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Effects of Cooperative Learning Method on Secondary School Students' Physics Achievement

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Abstract

This study aimed at investigating the effect of cooperative learning method on students' physics achievement. The design of the study was quasi-experimental pre-test post-test non equivalent control groups. Two sections from each of grade 9 and 10 students were randomly selected from Robe Galema secondary school. Data gathering instruments were achievement tests and observation. A treatment of Student Teams Achievement Division (STAD) method of cooperative learning was provided to treatment groups while the traditional method was used in the comparison groups. The experiment lasted for seven weeks on grade 9 and for four weeks on grade 10 students. The result of the findings showed that the treatment group students out performed significantly than the comparison group on post test in each of the two grade levels. The result also showed the effectiveness of the method for teaching physics to the low achievers as compared to high achievers. Hence, the study revealed the effectiveness of the method as compared to traditional method.

Keywords: *Cooperative learning method, Secondary school students, Physics achievement*

Introduction

Education helps society to improve, change as well as develop and conserve its environment for the purpose of an all rounded development by diffusing science and technology into the societies every activity (Transitional Government of Ethiopia [TGE], 1994). In line with this, one of the goals of science education is to produce a scientifically literate citizen who can solve the problems of science related societal issues (Nesbit & Rogers, 1997; Osborne & Hennessy, 2003). This indicates that science education plays a crucial role in developing human resources necessary for science and technological advancements.

Many African countries have attempted to strengthen mathematics and science education in order to develop human resources that can contribute to industrial development through scientific and technological development (Association for the Development of Education in Africa [ADEA], 2012). When we see the experience of Ethiopia, the Ministry of Education [MoE] came up with a policy whereby 70% of overall university enrolment is expected to be in a science field with the remaining 30% in the social sciences (MoE, 2008). This enrolment policy has emerged based on Ethiopia's aim to become one of the middle income countries in the shortest time span as possible (Ministry of Finance and Economic Development [MoFED], 2006) to secure sustainable development in the country. This scenario has created a unique and challenging situation whereby science and mathematics education is put to the spotlight (Eshetu, Dilamo, Tesfaye & Zinabu, 2009).

Physics education is aimed at equipping the individual learner with such knowledge, skills and attitudes that will enable him/her to live a meaningful and fulfilled life by contributing positively to the development of the society from which he can derive maximum social, economic and cultural benefits (National Educational Research and Development Centre [NERDC], 2004). Since most forms of technology result from advances in physics**,** physics plays a vital role for one`s country economic development by diffusing science and technology in to the society. However, the performance of students in physics had persistently remained poor in most schools in many countries (Sogoni & Musasia, 2016). In Ethiopia, students' performance in physics is the least compared to other subjects (National Agency for Examinations [NAE], 2010). The study conducted by Oli (2014) had also shown that the Ethiopian schools were unsuccessful in their efforts to improve the teaching and learning of physics and students' physics achievement. As a result, majority of students in the secondary schools had no interest to learn physics and this resulted in low achievement in national examinations (Solomon & Kedir, 2015). The students'

attitudes toward science, students learning strategies, and ineffective teaching methods are among the main factors that were believed to contribute to the poor academic achievement of students in physics (Oli, 2014). A study conducted by Adula and Kassahun (2010) and Sintayehu (2014) also confirmed the teachers' ignorance to implement student-centred instruction including other factors resulted students in poor physics achievement. Mekbib (2011) after demonstrating that physics education is critical to more than 65% of the enrolment expected by the 70/30 plan, had also evidenced that new and tenured physics teachers have weak physics and physics teaching knowledge.

Method of teaching is one of the problems observed in the teaching and learning of physics in the Ethiopian schools (Solomon & Kedir, 2015). This is because the poor performance was attributed to conventional teaching methods that are being used by the teachers (Sogoni & Musasia, 2016). So it is a must to search and apply a right method in our physics class to stimulate the students to learn (Smitha & Aruna, 2014). Hence, in view of the obvious importance of physics in the scientific and technological advancement of any nation and its usefulness in most fields of human endeavour, there is a need to develop effective strategies in the teaching of this subject.

An effective teaching method can ensure effective learning by allowing students to reflect their own ideas. This can be done by preparing an environment which gives them a chance to discuss their learning with other students and their teachers. Hence, students must talk about what they are learning, write about it, relate it to past experience and apply it to their daily lives. They must make what they learn part of themselves (Chickering & Gamson, 1987). Since it is quite evident that the active involvement of students in the teaching learning process improves their achievement scores, it is essential to make students learn in a cooperative manner. Cooperative learning comprises "instructional methods in which teachers organize students into small groups, which then work together to help one another learn academic content" (Slavin, 2011, p.344). Cooperative learning consists of five basic essential elements: positive interdependence, promotive interaction, individual accountability, teaching of interpersonal and social skills, and quality of group processing (Johnson & Johnson, 1999).

There is a growing consensus among researchers about the positive effects of cooperative learning on student's achievement and hence a rapidly growing number of educators were using the methods at all levels of schooling and in many subject areas (Slavin, 1996; Tran, 2013). These studies have been conducted in different settings of education, using different kinds of cooperative learning techniques (Tran, 2013). Such techniques are Learning Together (LT), Jigsaw Grouping, Teams-Games-Tournaments (TGT), Group Investigation (GI), Student Teams Achievement Division (STAD), and Team Accelerated Instruction (TAI). But among the studies conducted in Ethiopia in relation to the cooperative learning method, Gebeyehu (2007) has indicated that the magnitude of practicing a variety of cooperative learning methods is very low. The study reported that large class size, lack of skills in selecting variety of methods and lack of awareness on what cooperative learning are the major factors affecting the implementation of the method. Hence, more research has to be conducted so as to improve the achievement of students and promote more positive attitude towards the learning of the subject thereby encouraging teachers. So in this study, the STAD method of cooperative learning was used as an alternative to traditional teaching method.

The research Problem

Having observed the problems mentioned above in the use of cooperative learning, the present study aims at the investigation of the effects of cooperative learning method on secondary school students' academic achievement in physics. Therefore, in this study attempts were made to answer the following specific research questions:

1. Does cooperative learning method of teaching bring about a difference in students' physics achievement instead of the traditional teaching method?
2. Is there a difference in the effectiveness of cooperative learning method on students' achievement based on specific physics topics?
3. Is there a differential effectiveness of cooperative learning method related to student's achievement level in physics?

Research Methods

As this study aims at effectiveness, it utilized quantitative approach. Thus, the design used was a pre-test-post-test non-equivalent control group's quasi-experimental research design. The design enabled the comparison of the pre-test (O_1) as well as the post-test (O_2) scores of the those who were taught physics with cooperative learning method (treatment, X) and those for which the common place traditional teaching was used (comparison groups) from grade 9 and 10 of in each of the two grade levels. In symbolic representation the design looks:

Treatment group:	N	O_1	X	O_2
Comparison group:	N	O_1		O_2

Besides this, the data's obtained from the observation checklist are also used to support the data's obtained from the tests. On the other hand, the independent variables of the research consist of the STAD method of cooperative learning and traditional teaching method. The academic achievement of the students towards the method is the dependent variable of the study.

Intervention and Comparison Groups

As this was a research with a quasi-experimental design, the intervention and comparison groups were conveniently chosen from Robe Galema Secondary School and randomly assigned into treatment and comparison groups. The school is found in Bale Zone of Oromia region in south-eastern Ethiopia, Robe town. Robe is a town with an urban surrounding which is located 430 km from Addis Ababa, the capital city of Ethiopia. Robe Galema Secondary School had a population of 1127 grade 9 and grade 10 students of which 845 of them are grade 9 and the remaining 282 are grade 10. The main livelihoods of these students depend on agriculture. In the previous year's national examination, the data's obtained from the school showed that the school was one of the least performing schools in physics subject just like the other schools in the region as well as the country. Previous semester class averages of the 20 sections there in the schools were used to select the four sections for the research. Based on the average score in physics, those classes who were closer to each other from each of the two grade levels were picked and randomly assigned to treatment and comparison groups by lottery method. The equivalence of the groups was also confirmed by administering pre-test and analysing the score.

Procedures and Instruments

The research was conducted over two physics units for grade 9 and one unit for grade 10. The topics selected for conducting the research were Work, Energy and Power unit and unit of Waves for grade 9^{th} students. The research was conducted with grade 10 students with Optics unit. These units were chosen for the research just as a matter of convenience. Students had learned other physics units with the same teachers in the semester before they begin working in the research units. This made the time of data collection convenient for the researchers and the introduction of new teaching methods smooth. The time of implementation was seven weeks in grade 9 and four weeks in grade 10. The teacher was made to teach the respective units in their classes using both methods: using STAD to the treatment groups and traditional method for comparison groups. Before they start to implement cooperative learning method they were trained for a week by one of the researchers in particular on the implementation of STAD method of cooperative learning.

Students in the treatment group were divided into small groups of four or five members in such a manner as to reflect the class heterogeneous mixture of academic ability and gender. With these groups, the cooperative learning method was employed to teach the content and hence each lesson proceeds using the regular cycle of instructional activities of STAD. The STAD cycle is consisting of Teach, Team Study, Test and Team Recognition (Slavin, 1995) until the end of the study. In each last period of the week, the teacher gave a paper and pencil quiz for the treatment group students. Quizzes were designed to test physics knowledge learned and skills developed based on the activities they were doing during the lessons of the week. Then the teacher marked and returned the papers to the learners in their next class period. Using this technique, the learners received an improved score each week using the STAD improvement criteria based on their past average performance (base score) indicating how well they were performing. Team summary sheet was also prepared to show the team's performance in the quiz. Lastly, the teams received recognition for the average of the improvement scores of the team members each week. Certificates saying "GOOD TEAM", "GREAT TEAM" and "SUPER TEAM" were the primary means of rewarding teams for their performance (Slavin, 1994).

Comparison group students were also exposed to the same physics content with the same syllabus. In addition to making sure that these groups learn the same physics content, they were given the same exercise, activities, worksheets and homework tasks. The length of time (number of lessons) used for each unit was also approximately the same. However, the teaching method used for the units with these groups was teachers' explanation, teacher lead question and answer, and blackboard summary given by the teacher. The teacher was also marking and commenting on students work during class activities and homework activities. Nevertheless, as it was the practice for these common place traditional classes, feedback was given individually and no deliberate provision was made for students to discuss and share feedbacks.

In the week before the intervention (and also the research units) begin, pre-test was administered to the whole of the sample groups at once. Post-test measurement was also conducted at the beginning of the week after the last week of the intervention. In addition to pre- and post-tests, classroom observations were conducted. During the implementation, guidance and strict follow-ups were provided to the teachers to keep their lessons in both groups as identical as possible except the methods of teaching.

With the aim of finding answer to the research questions mentioned in this manuscript, two instruments were used to collect data. These are physics achievement tests and observation.

i. Physics achievement test

Based on the syllabus physics achievement test for each of the units was developed by one of the researchers and commented by the others. Several discussions among the researchers were conducted to assure the content and face validity of the items. Further validation was also made by giving the draft physics tests for experts and practitioner teachers in Addis Ababa University and Bale Zone secondary schools. After appropriate modifications,

according to the feedback obtained from experts and teachers, every one of the tests was piloted in a school with a similar background in a nearby town. Pilot test scores were used for item characteristics determination and improvement of some of the items. The calculated values for the item difficulty level and discrimination index was found to be greater than 0.63 and 0.3 respectively after discarding some of the items which were not found to be good items. In addition, reliability coefficients of the achievement tests were also calculated using Kuder Richardson estimate (KR-21) reliability coefficient formula (Hale & Astolfi, 2014). As a result, the obtained reliability coefficients of the achievement tests for each of the three units were as presented in the table below.

Table 1: Reliability Coefficients of Physics Achievement Tests of the Three Units

	Unit	Pre-Test	Post Test
1.	Work, Energy and Power	0.78	0.83
2.	Waves	0.75	0.80
3.	Optics	0.74	0.85

As can be seen from the table, the difference in reliabilities of the tests are not very strong even if there are variations between 0.74 for Optics pre-test to 0.85 to Optics post-test. Instead of these variations, the improvement pattern in the post-test coefficients is noticeable. In general, we conclude that the post-tests were more reliable than the pre-test. Nevertheless, according to Fraenkel and Warrel (1996) and many others, the pre- and posts in this research were found to be in high reliability ($\alpha > 0.7$) range.

ii. Observation

Observations were made on both the treatment and comparison groups repeatedly during the period of the study. This was needed to minimize fidelity of the methods as the same teacher was teaching both groups and to make sure that support will be available to the teacher for effective implementation of both the cooperative method and traditional teaching method without compromising the physics content taught in every class. Furthermore, information was gathered though observation regarding the implementation of cooperative learning in the treatment groups. To enhance the observation quality, observation checklist was developed by the researchers and used in some of the lessons.

Methods of data analysis

In order to see if cooperative learning method was better for teaching physics in this research, mainly achievement data was analysed. The analysis was focused in determining mean achievements and differences in mean achievements. Therefore, beside descriptive statistics like mean and standard deviations, parametric statistics such as the independent sample t-tests were used. Students achievement scores in the three units and of the treatment and comparison groups in pre- and post-tests were compared. To examine the effectiveness of cooperative learning method in relation to different physics content, students' scores for the two units in grade 9 were compared. Furthermore, to see grade level, student achievement level, and gender dependence of the effectiveness, appropriate classifications and comparison were made using independent sample t-test. In addition, in order to see whether the difference is strong or weak and have practical significance, Cohen's d effect size was also calculated. Observation data had supplementary role in the analysis and interpretation of the achievement data.

Results

Pre-existing Differences in Physics achievement

In order to find if there are any pre-existing differences between treatment and comparison groups, their physics achievement scores in the pre-test were compared. As the achievement scores in every group and sub-group were found to be normally distributed, an independent sample t-test was employed for pair-wise comparison. The result of the t-test is presented in Table 2.

Table 2: Comparisons of Pre-Test Mean Scores of Treatment and Comparison Groups in Three Physics Units for Grade 9 and 10

Grade	Unit	Group	N	Mean score	SD	t	p
9	Work, Energy and power	Treatment	58	8.36	3.18	0.469	0.640
		comparison	59	8.09	3.02		
	Wave	Treatment	58	7.76	3.02	-0.131	0.896
		comparison	59	7.83	2.93		
10	Optics	Treatment	48	7.50	3.04	-0.326	0.745
		comparison	43	7.72	3.42		

Table 2 indicates that the difference between the mean scores of the treatment and comparison group on pre-test for grade 9 and grade 10 were found to be not significantly different at 0.05 levels for each of the units. Hence, it is found that, prior to the intervention, there were no reasons to assume each of the treatment groups to differ from their comparison groups in physics achievement scores in any of the physics topics treated. The same was confirmed between the sub-groups such as achiever levels of treatment and comparison groups. So all the groups (treatments and comparisons) were at the same achievement level before the interventions was implemented. Therefore, if differences were observed between comparison and treatment groups, there would

be no reason to attribute it to pre-existing differences between the groups after the intervention.

Comparison of effectiveness of Cooperative Learning with Traditional Teaching

The major research question we have in this research was "Does cooperative learning method of teaching brings about a difference in students' physics achievement instead of the traditional teaching method?" However, before we compare the mean scores in the treatment groups with those in the comparison group we need to see if learning had at all occurred in all the groups during the learning of every one of the three units. To do that, we made comparison of the respective pre-test means and post-test means. The analysis of the data demonstrated that learning has taken place in every case during the intervention period. Now, the question is to see if the increment in physics achievements has dependence on the teaching method employed.

Therefore, the post-test mean of achievement scores of each groups were calculated and comparison between the respective means of the treatment and comparison groups were carried out. The comparison of the post-test mean scores in terms of independent sample t-test was presented in Table 3 below.

Table 3: Comparisons of Post-Test Mean Scores of Treatment and Comparison Groups with respect to Physics content learned

Grade	Unit	Group	N	Mean Score	SD	t	p
9	Work, Energy and power	Treatment	58	13.57	2.41	6.523	0.000**
		comparison	59	10.02	3.39		
	Wave	Treatment	58	13.03	2.72	5.488	0.000**
		comparison	59	10.29	2.66		
10	Optics	Treatment	48	12.93	2.48	5.672	0.000**
		comparison	43	9.44	3.35		

** Significant at 0.05 level

According to Table 3, it was found that there is a significant difference ($t_{calculated} > t_{critical,}$ $p < 0.05$) for treatment group students between post-test achievement mean scores of the treatment and comparison groups of grade 9 as well as grade 10 students.

Effects of Physics Content and Grade Level

As it can be seen in table 3, grade 9 treatment group students performed significantly better than the comparison group on post-test for the unit on work, energy and power as well as the unit on waves. The following figure showed that the existence of a consistent improvement in the scores of grade 9 students in both units after the treatment. Hence, the STAD method of cooperative learning can be an effective teaching method to teach different physics topics across the same grade levels.

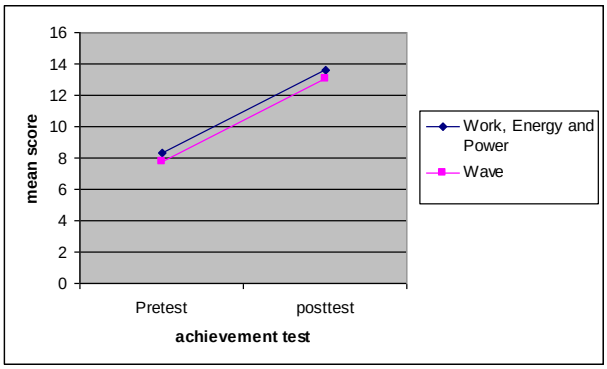

Figure 1: Differences in mean scores of grade 9 treatment group students on pre-and post-test.

The data's obtained in Table 3 for grade 10 students on the unit Optics has also proved the effectiveness of this method as it is indicated in Figure 2.

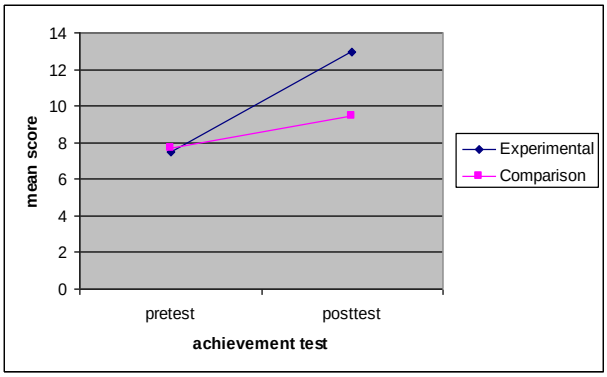

Figure 2: Differences in mean scores of the treatment (experimental) and comparison group students of grade 10 on the unit Optics.

Hence, the STAD method of cooperative learning is effective when it is applied in different grade levels even though in this study the student's maturity between the two grade levels is that much significant and the topics treated across the two grade levels was also different.

Effectiveness with Respect to Achievement Levels

The post-test achievement data's were also analyzed for high achievers as well as low achiever students of each of the two grade levels. Based on the statistical analysis, it was found that there is a significant difference ($t_{calculated} > t_{critical,}$ $p < 0.05$) for high achiever treatment group students with a large effect size of 1.196 and 1.033 respectively for a unit on work, energy and power as well as for the unit on wave. Moreover, it was also found that there is a significant difference ($t_{calculated} > t_{critical,}$ $p < 0.05$) for high achiever treatment group students (with a moderate effect size of 0.969) between post-test achievement score averages of both groups of students for the unit on Optics.

Similarly, it was found that there is a significant difference ($t_{calculated} > t_{critical,}$ $p < 0.05$) for low achiever

treatment group students with a large effect size of 1.381 and 1.193 respectively for the two units of grade 9. Moreover, it also showed a significant difference ($t_{calculated} > t_{critical}$, $p < 0.05$) between the mean scores of low achievers of the treatment and the comparison group on post-test for grade 10 students. The corresponding effect size was 1.627.

Hence, the comparison of mean scores of high achievers of the treatment and comparison groups on post-test reflected a significant difference at 0.05 levels for each of the different units of the two grade levels. Similarly, the comparison of mean scores of low achievers of both groups on post-test showed a significant difference at 0.05 levels in favour of the treatment groups for the two grade levels. This indicates that high as well as low achiever students of the treatment groups had performed significantly better on the post-test than those found in the comparison groups for each of the two grade levels as shown in Figure 3.

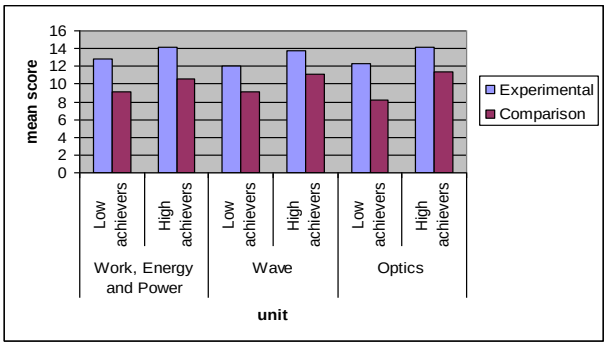

Figure 3: Differences in post-test mean scores of high and low achiever students for each of the three units of the two grade levels

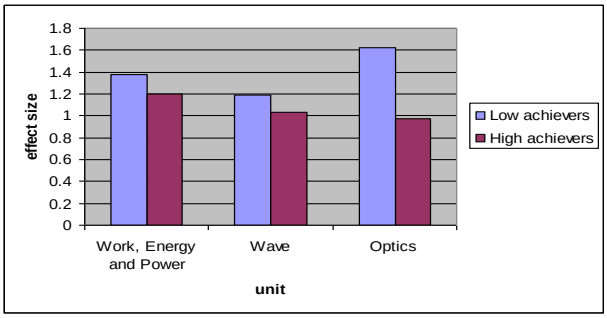

Figure 4: Cohen's d effect size for high and low achiever students of the treatment group on post-test for each of the three units of the two grade levels

In the data analysis, the calculation of the effect size for low achievers is relatively high when compared with the effect size of high achiever students of the two grade levels for each of the three units. This difference of the effect size for low and high achievers can clearly be observed graphically in Figure 4 for each of the three units treated in this study.

On the other hand, the findings obtained from the classroom observation conducted in the treatment group students regarding the overall application are averaged and analyzed by percentages.

Discussion

The results of the study support the view that the use of cooperative learning strategies contributes to higher students' academic achievement in relations to the physics units under study. From this research, comparison of pre-test scores of both the treatment and comparison groups showed the existence of no significance difference between the two groups (Table 2) for each of the two grade levels and hence both the groups were almost equal with respect to the physics units treated in this study. Moreover, the comparison between mean pre-test scores of high achievers of both groups for both of the grade levels showed that the difference between mean pre-test scores was in significant at 0.05 levels indicating that high achievers of both groups were almost equal at the beginning of the study for the physics units treated in this research. Similarly, the difference between the mean pre-test scores of low achievers of both groups for each of the two grade levels was also insignificant at 0.05 levels. This also showed that low achievers of both the treatment and the comparison groups had almost equal physics base at the commencement of the study.

According to table 3, at the end of the application, it is found that there is significant differences for treatment group students between post-test achievements mean scores of the experimental and comparison groups of grade 9 as well as grade 10 students. In order to see whether the treatment difference between post-test achievement mean scores of the groups is strong or weak, Cohen's d effect size was calculated. As cited in Muijs (2004), Cohen's d is a measure of effect size that one will use in conjunction with the t-test. The effect size corresponding to the above data was 1.224 (which is strong effect) and 1.018 (which is almost at the boundary of strong effect) for the two units of the 9th grade respectively and 1.197 (which is strong effect) for grade 10 students. These also showed the advantages of cooperative learning over the traditional method. The reason for the increase in students' achievement could be caused by the student's involvement in explaining and receiving explanation which makes the concepts to be easily understood. Cooperative learning gives more space and opportunities for students to discuss, solve problems, create solutions, provide ideas and help each other. The findings of this study are in line with the findings of previous studies (Ho & Boo, 2007; Iqbal, 2004; Majoka et al, 2007; Sogoni & Musasia, 2016; Tanel & Erol, 2008; Tran, 2013; Whicker et al, 1997 and Vaughan, 2002) which indicate that the cooperative learning method results in higher academic achievement.

Figure 1 showed the existence of a consistent improvement in the scores of grade 9 students in both units after the treatment. This mirrors the results of the action research conducted by Ho and Boo (2007) in

teaching the topics of current electricity and DC circuits. However, a more significant increase should be expected in the second unit as the students become familiar with the method. Anyhow, the method was also effective for the unit on wave. In addition, with regards to different grade levels, the maturity of the students do not have an impact on the effectiveness of the STAD method of cooperative learning since the method was effective for grade 9 (Figure 1) as well as grade 10 (Figure 2) students. This is consistent with the findings of Tshibalo (2003) that used the STAD method of cooperative learning to teach grade 11 and 12 learners.

The effect size of low achievers is relatively greater than that of high achievers of the treatment group (Figure 4). This shows that the STAD method of cooperative learning seems like a potential contributor to enhance the achievement of low achiever students. Majoka et al (2007) reported that low achieving high school mathematics students benefited the most from cooperative learning. These findings were in line with those reported in a study carried out by Kagan (1994). However, according to Slavin (1996), most studies found equal benefits for high, average and low achievers even though a few studies revealed more benefits for low achievers as compared to high achievers. According to him, high achievers could be held back by explaining materials to their low achieving group mates. But it would be equally possible for someone to argue that since students who give elaborated explanations typically learn more than those who receive; high achievers should be the students who benefit the most from cooperative learning because they give the most frequent elaborated explanations. This difference may arise from the variation in the classroom setting, successful implementation of cooperative learning, training and experience of the teacher implementing cooperative learning or the subject area as a focus of learning (Slavin, 1996). Anyhow, since physics is the subject which involves the knowledge of concept and calculations, learners require help while learning physics. In cooperative learning groups, low achievers received help from more capable peers as compared to high achievers. Hence, low achievers attain more as compared to high achievers and hence there is a difference in the effectiveness of cooperative learning due to the achievement level of students.

On the other hand, the findings obtained from the classroom observation showed that treatment group students have a more positive feedback on the issues observed during the classroom observation (lesson objective, social objective, interdependence and accountability). This indicated their eagerness to produce positive results through discussion with their fellow classmates. The observation of the class also revealed a high level of motivation by the students to complete the tasks and quizzes given to them. During the classroom observation, the researcher also observed the skills necessary to create and maintain good cooperative learning groups (teamwork, respect for others and sharing responsibilities). By encouraging one another, the treatment group students were more confident and attentive to the subject matter and generally have a better attitude in the classroom environment by showing evidences for positive interdependence and individual accountability. As Johnson and Johnson (1999) indicated, cooperative groups help students establish and maintain friendships with peers. They added that as relationships become more positive, there are corresponding improvements in productivity, moral, feelings of personal commitment and responsibility to do the assigned work, willingness to take on and persist in completing difficult tasks and commitment to peers' success and growth. In addition, it is thought that the students have undertaken the responsibility of other members in cooperative groups which in turn improves their responsibility and understanding of democracy. These showed the effectiveness of cooperative learning as a teaching and learning strategy in the physics classroom of secondary schools.

Conclusion

This study provides evidence that the cooperative learning method is an effective teaching learning method for all the physics units treated in this study as compared to the traditional teaching method. The method can be used to teach different physics units in different grade levels regardless of the maturity level of students. Based on the results obtained from this study, the students who were taught through cooperative learning method achieved higher scores than those taught under traditional learning method. This is because cooperative learning encourages critical thinking through the problem-solving process. The method makes students to gain a lot of knowledge and new experiences through sharing their ideas with others. Moreover, cooperative learning method creates more supportive and committed relationships among group mates. The result also showed that the cooperative learning method is an effective method for teaching physics to the low achievers as compared to the high achievers even though high achiever student's also benefitted from the method.

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