

UNIVERSITY OF EDUCATION, WINNEBA

**USING COOPERATIVE LEARNING TO ENHANCE PUPILS' PERFORMANCE
IN SCIENCE IN SOME SCHOOLS IN AGORTIME-ZIOPE DISTRICT**



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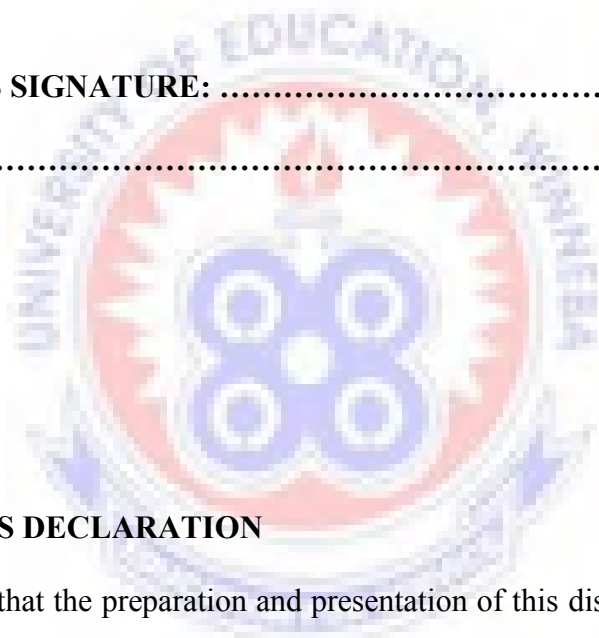
DECLARATIONS

CANDIDATE'S DECLARATION

I, Erastus Mak-Mensah, declare that this dissertation, with the exemption of quotations and references contained in published works which have all been identified and acknowledged, is entirely my own original work and it has not been submitted either in part or whole for another degree elsewhere.

CANDIDATE'S SIGNATURE:

DATE:



SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this dissertation were supervised by me, in accordance with the guidelines and supervision of thesis as laid down by the University of Education, Winneba.

SUPERVISOR: Dr. Ruby Hanson

SIGNATURE:

DATE:

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DEDICATION

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ABSTRACT

Cooperative learning is the instructional use of small groups of learners so that they work together to maximize their own and each other's learning. This study investigated the use of cooperative learning to enhance the performance of upper primary pupils in science. A mixed method approach with a quasi-experimental design was used. The access population was upper primary pupils from Kortsrala and Takuve D/A primary schools in the Agortime-Ziope district of the Volta region of Ghana with a sample size of 32 pupils. The sample was divided into experimental and control group with each group consisting of sixteen pupils. At the beginning of the study, both the experimental group and control groups were pre-tested.

The experimental group was taught using the cooperative learning method while the control group was taught using the old-fashioned way of teaching. At the end of the four weeks treatment, both groups were post-tested. Post-test results showed that pupils taught with cooperative learning approach exhibited high academic performance and thus prove that cooperative learning enhances pupil's own understanding of concepts.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter consists of the background of the study, statement of the problem, purpose of the study, objectives, research questions, hypotheses, significance of the study, delimitation, limitation and organization of the study.

1.1 Background of the Study

Education is a 'light' that shows mankind the right direction to go in order to develop himself and the environment in which he lives. It is an engine for the growth and progress of any society. The purpose of education is not just to make a student literate but also to equip him with knowledge, self-sufficiency, skills and rationale thinking for a purposeful life. Thus, we have to ensure that learning becomes a process that will generate interest in pupils and motivate them to stay in institutions and study hard so as to achieve their goals and aspirations. Education should be fun and thrilling, rather than a burden. Education must be seen as an integral part of one's growth that helps one to become a good citizen. Teachers, as propellers or facilitators of education, must therefore come up with innovative and interesting teaching methods which will motivate students to learn.

The poor academic performance of many pupils is often linked with ineffective teaching methods (Adunola, 2011). In order for a method used in teaching to be effective, Adunola maintains that teachers need to be conversant with its strategies that take cognizance of

the magnitude of complexity of learning concepts to be covered in a lesson. According to Ayeni (2011), teaching is a process that involves bringing about desirable changes in pupils so as to achieve specific outcomes. If these factors are not considered they could lead to ineffective teaching and affect pupil's academic performance.

From the researcher's observations, the process of learning is most effective when it is accompanied by activities so that pupils can acquire knowledge from their activities rather than be asked to remember some information. In view of that, many schools are using cooperative learning in classrooms which is seen to be interactive. Cooperative learning encourages pupils to debate, do discussions, disagree to agree, and by so doing teach one another in the process to enhance their learning skills.

In practical terms, without good performance in science, the chances of pupils gaining admissions in higher institutions to pursue science related courses are slim. This implies that, their employment prospects would become marginal, which would in turn undermine their standard of living and the prospects of contributing to the economic development of their country (Mwamwenda, 2004). The poor performance of primary pupils in the natural sciences would mean that few pupils would study pure science in secondary schools, and this could translate into fewer pupils gaining admissions into higher institutions to study science related courses. This will not be good for the Ghanaian economy as a country in such a state would produce fewer science professionals with the required or needed skills to develop the country.

1.2 Statement of the Problem

From the experiences gathered by the researcher over the years as a student, teacher, how well pupils retain taught science concepts can be traced back to the teaching approach used by their teachers. Pupils at the primary level are at the concrete operational stage. Therefore, using the lecture method which is more appropriate for older students who are in the secondary and tertiary levels is inappropriate for the pupils. Primary pupils require more practical and interactive lessons to help them conceptualize the lesson taught. They like to feel, taste, smell, handle and manipulate things. It has been observed by the researcher too that pupils are hardly engaged in science activities in primary schools within the Agortime-Ziope District. Teachers do not have access to basic science equipment with which they can engage their pupils in science activities. Neither do they engage in improvising the much needed kits for use in science in their schools. They basically resort to the lecture method and teach science in the abstract.

This necessitates the need for this research to be carried out in the Agortime-Ziope district of the Volta region of Ghana to investigate whether cooperative learning enhances the academic performance of pupils in science. It was also carried out to assess the impact of the cooperative learning on the pupils' performance in the district.

1.3 Purpose of the study

The main purpose of this study was to investigate whether the use of cooperative learning enhances the academic performance of pupils in science the Agortime-Ziope district of Ghana.

1.4 Research Objectives

The objectives of this study were to:

1. Verify whether teachers integrate cooperative learning into teaching as an innovative tool in science in the Agortime-Ziope district of Ghana.
2. Find out whether the use of cooperative learning enhances the academic performance of pupils in science in the Agortime-Ziope district.
3. Investigate whether cooperative learning has any impact on pupils' academic performance in integrated science in the Agortime-Ziope district.

1.5 Research questions

The research questions therefore were:

1. What innovative tools do teachers employ in teaching science at the primary school level in the Agortime-Ziope district in the Volta region?
2. How would the use of cooperative learning enhance pupils' performance in science at the upper primary school in the Agortime-Ziope district?
3. What is the impact of cooperative learning on academic performance of pupils in science in the Agortime-Ziope district of Ghana?

1.6 Hypotheses

The research hypotheses were:

1. The use of cooperative learning enhances pupils' academic performance in science.
2. There is significant difference in performance of pupils when cooperative learning is used as an instructional method to teach science.

1.7 Significance of the study

The findings of this research would help science teachers especially those who teach in upper primary to make informed decisions on appropriate and effective teaching strategies that could be used to motivate learners and improve their performance.

The study could also provide very useful information to the Agortime-Ziope District, Ministry of Education (M.O.E), the Ghana Education Service (G.E.S) and non-governmental organizations (N.G.Os) to provide interventions which promote the use of diverse teaching methods in the classroom.

Finally, the findings may augment the pool of data required by other educational researchers to solve educational problems in science especially in the Agortime-Ziope district.

1.8 Delimitations of the study

The delimitations of this study boiled down to the fact that there are many schools where this research could be carried out but it was carried out with only two primary schools due to their proximity to the researcher.

1.9 Limitations of the study

Time framework given for the completion of the research and financial constraints were the limitations to the study.

1.10 Organization of the study

This research report was presented in five chapters. The first chapter dealt with background of the study, statement of the problem, purpose of the study, research questions, significance of the study, limitations, delimitations of the study, as well as the organization of the study.

The review of relevant literature on the study constituted the chapter two, while chapter three dealt with the methodology. This comprised the design of the study, population, sample and sampling techniques, instruments and data collection procedure as well as procedure for analyzing the data.

Chapter four comprised of the data analysis and discussion of the findings while chapter five dealt with the conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter primarily reviewed literature on cooperative learning. It dealt with various learning theories that support cooperative learning, essential features of cooperative learning and claimed benefits as well as shortcomings of cooperative learning. It also presents research findings that support the effectiveness of cooperative learning as well as findings that do not support cooperative learning. It finally concluded with the summary of reviewed literature study on cooperative learning.

2.2 Theoretical framework

Cooperative learning is supported by the information processing theory, social interdependence theory and the social cognitive theory proposed by Vygotsky and Piaget respectively. Information processing theorists claim that group discussion helps pupils to rehearse, elaborate and expand their knowledge. As group members discuss questions and explain things to one another, they trigger the process that supports information processing (Woolfolk, 2010).

The social interdependence perspective of cooperative learning proposes that the way social interdependence is structured determines the way pupils interact, which in turn determines outcomes. Positive interdependence results in the promotion of interaction as pupils encourage and facilitate the achievement of group goals (Susan, 2007).

Proponents of Vygotsky's theory suggest that social interaction is important for learning because mental functions or cognitive development originate in social interactions and are internalized by pupils (Fushino, 2008). The Piagetian theory advocates thus contend that cooperative learning improves learning as interactions in groups create cognitive conflict and disequilibrium that lead an individual to question his or her understanding and try out new ideas (Woolfolk, 2010).

2.3. Features of cooperative learning

According to Slavin (2009), cooperative learning comprises of instructional methods in which teachers organize pupils into small groups, who work together to help one another learn academic content. In contrast to the traditional learning setting where the majority of interactions are teacher-centered as stated by Van Dat and Ramon (2012), cooperative learning is learner- centered and focuses on coordinating, stimulating, and encouraging interactions among pupils, as pupils are expected to learn from their own activities and interactions with their peers (Shimazoe & Aldrich, 2010). Cooperative learning is therefore perceived as an alternative learning method to traditional pedagogy as it creates a competitive learning environment (Killen, 2007).

Johnson and Johnson (2009) intimated five essential elements for effective cooperative learning. These are positive interdependence, individual accountability, face to face interaction, interpersonal and small group social skills and group processing. Although not included by Johnson and Johnson (2009) as essential elements of cooperative learning, most researchers consider teacher supervision and heterogeneous grouping as

essential for effective cooperative learning. The discussion that follows in the next section focused on heterogeneous grouping.

2.3.1 Heterogeneous grouping

The first step of cooperative learning is the formation of groups which could be homogeneous or heterogeneous. In the context of cooperative learning, heterogeneous grouping denotes groups in which pupils may be mixed on the basis of gender, ethnicity, social class, academic ability, language proficiency and diligence to carry out tasks (George & Dan, 2004).

When placing or grouping pupils for cooperative learning, Dennis (2004) notes that it is necessary to integrate pupils who have the ability to communicate effectively and solve problems with those who cannot. By so doing, pupils who are less competent in communication and general problem solving can be helped. The rationale for heterogeneous grouping according to Sunarti, Jaya, and Nootan (2006) is that it provides the greatest opportunities for peer tutoring and supports improving cross-race and cross-sex relations and integration.

Heterogeneous grouping may also benefit high ability pupils as it provides them with the opportunity to explain the learning task to other members of the group. This enhances their social and intellectual standing. In the views of Woolfolk (2010) the more a learner provides elaborated and thoughtful explanation to other pupils in a group, the more the learner understands what he explains.

2.4 Importance of cooperative learning

Cooperative learning has been reported to produce a range of positive social, affective and psychological outcomes, including social support, the quality of learner relationships, attitude to learning, learning skills, and self-esteem (Van Dat & Ramon, 2012). According to Parr (2007) one of the main benefits of cooperative learning is that it can foster an environment that embraces the great diversity of pupils that are found in today's classrooms. This viewpoint is shared by Lord (2001) who claims that cooperative learning allows pupils to share their differences in a positive way and can add value to the team by bringing their different backgrounds to the group.

There is a great deal of evidence that supports the effectiveness of cooperative learning in promoting academic achievement. Some of these studies include what has been done by Steven Yamarik (2007) who used multivariate regression analysis to analyze the effect of group learning on learning outcomes in economic instruction. Yamarik applied cooperative learning to an economics course in 2002 and again in 2004. The subjects assessed were 116 students in four macroeconomic courses. Thirty five students from an early afternoon course and 22 more students in a late afternoon class were assessed in 2002. The early afternoon class was used as the control section and the late afternoon section was used as the experimental group. Yamarik again assessed students in 2004 by assessing 35 students in the early afternoon and 24 more students in the late afternoon. The early afternoon section was the experimental group and the late afternoon section was used as the control group. The post-test scores of students learning in the experimental group, or the cooperative learning group, were measurably higher than that of those in the control group, or the lecture style group. The cooperative learning groups

scored four to six points higher in the post-test than the lecture style groups (Yamarik, 2007).

Muraya and Kimamo (2011) also investigated the effects of cooperative learning approach on biology mean achievement scores of secondary school students. They found that cooperative learning approach resulted in significantly higher mean achievement scores compared to traditional teaching method. In the same vein, Armstrong, Shu-mei and Marguerite (2007) compared cooperative learning and traditional lecture method in an undergraduate biology course. Their results showed that the experimental group that was instructed through cooperative learning showed greater improvements in overall test scores than the control group that was taught using a traditional lecture method.

Similarly, Christian and Pepple (2012) found that cooperative learning resulted in enhanced academic performance. The researchers carried out a four week study involving 370 senior secondary school students. Pupils in different groups were taught chemistry using one of cooperative, individualistic, and conventional teaching strategies. At the end of the study, pupils were post-tested to evaluate the effects of the teaching strategies. The results showed that pupils in the cooperative group performed better than their counterparts in the individualistic and conventional learning groups.

Shimazoe and Aldrich (2010) asserts that cooperative learning promotes deep learning of materials, enables pupils to achieve better grades, learn social and civic values, learn higher-order critical thinking skills and promotes personal growth. They also believe that cooperative learning provides the opportunity for teachers to reflect on what is happening

in the classroom, as they monitor and guide pupils in their different groups. Finally, they conclude that pupils develop positive attitudes towards autonomous learning.

Majoka, Khan, and Shah (2011) looked at the impact of cooperative learning and traditional methods of teaching in social studies. The quantitative experimental study compared achievement scores among all the pupils at the elementary level in public schools of the Mansehra District in Pakistan. The control group and the experimental group each contained 50 pupils. Pupils were placed in each group based on the mean scores of a pre-test. Two teachers were selected for the study, each having the same academic qualification and teaching experience. Pupils in the control group were taught using a lecture method for each of the three parts of the lesson. The experimental group experienced one day of direct teaching followed by a worksheet and team time. Statistical tools used in the study were standard deviation, effect size, and percentile point gain. The pre-test and post-test scores served as the data of the study. Majoka, Khan and Shah concluded that learning in a cooperative classroom enhanced the pupils' ability to learn in the subject of social studies.

Gillies and Ashman (2000) analyzed the effects of training in cooperative learning on verbal comprehension, figural, and quantitative reasoning of primary pupils. The sample included 152 third grade pupils drawn from 25 classes of 11 schools in Brisbane, Australia. Classes were randomly assigned to cooperative learning group and control group. In both conditions participants were allocated into four pupils' workgroups, and each group included one high-ability, two medium-ability, and one low-ability student. In the structured group, pupils participated in two training sessions of one hour each, in which they learned about small-group behaviors, group involvement, sharing resources,

and providing constructive feedback. After this initial training, pupils worked with their cooperative learning groups one hour per day, three times per week throughout nine months. Furthermore, pupils worked in groups in their social studies class, and they solved problems that entailed comprehension, analysis, synthesis, and evaluation of the information. In the unstructured group, children received traditional instruction combined with unstructured cooperative work (cooperative learning conducted without proper training). Outcomes were measured through a comprehension test answered in groups and an individual reading test. Results showed a significant difference between the comprehension post-tests of the structured group in comparison to the unstructured group.

In addition, a research by Belesanmi and Oludipe (2012) corroborates the effectiveness of cooperative learning and claim that it creates a friendly learning environment in which pupils are motivated to learn and are more confident to ask questions from one another leading to a better understanding of the tasks being learnt thereby enhancing their academic achievement. Their study investigated the effect of cooperative learning on junior secondary school students' academic achievement in science. The sample consisted of 120 pupils selected from three intact classes. Two experimental groups were taught using cooperative instructional strategies (learning together with jigsaw II) while the control group was taught using the conventional teaching method. The findings of the study showed that cooperative learning was more effective in enhancing pupils' academic achievement and retention in science than the conventional teaching method.

A study by Thurston, Duran, Cunningham, Blanch and Topping (2009), investigated the effects of an online peer tutoring on first and second language achievements (reading

attainment and writing fluency), in comparison to a traditional teacher centered class. The samples included 85 pupils between nine and twelve years old, and were drawn from two schools, one in Spain and the other in Scotland. In this quasi-experimental study, 33 pupils were assigned to the experimental group and 52 to the control group. In the experimental group pupils were paired across countries through internet. Pupils were paired based on similar abilities in the second language and received the instruction to write messages in the language they were learning and correct messages in their native languages. Therefore, each student assumed both the role of tutor and tutee in different activities. The intervention lasted four hours per week for eight weeks. The control group received normal Spanish/English curriculum tutoring by a teacher. Outcomes on language achievement were measured through standardized Spanish and English tests. Results showed that the Scottish experimental group, in comparison to the control group, gained significantly from pre- to post-test in their second language attainment. Spanish experimental pupils gained significantly more than the control pupils in their own language attainment.

Van Wyk (2007) emphasized the importance of cooperative learning and points out that it offers a different paradigm for teaching and learning, because pupils discover and construct knowledge. He intimated that, cooperative learning gives pupils the opportunity to develop new talents and skills, and optimizes teaching-learning interactions amongst pupils and between pupils and teachers. Sahin (2011) also conducted a study which analyzed the effects of the Jigsaw III cooperative learning technique on academic attainment of primary pupils on written expression. The sample included 71 sixth-grade pupils from a Turkish primary school, and all pupils rather than classes, were randomly

assigned to an experimental group (36 pupils) and a control group (35 pupils). For five hours a week over a six weeks period, the intervention group received instruction about the Jigsaw III technique and Turkish writing expression. Further, pupils were divided into groups of six children, and each member of the group had the task of becoming an expert in a topic related to written expression and then to explain it to the rest of the group. The comparison group received instruction on Turkish written expression through a teacher centered method but not through jigsaw instruction. The outcomes of the intervention were assessed through pre-test and post-tests. The results showed that the experimental group did significantly better than the control group in terms of written expression.

Kutnick, Ota, and Berdondini (2006) investigated the effects of cooperative learning on primary pupils' academic attainment in mathematics and reading. The study sample included 980 pupils between five to seven years old, who were assigned to an experimental group (475 pupils) and a control group (505 pupils). The researchers adopted a quasi-experimental design. In the intervention group, teachers worked with researchers to learn about cooperative learning and how to develop its activities. Afterwards, teachers transferred the learned skills to their classrooms by leading activities that promote trust and support, communication skills, discussions, and socio-emotional consideration. Pupils received group work instructions in three lessons per week during one academic year. In the control group teachers didn't receive support to develop cooperative learning activities and implemented regular teacher-centered classes which may occasionally include cooperative learning. Academic outcomes in mathematics and reading were assessed using pre- and post-standardized test and Performance Indicators in Primary Schools (PIPS) which covers curriculum-related areas of reading, vocabulary,

and mathematics. Results on reading achievement showed that experimental classes gained more scores than control classes while analyses of mathematics showed that experimental classes gained significantly higher post-test scores more than control classes.

Meanwhile, Topping and Trickey (2007) studied the long term effects of collaborative intervention on cognitive attainment. The sample included 148 fifth-grade students from nineteen schools in Scotland. The outcomes of the intervention were assessed through pre-test and post-tests. Results showed that pupils in the intervention group had significant gains in achievement, while children in the control group did not.

Another benefit of cooperative learning lies in the fact that it promotes positive relationships among pupils. Such positive relationships result in an increase in motivation and persistence in working toward the shared goals, satisfaction, commitment to group goals, productivity and personal responsibility for achievement. In addition to promoting positive relationships, cooperative learning also enhances the use of problem solving, critical thinking and oral communication skills because pupils interact and exchange ideas during learning tasks (Johnson & Johnson, 2009).

In a study by Parveen and Sadia (2012), the effect of cooperative learning on science achievement of 9th grade pupils was investigated. Their experimental group was taught through cooperative learning while their control group was taught through conventional lecture method. The results showed that cooperative learning resulted in higher academic achievement as compared to conventional lecture method. This study lends support to the claim that cooperative learning can promote academic achievement.

Hijazi (2003) did a study which aimed to identify the effectiveness of collaborative learning strategy in science achievement of primary pupils and attitudes towards collective action. The study used achievement test, and a scale to measure the fifth grade of primary school pupils' trend towards cooperative teamwork. The findings of the study showed that the differences are statistically significant between the means of pupils test, and trends towards collective action for the benefit of the experimental group.

Omrod (2004), in a book he wrote on human learning, maintains that when proper activities are designed, cooperative learning has the potential to ensure that pupils have a higher self-efficacy about their chances of being successful, express more intrinsic motivation to learn school subject matter, participate more actively in classroom activities and exhibit more self-regulated learning. He further claims that cooperative learning predisposes pupils to pro-social behavior; as pupils work in heterogeneous and diverse ability groups to achieve learning outcomes.

Marinopoulos and Stavridou (2002) studied the effects of collaborative learning instruction on primary pupils' achievement on science in comparison to traditional instruction. The sample included 329 fifth and sixth grade pupils from eleven to twelve years old. The sample was drawn from seven primary schools in Greece. One hundred and twenty eight pupils and six teachers volunteered to participate in the experimental group while 101 pupils and five teachers volunteered to be part of the control group. In the intervention group, pupils received ten sessions of one hour each, about gases, air pollution and acid rain. Pupils worked collaboratively in small groups of three to five pupils, and within these groups pupils expressed personal ideas about the phenomenon, talked with other members about the assigned topics, and drew conclusions together. In

the control group pupils were instructed through traditional teachers' lectures, and no collaborative work was conducted. Outcomes of the intervention were assessed through pre- and post-tests regarding science concepts. Results indicated that after the intervention the experimental group increased substantially their academic achievement (no overall significant effects were reported), in comparison to the control group.

Liao (2005) supports the use of cooperative learning and claims that if properly designed and implemented, cooperative learning has the potential to ensure that pupils are valued and cherished by their peers for who they are. More specifically higher achievers are valued for their knowledge as well as their ability and willingness to share what they know. Low achievers are accepted and also respected for who they are and their willingness to improve. The benefits of cooperative learning transcend academic learning and performance. Some educational researchers expressed the view that instead of focusing only on academic performance, education should also be aimed at instilling in pupils the culture of working cooperatively with all kinds of people. Cooperative learning with its emphasis on team work is the best method suitable to prepare pupils for the world of work.

2.5 Limitations of cooperative learning

Although there are many research findings that provide weight to the effectiveness of cooperative learning, there are also studies that do not consider cooperative learning effective in promoting academic achievement. This section of the literature reviewed some of these findings.

First of all, one of the major disadvantages of cooperative learning methods is that, in grouping pupils there would be gifted ones or those who learn and work faster. The pupils who need more time to understand the work may feel frustrated at being left behind. Alternatively gifted pupils who learn faster may feel delayed or held back by having to wait for the ones that learn more slowly (Woolfolk, 2010). Parents whose children are brilliant might object to cooperative learning. They think that cooperative learning would be unfair to their children who have to learn and share ideas with other pupils whom they might consider not to be as brilliant as their children.

Although Van Wyk (2007) emphasized on the importance of cooperative learning, he also expressed concerns on the use of cooperative learning and argues that gifted pupils could tend to take over the group rather than share and support leadership. He further notes that gifted pupils could grow frustrated and bored if group members fail to honor their responsibilities and roles in the group according to the group project. Nevertheless, there are a few weaknesses as may be observed with all other teaching strategies (Woolfolk, 2010).

Sharan (2003) perceives that cooperative learning is constantly evolving and considers this constant evolution as a threat that could make cooperative learning too complicated to be used in the classrooms by teachers. Another criticism of cooperative learning is that working in groups does not necessarily mean that pupils would arrive at the correct answer. According to Woolfolk (2010) in his book called the educational psychology, pupils who work in groups but arrive at wrong answers may be more confident that they are right. This has been described by Puncochar and Fox (2004) as a case of “two heads are worse than one”.

In addition, one other criticism leveled by opponents of cooperative learning is that it is too informal to bring about a deep understanding of the subject matter. Others argue that it is too time consuming and disruptive due to the informality of the process (Lord, 2001).

Another study by Lawrence (2006) also found that cooperative learning was ineffective in enhancing academic achievement. He investigated the effect of cooperative learning on the performance of pupils in vocational studies. The results showed that there was no significant difference between the achievement scores of pupils in the cooperative learning group and those in the traditional learning group. He also compared biology achievement in individually competitive and cooperative learning environments. The results showed no difference in pupils' achievement as both the treatment and control groups obtained significantly higher post-test scores.

In a similar vein, the study of Martin and Rowland (2007) does not consider cooperative learning effective in enhancing academic achievement. They compared the effects of jigsaw method of cooperative instruction and traditional teaching method on the achievement of grade 12 pupils in physics. Their results revealed no significant differences between the two groups of instruction in pupils' achievement in physics.

Woolfolk (2010) expressed concerns that in group learning, the ideas of low-status pupils may be ignored or even ridiculed while the contributions of high status pupils are accepted and reinforced, regardless of the merit of either set of ideas. There is also concern that simply putting pupils in small diverse groups for purposes of cooperative learning is not a guarantee that they would cooperate and learn. Without careful planning

and monitoring by the teacher, group interactions can hinder learning and reduce rather than improve social relations in classes.

2.6 Summary

Although majority of the reviewed studies acknowledged the effectiveness of cooperative learning in improving academic performance, promoting positive social interactions, and providing pupils with social skills and civic values, some other studies established no significant differences between cooperative learning and conventional learning in terms of improving academic performance. However, though these studies were carried out in respect to cooperative learning, they were not done in natural science at the primary school level. In addition, the culture and geographical area of the pupils used in these researches were different from those in the Volta region of Ghana and specifically Agortime-Ziope district where this research was carried out. This however influenced the researcher's interest in this topic. The next section focuses on the research design and methodology of the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

In this chapter, the research methodologies of the study are presented. The target population, sampling procedures, data collection methods, and validity of data collection tools, are also presented. The chapter then concluded with data analysis methods and the ethical considerations of the study.

3.2 Experimental Research Design

One type of experimental research design called the quasi-experimental design was used to collect data in this study. In a quasi-experimental design, the main purpose is to determine cause and effect. Therefore the researcher does not usually randomly assign participants to evaluation groups because random assignment is not feasible (McMillan & Schumacher, 2010). A common situation for implementing quasi-experimental research involves research in which several classes or schools are used to determine the effect of teaching methods. In such a situation, it is possible to give an intervention to some of the classes and treat other classes as the control group (McMillan & Schumacher, 2010). The quasi-experimental design was considered appropriate for this study since it allowed for comparison of the experimental and control groups, manipulation of independent variables, measurement of dependent variables, use of inferential statistics and provision for maximum control of extraneous variables (McMillan & Schumacher, 2010).

3.3 Research Location

Research location refers to a place selected for the purpose of gathering data about the problem being investigated by a researcher. It is selected because it is likely to provide rich data about the phenomenon the researcher is investigating (McMillan & Schumacher, 2010). This study investigated the use of cooperative learning to enhance the performance of primary pupils in science in some selected schools in the Agotime-Ziope District.

The Agotime-Ziope District is bordered by the Republic of Togo to the East, Akatsi District to the North, Central Tongu Districts to the South and the Adaklu District to the West. The District covers a total land area of three hundred and fifteen kilometers square (315.7km²) and a population density of 88.7 persons per square kilometer (Ghana Statistical Service, 2014).

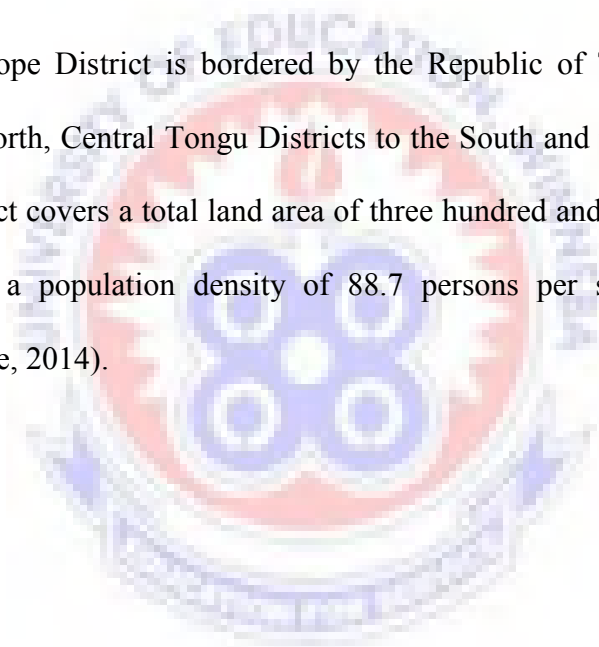


Figure 3.1 shows the boundary, road network and towns found in the Agortime-Ziope District.



Fig: 3.1 District map of Agortime-Ziope

3.4 Target Population

According to McMillan and Schumacher (2010), target population refers to a group of elements or cases, whether individuals, objects, or events that conform to specific criteria and to which researchers are interested in generalizing their conclusions. The target population for this study was all the primary schools in the Agotime-Ziope District.

3.4.1 Accessible Population

The accessible population was a sample of 16 pupils each from Kortsrala and Takuve primary schools which were selected using the convenience sampling technique due to their proximity to the researcher.

3.5 Variables of the study

In this study the variables were as follows:

1. Independent variables – Traditional teaching method and cooperative learning method.
2. Dependent variable – Academic Achievements of the pupils on the topic, “solar systems”.

3.6 Data Collection Procedures

In this study, the researcher used pre-tests and post-tests to collect data. At the beginning of the study, pupils in both the experimental and control groups were pre tested on the topic ‘solar system’. Pupils in the experimental group were taught using the cooperative learning method while pupils in the control group were taught using the traditional teaching method. At the end of the treatment which lasted for four weeks, pupils in both

the experimental and control groups were tested (post-test) again using a science achievement test so as to determine the effects of the teaching strategies that were used in the study. Both the pre-test and post-tests were administered under similar conditions in both the experimental and control groups.

3.6.1 Treatment / Experimental Group

In the experimental group, pupils were divided into groups of four members. The decision to form groups of four members was based on research that suggested that groups larger than four presented problems, such as making it easier for unenthusiastic pupils to play a smaller role in group activities (Asherson, 2008). Each group consisted of a mixture of high and low ability pupils of both boys and girls. The rationale for forming heterogeneous groups was to maximize the learning capabilities of the pupils (Asherson, 2008). Pupils in the experimental groups were given orientation about cooperative learning and its importance. In addition, they were taught appropriate social skills needed for them to work effectively as a team. The taught skills included how to communicate effectively, how to help and support each other, and how to resolve conflicts amicably. The researcher then assign pupils in each group complementary roles such as being a leader, recorder, resource manager or time keeper.

The group leader facilitated group discussions and ensured that group members' discussions were relevant to the learning task. The time keeper ensured that group members stuck to set time during group work. The recorder kept the group's self-assessment records as well as other written records while the resource manager gathered and organized materials for group activities. Complementary roles were assigned to

group members in this study as a strategy to maximize cooperation and learning (Woolfolk, 2010). Woolfolk (2010) stated that simply putting pupils in a group is not a guarantee that they would cooperate and learn.

The cooperative learning method used in this study was pupil group-achievement divisions which consisted of class presentations, groups, quizzes, individual improvement scores, and group recognition (Slavin, 2009). In the experimental group, each lesson began as a whole class instruction during which the teacher introduced the topic, outlined the learning outcomes and instructed the pupils on what to do during the lesson. Afterwards, pupils moved into their various groups to start with the group activities. As pupils worked in their groups, the researcher moved around to monitor how learning was taking place in the various groups. By moving around the class, the researcher was provided with the opportunity for one-on-one explanations with pupils in their various groups.

In order to assess the various learning outcomes, tests were given to pupils. The tests consisted of 25 questions which covered the various learning tasks that pupils worked on in their groups. Group members were not allowed to help each other during the tests. As a result, individual accountability for learning was strengthened. At the end of the test sessions, the scores of the pupils within the various groups were matched and the team with the highest average scores was recognized and applauded. Time was allocated at the end of each lesson for pupils to discuss how effectively they worked with their team mates.

3.6.2 Control Group

The control group consisted of 15 pupils who were taught using the traditional teaching method. In this method, the teacher presented information on the topic to the whole class while pupils listened and wrote notes at the end of the lesson. Learning activities were done by pupils individually. The topic taught in the experimental and control group were the same. The treatment in both the experimental and control group lasted for a period of four weeks.

3.6.3 Data Collection Instrument

According to Pierce (2009), data collection instrument refers to a survey, test, scale, rating or tool designed to measure the variables, characteristics or information of interest. In this study, pre-test and post-tests on the solar system were used to measure the achievement of pupils in the experimental and control groups before and after the study respectively. The test was designed by the researcher and moderated by a natural science subject specialist for its content validity. The pre-test and post-test were based on the content taught during the study, and consisted of fill-ins, true/false and multiple choice questions. The total marks allocated for the test was 50 and time duration was one hour per the standard of testing at the primary school level.

3.7 Validity and Reliability of Research Instruments

Reliability is the degree to which an assessment tool produces stable and consistent results while validity on the other hand refers to how well a test measures what is purported to measure. Although reliability is necessary, it alone is not sufficient. For a

test to be reliable, it also needs to be valid. Researchers are therefore requested to ensure that the instruments used in a research are reliable and valid (Phedan & Wren, 2006).

To ensure the validity and reliability of the research instruments used, the researcher made sure that each item in the questionnaire related well to the topic under investigation. The draft questions were given out to the researcher's supervisor for vetting and approval and also to other scholars well vested in teaching science for review. The questionnaires were pilot tested in Atsrulume and Keyime primary schools to ensure their reliability and validity were within acceptable limits. The questionnaire items were modified after the piloting.

The two selected primary schools were randomly assigned to experimental and control group. The schools selected were based on their proximity to the researcher. Pupils in both the experimental and control groups did not differ much in academic abilities.

The schools used in this study were far apart from each other. This was to ensure that there would be no cross interactions between groups to affect the results that would be obtained. In this way, the diffusion of treatment was controlled. During the course of this study, there was no major school disruption or strike. However, there could have been other unforeseen events or experiences unique to individual pupils in the course of this study that could have escaped the researcher and might influenced the results.

The same pre-test and post-tests were administered to the experimental and control groups. All the teachers who participated in this study were professionally trained teachers and taught natural sciences in primary 4 in their schools. In addition, the teachers who taught in the experimental group were trained for two weeks on the implementation

and assessment of cooperative learning. In this way the threat of experimenter effect on internal validity was controlled.

3.8 Pilot Test

To test the research instrument, pilot studies were carried out in Atsrulume and Keyime primary schools which were considered as non-target schools. This aided the researcher to detect aspects of the research instrument that needed improvement before conducting the actual study. The researcher also carried out an informal observation of cooperative learning during the pilot study in order to establish the need for the research work.

3.9 Data Analysis

Shephard (2002) argues that an essential component of ensuring data integrity is the accurate and appropriate use of statistical analysis as improper statistical analyses could distort scientific findings, mislead casual readers, and negatively influence the public's perception of the research. According to McMillan and Schumacher (2010), t-test is used in a situation when there is a comparison between two values to see if they are different. Therefore, the data analysis method for this study was the t-test. The t-test was used because the mean scores of pupils were compared in the experimental and control groups were compared.

3.10 Ethical Concerns

According to Neuman (2011), ethical issues are the concerns, dilemmas and conflicts that arise over the proper way to conduct research. McMillan and Schumacher (2010) argue that research ethics are focused on what is morally proper and improper when engaging

with participants or when accessing archival data. Cohen, Manion and Morrison (2007) pointed out that social scientists generally have a responsibility not only to their profession in search of knowledge, but also for the subjects they depend on for their work. Therefore, it is important for the researcher to reveal fully his or her procedures of research to the subjects from the beginning.

In this study, permission was sought to embark on the research from the Agortime-Ziope District Education Office, the Adzonkor circuit supervisor, the Head teachers of the selected schools, and the primary four (4) class teachers of the selected schools. In addition, the pupils were fully notified about the purpose and procedure of the study before they were asked to volunteer. They were also made aware that the study would cause no harm to them and that they could withdraw their participation at any time.

Pupils were asked to voluntarily come forward if they wished to take part in the research which they all did. In addition, they were informed that there would be no consequences or punishments if they decide to withdraw from the study at any time.

3.11 Summary

In this chapter, the research design, population, sampling, data collection methods and validity of data collection tools of the study were outlined. The chapter also touched on the data analysis, interpretation methods and the ethical concerns of the study. The next section will focus on the results and analysis of the data obtained in the study.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Overview

This chapter presents and analyses the data collected from the field survey. The discussions and interpretations of the outcome of the various analyses are presented using tables and bar graphs.

4.2 Data Analysis and Interpretation

Data analysis is a method of categorizing, ordering, manipulating and summarizing data to attain answers to a specific research question (De Vos, Strydom, Fouche, & Delpont, 2005). The data collected from the research was analyzed with the help of statistical tools and logical techniques.

4.3 The Pre-Test and Post-Test Results

The results of this study were based on pre and post-tests data collected over four weeks. Eight assessments in total were administered during this time to get a better picture of pupils' academic progression. This helped to give parallel results with no advantage bias on any side. The researcher used Statistical Package for Social Science SPSS for data analysis. Results from pupils' performance in both groups are presented in Tables. Table 4.1 shows a descriptive statistics of the pre-test scores of both experimental and control groups.

Table 4.1 Descriptive Statistics of only the Pre-Test Scores of Experimental and Control Groups.

	Control Group	Experimental Group
	Pre-Test Scores (%)	Pre-Test Scores (%)
1	36	17
2	47	21
3	46	32
4	27	13
5	23	29
6	38	33
7	26	28
8	19	19
9	12	14
10	15	34
11	34	48
12	36	37
13	43	42
14	34	25
15	22	44
16	18	32
Total	476	468
Mean	29.75	29.25
Max	47	48
Min	12	13

It should be noted that the results from the pre-tests from both the experimental group and the control group as shown in Table 4.1 are similar. This implies that before the implementation of the treatment, there was no significant difference in performance of both groups. Both groups had little knowledge on solar system thus their poor performance. There was little difference in the baseline data between the two groups. This stage of the finding supports the view of Lawrence (2006) that there was no significant difference between the achievement scores of pupils in the cooperative learning group and those in the traditional learning group.



However, Table 4.2 shows the descriptive statistics of post-test of both groups.

Table 4.2. Descriptive Statistics of Post-test of Both Groups.

	Control Group	Experimental Group
	Post-test Scores (%)	Post-test Scores (%)
1	54	36
2	66	50
3	45	70
4	23	62
5	17	68
6	42	76
7	30	66
8	72	50
9	38	46
10	32	76
11	27	84
12	22	62
13	31	78
14	43	72
15	51	90
16	28	71
Total	621	1057
Mean	38.8125	66.0625
Max	72	90
Min	17	36

It can be seen through the result from Table 4.2 that the experimental group scored higher marks as compared to the control group with means of 66.0625 and 38.8125 respectively. The results also showed that cooperative learning helps pupils better understand the content of the subjects. The results of this study demonstrated a difference between the academic performance of the experimental and control groups. This difference may be because traditional learning does not typically allow pupils to become engaged and express their opinions. This finding supports the assertion held by Christian and Pepple (2012) that cooperative learning resulted in enhanced academic performance. A diagrammatic representation of mean scores of both groups is shown in Figure 4.3.

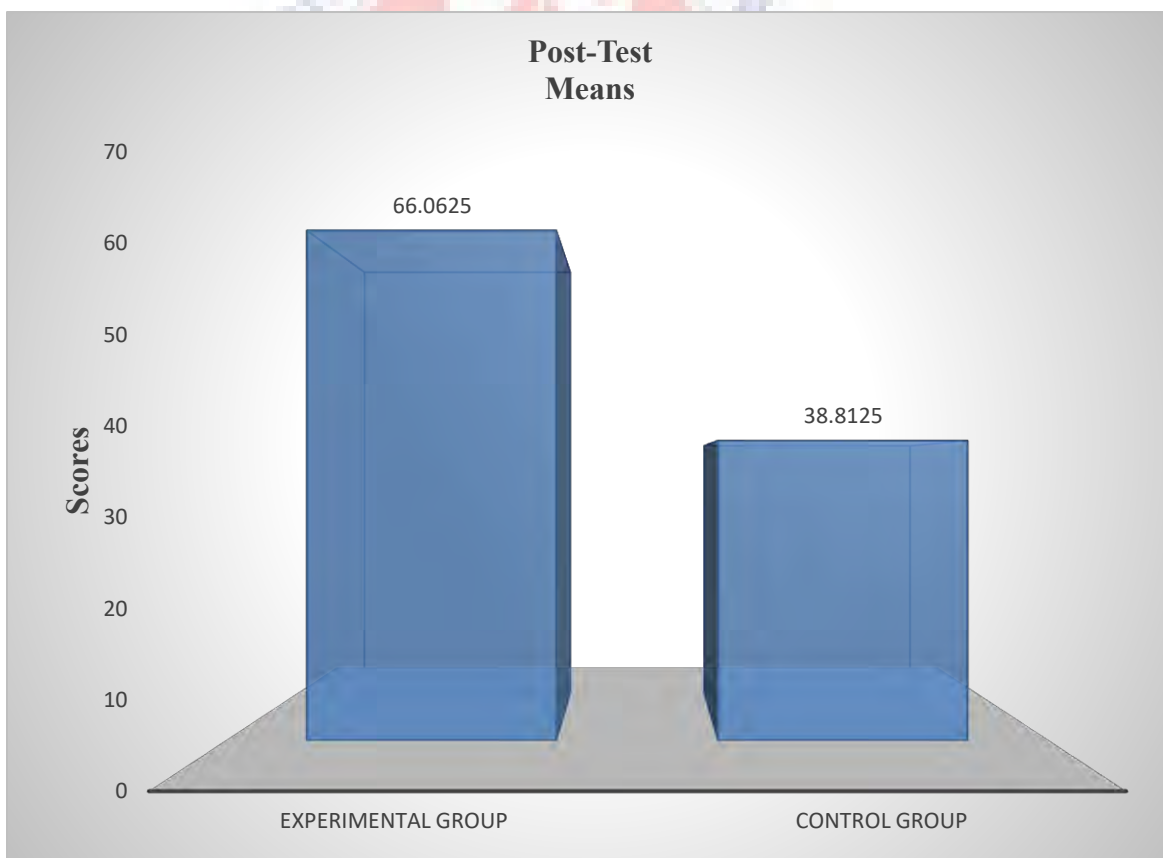


Figure 4.1: Post-Test Mean Scores for the Experimental and Control Group.

From the graph (Figure 4.1), the mean score of the experimental group was higher than that of the scores obtained by pupils taught with the traditional teaching method. Therefore this result rejects the hypothesis that states that there is no significant difference between performances of both the control group and the experimental groups. This finding contradicts the opinion of Lawrence (2006) that there is no significant difference between the achievement scores of pupils in a cooperative learning group and those in the traditional learning group. The post-test scores of both groups were compared to find out if the difference between them were statistically significant. The paired sample test is presented as Table 4.3.

Table 4.3: Paired Samples Test of the Post-Tests of Both Groups.

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Experimental Group – Control Group	2.72500 E1	25.3653 3	6.34133	13.7337 7	40.7662 3	4.297	15	.001

From Table 4.3, the two tailed P value equals 0.0006 at 15 degrees of freedom and at a t-test value of 4.297. By conventional criteria, this difference is considered to be extremely statistically significant. These results suggest that cooperative learning has the capacity to improve pupils' academic performance, which is the hypothesis of this research study. Meanwhile, Performance of the Control Group in the Pre-Test and Post-Test is shown in Figure 4.2.

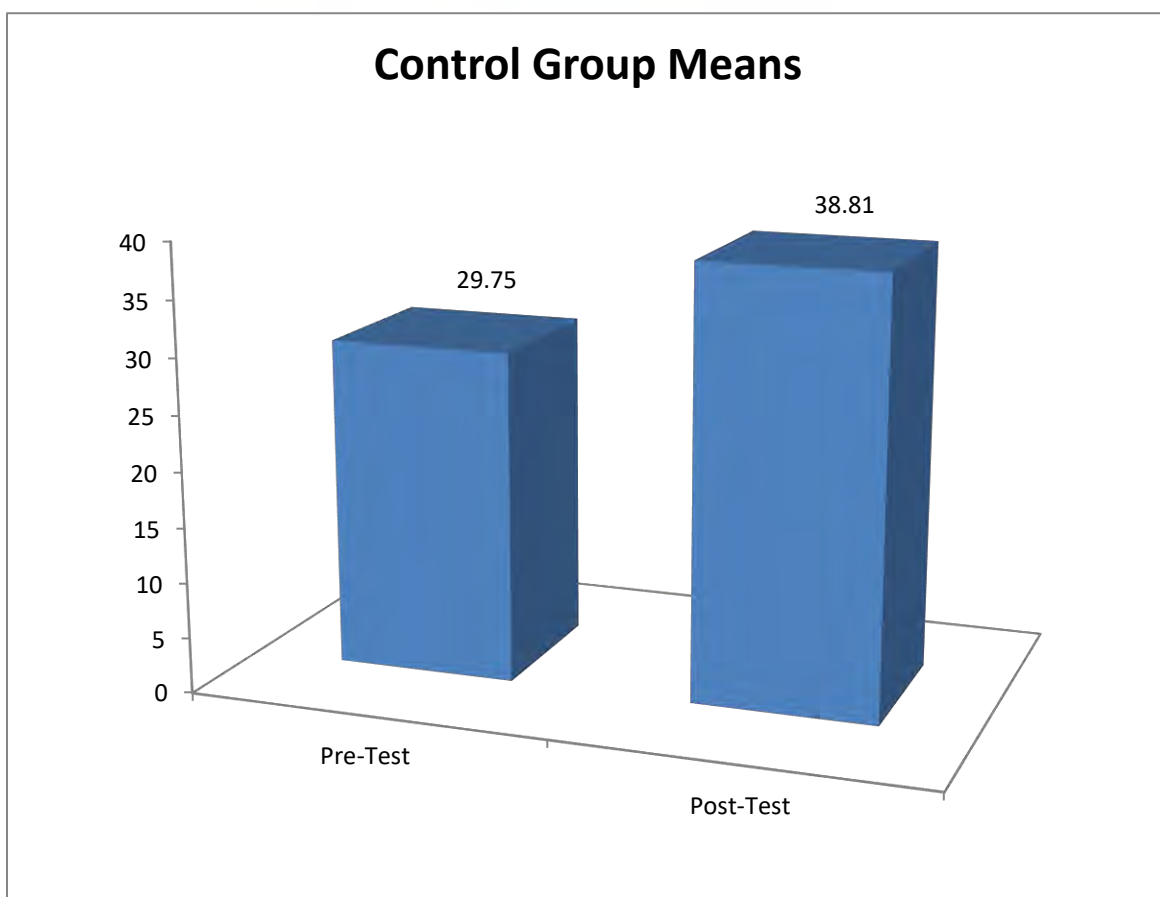


Figure 4.2: Performance of the Control Group in the Pre-Test and Post-Test

Figure 4.2 is a graph that shows the differences in the mean scores of the control group. It can however be seen from the graph that, though the pupils performed better in the post test the difference in the scores are not wide. Similarly the performance of the

experimental group in the pre-test and post-test is displayed in the bar graph in Figure 4.3.

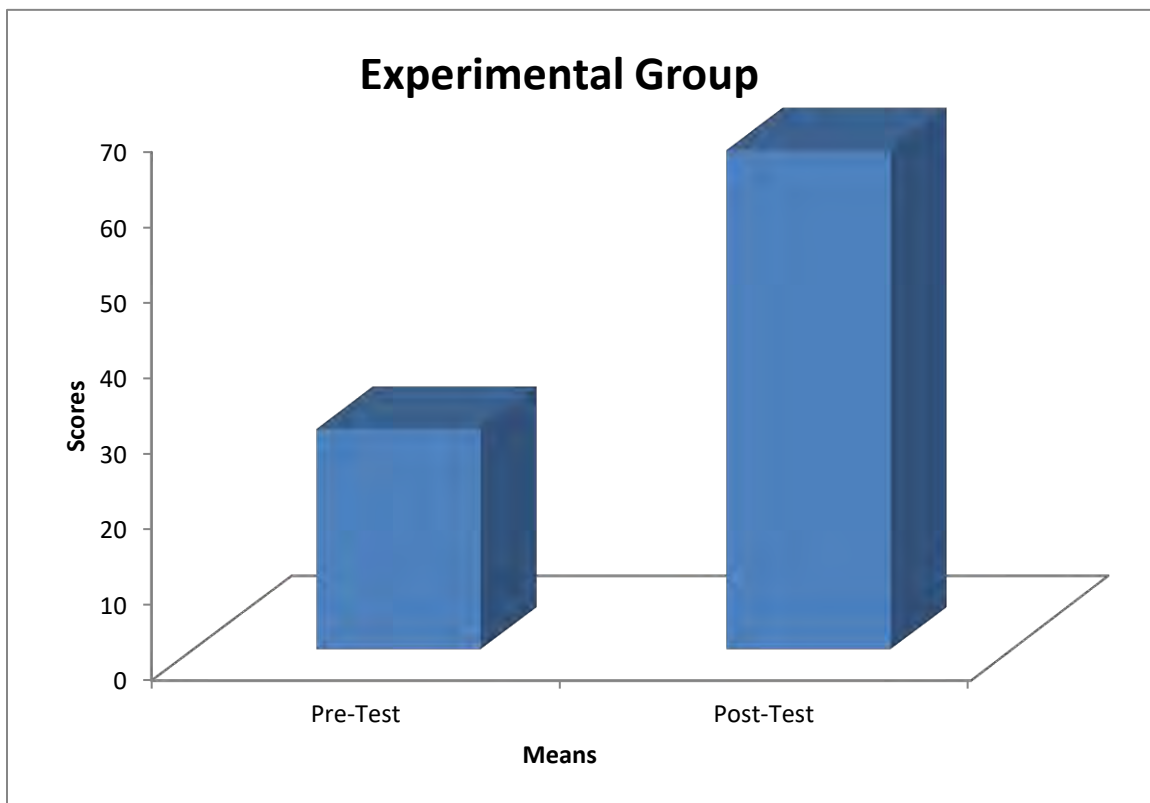


Figure 4.3: Performance of the Experimental Group in the Pre-Test and Post-Test.

Figure 4.3 points out that the performance of pupils in the post-test far more exceeds that of the scores they had in the pre-test. This however indicates that, cooperative learning had a positive impact on the performance of the pupils and helped the researcher to accept the hypothesis that states that the use of cooperative learning in teaching science at the upper primary enhances pupils' performance.

Consequently, cooperative learning could be viewed as a superior approach that could benefit pupils in the Agortime-Ziope District, if implemented properly. In Ghana, traditional teaching method is the regularly embraced system in school instruction. The

research regarding cooperative learning has proved that pupils benefit academically in comparison to the traditional teaching method. Subsequently, the research advocates that schools in Ghana ought to embrace cooperative learning so as to achieve the results stipulated in the research. This result also lends support to the claim made by Parveen and Sadia (2012), Hijazi (2003) and Marinopoulos and Stavridou (2002) among other researchers that cooperative learning can promote academic achievement.

4.4 Summary

In this chapter, the data collected in order to investigate the use of cooperative learning on the performance of pupils in science was analyzed, interpreted and discussed. The analyzed data in this section showed that cooperative learning resulted in better performance in science than the traditional teaching method among primary school children. The next chapter contains the conclusions and recommendations from the studies.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This chapter presents a summary, conclusions drawn from the study and recommendations with respect to the results obtained from the study.

5.2 Summary

This study investigated the use of cooperative learning to enhance pupils' performance in science in some selected primary schools in Agortime-Ziope District. In order to collect data for the study, these research questions were formulated:

- (1) What innovative tools do teachers employ in teaching science at the primary school level?
- (2) How would the use of cooperative learning enhance pupils' performance in science and
- (3) What is the impact of cooperative learning on pupils' performance in science?

A quasi-experimental design was used in order to answer the research questions. The target population was primary four pupils from Adzonkor circuit in Agortime-Ziope District. The sample consisted of thirty two pupils two participating schools that were purposively selected. The sample was divided into experimental and control group with each group consisting of sixteen pupils.

At the beginning of the study, both the experimental and control group were pre-tested in science and their academic performance was about the same. The experimental group was taught using cooperative learning while the control group was taught using traditional teaching method. At the end of the four weeks treatment period, both groups were tested again in science. A sample t-test was used to analyze the pre-test and post-test scores of the experimental and control group for purposes of establishing any statistical difference. The t-test results revealed that the post-test scores of the pupils taught with cooperative learning resulted in better performance than the traditional teaching method.

5.3 Conclusion

In light of the fact that learning is a process that involves investigation, formulation, reasoning and using of appropriate strategies to solve problems, cooperative learning was found to be more effective in the teaching of science in the Adzonkor circuit of the Agortime-Ziope district in the Volta region of Ghana. This was evident from the results found from this research. Findings from the study showed that a learning environment with a presentation from the course teacher accompanied by lecture neither promotes pupils' participation nor builds the required level of reasoning among pupils in the Agortime-Ziope district instead it was realized that pupils build better understanding of concepts more effectively when they are engaged to solve problems during class activities as practiced in cooperative learning.

5.4 Recommendation

In relation to the various perspectives expressed on the relevance and pitfalls of cooperative learning in chapter two, the findings from the researcher played a critical and

significant part in this study. Based on the findings from the study, it is recommended that teachers should adopt the cooperative learning approach and use it to teach for conceptual understanding and retention.

Workshops should be organized by educational bodies to emphasize and enlighten teachers and science educators in particularly on the importance of the cooperative learning approach. The Agortime-Ziope District Education office of the Ghana Education Service should embark on proactive programs targeted at incorporating or encouraging cooperative learning among basic school teachers during seminars organized by their outfit.



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APPENDIX A: TEST INSTRUMENTS

SECTION A

Fill in the blank spaces with the words provided below.

1. The solar system is made up of the

- a. Sun, Earth and Light b. Earth, Sun and Moon c. Satellite, Sun and Earth

2. A satellite is a smaller body that

- a. Produce their own light b. Are man-made only c. Moves round a larger body

3. Luminous bodies

- a. Absorb (takes in) light that falls on them b. produce their own light
c. reflects (throw back) light that falls on them

4. Non-luminous bodies

- a. Absorb (take in) light that falls on them b. produce their own light c. Gives out light

5. Artificial satellite can also be called

- a. Natural satellites b. man-made satellite c. solar satellites

SECTION B

Complete the sentences with the words in the box

Earth	sun	weather	planets	satellite
Reflects	light	luminous	communication	planet

1. The sun, moon, earth and other ----- form the solar system.
2. Non-luminous bodies do not produce ----- of their own.
3. The moon is not a ----- body.
4. The ----- is at the center of the solar system.
5. The movement of the ----- round the sun is called a revolution.
6. The moon ----- light from the sun.
7. Meteorologists use information from ----- satellites.
8. We watched the world cup in Ghana through ----- satellites.

SECTION C

Answer the following questions with 'True or False'.

1. The earth, sun and moon are part of the solar system.
2. The sun revolves round the earth.
3. The moon revolves round the earth.
4. The moon is a natural satellite.
5. A planet revolves round a satellite.
6. The earth is a planet.
7. Luminous bodies produce their own light.
8. The moon is a luminous body.
9. The sun is a luminous body.
10. Artificial satellites are man-made.
11. Weather satellites enable us to make telephone calls to other countries.
12. Natural satellites are used for space exploration.