government Area in Enugu State, in Nigeria. It was restricted to four (4) Government secondary schools out of twelve (12) Government secondary schools within the area of study. Random sampling method was employed in the selection of the four (4) secondary schools, the students offering physics in the selected schools constituted the population of this study, and a total number of eighty (80) students constituted the sample size.

The instrument for data collection was pre – test physics achievement test and post – test physics achievement test. The instrument (i.e., the test questions) were collected from WAEC past questions, which have been tested for validity and reliability and was proved to be

standard. The questions were selected based on the topic and concepts covered during the course of 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 was two equivalent tests of multiple-choice items, comprising of twenty (20) items.

In the procedure for data collection, the researcher used a ballot techniques to select the four (4) secondary schools, the researcher also made personal visit to the four (4) 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 twenty (20) students were selected from each school, using ballot techniques, including ten (10) students with learning disabilities and ten (10) normal students. 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 two (2) groups of five (5) students each, all using ballot techniques, the students were taught for three (3) 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 so as to remove bias while marking, and after marking, the scripts were then separated and the marks recorded for the purpose of data analysis. This procedure was carried out in all the four (4) selected Government secondary schools used for this study. The data collected were analyzed using t – test method, and this was used to test the hypothesis at 0.05 level of significance.

Results:

Research Question 1: What is the difference in achievement between the pre – test of control and experimental groups.

Null Hypothesis 1: There is no significant difference between the mean achievement of students in pre -test score of control and experimental groups.

Table 1: t–test analysis of pre – test score of control and experimental groups

Source of Variation	N	Mean	SD	Df	t-cal	t-crit	Result
Control group	40	62.6	9.65	39	2.35	1.69	Significant
Experimental group	40	50.2	10.87				

The Table 1 showed that t–calculated is greater than t–critical, hence the null hypothesis is rejected at 0.05 level of significance. This implies that, there is a significant difference between the mean achievements of physics students in pre = test score of control and experimental groups in favour of the control group (individualistic learning strategy).

Research Question 2: What is the difference in achievement between the post – test of control and experimental groups.

Null Hypothesis 2: There is no significant difference between the mean achievement of physics students in post – test score of control and experimental groups.

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

Source of Variation	N	Mean	SD	Df	t-cal	t-crit	Result
Control group	40	78.8	10.73	39	6.03	1.96	Significant
Experimental Group	40	63.3	12.17				

The Table 2 showed that the t–calculated is greater than the t – critical, hence the null hypothesis is rejected at 0.05 level significance. This means that, there is a significant difference between the mean achievement of physics students in post – test score of control and experimental groups, in favour of the experimental group (cooperative learning strategy).

Research Question 3: What is the difference in achievement between the control group and experimental group, post – test of students with learning disabilities.

Null Hypothesis 3: There is no significant difference between the mean achievement of control group and experimental group post - test of students with learning disabilities.

Table 3: t – test analysis of control group and experimental group post – test of students with learning disabilities

Source of Variation	N	Mean	SD	Df	tcal	tcrit	Result
Control Group	20	59.8	12.40	19	6.70	1.96	Significant
Experimental Group	20	78.0	11.97				

Table 3 shows that t – calculated (5.84) is greater than t – critical (1.96), hence the null hypothesis is rejected at 0.05 level significance. This implies that, there is a significant difference between the mean score of students with learning disabilities in control group and experimental group post – test, in favour of the experimental group (cooperative learning strategy).

Discussion of Findings

What is the difference in achievement between the pre – test of control and experimental groups

Results obtained from Table 1 showed that students using 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 among other, 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 in an effort 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, scholarships 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 individual grades and where they fit into grade curve.

What is the difference in achievement between the post – test of control and experimental groups.

On the difference in achievements between the post – test of control and experimental groups, the result showed that students who used cooperative learning strategy (experimental

group) performed better in their post – test physics achievement test than those students who used 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 help 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 more positive attitude towards the instructional experiences; it also promoted students achievement, understanding of concepts, and retention of information in a positive way. This result is in line with Kolawole (2007) who stated that cooperative learning strategy is more effective than competitive learning strategy in teaching of mathematics at secondary school level. Ho and Boo (2007) also found that cooperative learning strategy contribute to higher students' academic achievement in relation to physics topics, promote students understanding of physics concept and motivate the students to learn.

What is the difference in achievement between the control group and experimental group, post – test of students with learning disabilities.

On the difference in achievement between post – test of students with learning disabilities in control group and experimental group, the result showed that students with learning disabilities performed better in experimental group than in the control group in their post – test. This result could be attributed to the fact that in cooperative learning, different levels of abilities worked together to maximize their own and each other's learning abilities, seek outcome that are beneficial to themselves and to all other members of the group, strived for mutual benefits so that all group members gain from each other's efforts. The results obtained were expected because it is likely that in making students to depend on each other to learn or study, enabled most of the students who could not read, nor understand on their own (students with learning disabilities) to work with some colleagues who can read and understand, thereby helping both students to increase their abilities. This strategy helped the students with learning disabilities to improve in their achievements and retention, increased their self – esteem and intrinsic their motivation, they also developed more positive attitude towards learning skills and social skills. This result is in line with Howard (2001) who stated that there is statically significant difference between cooperative learning strategy and normal strategy in favour of cooperative learning where students with learning disabilities performed higher.

Conclusion

It is an obvious fact that no Nation can survive technologically if her 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 learning disabilities were able to learn, understand and also perform better. It was discovered that, both the students with learning disabilities and the normal ones 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 actually 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 strategy into school curriculum as a way of helping students, especially the ones with learning disabilities to develop positive attitude towards learning and understanding of physics.
2. Government and school managements should give group rewards to students in order to motivate them to work and learn in groups based on cooperative learning.
3. Physics teachers, and other science teachers should adopt cooperative learning strategy as an effective teaching and learning method in order to improve students' performance, achievements and social interaction among students, especially the students with learning disabilities so as to foster their meta – cognition.
4. Students that are good (those without learning disabilities should adopt cooperative learning strategy as a means of carrying those with learning disabilities along with them.

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