University of Education, Winneba http://ir.uew.edu.gh

UNIVERSITY OF EDUCATION, WINNEBA

FACULTY OF SCIENCE EDUCATION

USING CO-OPERATIVE APPROACH TO ENHANCE J.H.S PUPILS UNDERSTANDING OF SELECTED TOPICS IN INTEGRATED SCIENCE

GRACE APPIAH-KUBI

A DISSERTATON IN THE DEPARTMENT OF SCIENCE EDUCATION, FACULTY OF SCIENCE EDUCATION, SUBMITTED TO THE SCHOOL OF RESEARCH AND GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF EDUCATION IN SCIENCE

2014

University of Education, Winneba http://ir.uew.edu.gh

DECLARATION

Candidate's Declaration

I hereby declare that this dissertation is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Name Signature:……

Date:……

Name: GRACE APPIAH- KUBI

Supervisor's Declaration

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

Supervisor's Signature: …… Date: ……

Name:……

University of Education, Winneba http://ir.uew.edu.gh

ACKNOWLEDGEMENTS

In writing this dissertation, I had assistance and encouragement from many personalities. Needless to say, I cannot mention all of them here.

I would like to express my sincere thanks to my research supervisor, Dr.Emmanuel K.Oppong of the department of Science Education, University of Education, Winneba for his patience and guidance.

I am immeasurably indebted to my Guardians Mr. and Mrs. Appiah-Kubi for their understanding, encouragement, assistance and patience while I was completing my study.

I would extend my sincere gratitude to Mr. Patrick Amega-Dunu who greatly assisted me with this study both financially and physically.

I would also like to express my thanks to my course mates, the 2013/14 M.Ed. (science) group and good friends,

To the headmaster, staff and pupils of Asuotaino Presbyterian Junior High School, I am only left to say “more is thy due than all can pay”.

University of Education, Winneba http://ir.uew.edu.gh

DEDICATION

I dedicate this dissertation to my Dad Mr. Stephen Yaw Appiah and all my family members who have largely contributed to my education. I am very grateful for your prayers, advice and financial assistance. May God richly bless you all.

University of Education, Winneba http://ir.uew.edu.gh

TABLE OF CONTENT

University of Education, Winneba http://ir.uew.edu.gh

University of Education, Winneba http://ir.uew.edu.gh

University of Education, Winneba http://ir.uew.edu.gh

LIST OF TABLES

University of Education, Winneba http://ir.uew.edu.gh

LIST OF FIGURES

University of Education, Winneba http://ir.uew.edu.gh

ABSTRACT

This study sought to use the cooperative learning approach to assist JHS 2 pupils at Asuotino Presbyterian JHS to understand selected topics in integrated science. This was an action research and it involved conducting test (pre and post), use of the cooperative approach, interviews and observation. A sample of 50 pupils and 2 teachers participated in the study. Two hypotheses were tested for the study. The hypotheses were in relation to the effect of using cooperative approach on the academic achievement of pupils and pupils' attitude to integrated science education after the use of the cooperative approach. It was found out that, using the cooperative approach significantly affected pupils' academic achievement in integrated science and their attitude to the subject as well. Cooperative approach positively affected the academic performance of pupils. It as well improved their attitude towards science lessons. Furthermore, the results of the action research showed that in enhancing the understanding of pupils in selected integrated science topics, both teachers and pupils have unique roles to play and teachers must remain flexible in their teaching approach.

University of Education, Winneba http://ir.uew.edu.gh

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter is designed to cover the background to the study, statement of the problem, purpose of the study. The structure of the chapter also includes the research questions and significance of the study as well as the limitation and delimitation that were identified. The chapter ends with the terms and abbreviations used in the study.

1.1 Background of the study

Science and technology plays a major role in the society to bring about sustainable development. Nations all over the world, strive to have its citizens educated in Science, Technology, Engineering and Mathematics (STEM) disciplines. Ghana, as a developing nation has made quite commendable efforts to enhance scientific literacy of its citizens.

In 1974, there was a proposal for the implementation of the new structure and content of education in Ghana. The implementation of the new reform was started on pilot basis in 1976.The reform according to Mensah (2001) brought about the establishment of six year primary school, three year junior high school (JHS) and three year senior high school (SHS). On the reform science begins an examinable subject at the basic level in 1987 as one of the core subjects.

The new educational reform brought about 6-year primary science program (1976)

Some of the aims of the program among others are;

University of Education, Winneba http://ir.uew.edu.gh

I. To provide pupils with skills they need in life either through experience they have in their classrooms or in the follow-up activities outside the classroom.

II. To prepare pupils to develop interest in science at the senior high school level(SHS)

III. To motivate pupils to learn integrated science.

Considering the objectives stated it became very clear that much have been done to achieve the objectives of teaching and learning of integrated science at the basic level. It is therefore very surprising to learn that pupils at the basic level perform very poorly in integrated science.

From 1987 up to date the chief examiners report the various years, call for more systematic and pragmatic approach in finding solutions to pupil's poor performance in integrated science.

The pupils from the basic school level are expected to gain the requisite knowledge in science to arouse their interest to study a subject or its related subject at secondary and tertiary levels.

Majority of pupils in the junior high school find specific topics in integrated science difficult to study and often fail to perform well in its examination. Basic science education has long been a problem to many developing countries.

However, the study of science at the basic level of education is compulsory regardless of gender, social backgrounds, aspirations or interest. Therefore, any child at the basic level of education must have equal opportunity to learn science. As mentioned earlier, in Ghana, there is no equality and equity in the teaching and learning of science among pupils. The

University of Education, Winneba http://ir.uew.edu.gh

Wamfie District equally shares in this challenge to teaching and learning of science. It must be noted that, each child comes to the science class with a unique set of characteristics

With the advancement in science and technology efforts must be made to provide the means that would make the teaching and learning of integrated science at the basic level very effective. This conviction has compelled most educationists particularly those whose responsibility is to plan the country's educational system and teachers' of science to adopt pragmatic approach in finding ways to improve the development of our socio-economic life.

These pragmatic approaches include the different teaching methods or instructional approaches to enhance the teaching and learning processes.

It is against this background that this research is undertaken to find out whether the use of co-operative method can have influence on the teaching and learning of integrated science at J.H.S.

1.2 Statement of the problem

Integrated science is a compulsory subject at the basic level. Good grade is required for further studies in almost every science discipline after completing the Junior High School.

It is very unfortunate that only few pupils excel in the subject during the basic level (JHS) and the reasons behind this is yet to be explained but the fact of the matter is that, teachers have an important role to play to arrest this situation .

This researcher, a teacher at Asuotiano JHS at Dormaa East District noticed that whenever pupils were given problems in integrated science, they scored low marks. The pupils'

University of Education, Winneba http://ir.uew.edu.gh

inability to solve the scientific problems meant that they did not understand the science concepts. It is against this background that the study is been conducted to ascertain the real causes of the problem and how best the problem could be solved.

1.3 Purpose of the study

The main purpose of this study was to employ the use of co-operative learning approach to enhance pupils understanding of some selected topics in integrated science at Asuotiano Presbyterian Junior high school.

Specifically the research sought to:

I. Find out effect of teacher centered instruction on the academic achievement of basic science pupils.
II. Explore the understanding of learner centered (cooperative approach) instruction on academic achievement on basic science concepts.
III. What are the conception held by junior high school pupils about some concepts in integrated science such as ;carbon cycle, forces and mixtures.

1.4 Significance of the study

It is hoped that the findings of this study would be useful to all teachers of science and textbook writers to employ the right instructional methodologies in their presentation and treatment of some scientific concept in the teaching and learning of integrated science.

University of Education, Winneba http://ir.uew.edu.gh

The study would be significant to other researchers because it will serve as a documentary reference for future research work.

Finally this research would be beneficial to stakeholders and educational policy makers because it will provide valuable information that will direct policy, planning and implementation in science educational studies in Asuotiano in the Dormaa East District.

1.5 Research Objectives

The objectives of the research are:

i. Ascertain the effect of a learner centered instruction (co-operative approach) on the academic achievement of basic science studies.
ii. Raise the level of pupils' performance in integrated science using cooperative learning instruction.
iii. To find out the pupils attitudes towards the learning of integrated science.

1.6 Research Questions

Three research questions were formulated to direct investigations in this study.

1. What is the effect of a learner centered instruction (cooperative approach) on the academic achievement of basic science studies?
2. How can cooperative learning instruction be used to enhance the understanding of pupils on some specific topics in integrated science, such as carbon cycle, force and mixtures?
3. What are pupils attitude toward science lessons?

University of Education, Winneba http://ir.uew.edu.gh

1.7 Formulation of Null Hypotheses

Based on the research questions, the following hypothesis were formulated for testing at 0.05 significance level.

Ho_1. There is no significant difference on the academic achievement of basic science pupils exposed the learner-centred instruction (cooperative approach).

Ho_2.There is no significant difference in pupils' attitude towards science lesson after being exposed to learner-centred instruction (cooperative approach).

1.8 Delimitations of the Study

The study was conducted at Asuotiano Presbyterian Junior High School, a rural community in the Dormaa East District of the Brong Ahafo Region. Focus was placed on integrated science teachers and pupils of the school. The scope of the study was restricted to J.H.S two (2) pupils of the said school. This implies that the findings of this research cannot be said to be the general representation of all pupils in the school. The content scope was to establish the effect of co-operative instructional approach on pupils understanding of some selected topics in integrated science, such as carbon cycle, mixtures, force.

University of Education, Winneba http://ir.uew.edu.gh

1.9 Limitations of the Study

Some weak points that might have affected the findings of this research are that some pupils were truant and so were not in school throughout the period. This affected collection of data as well as the results and the analysis of the study

Findings are limited to the data collected through data collection tool.

1.10 Organization of the Study

This study is presented in five chapters. The first chapter deals with the background to the study, statement of the problem, purpose of the study, research questions, educational significance of the study, delimitation of the study, limitation of the study, definition of terms and organization of the study. In Chapter Two, literature that is relevant to the research was reviewed. Chapter Three discusses the research design, population and sample and the sampling procedures, the research instrument for collecting the data, the method of data collection and data analysis.

Chapter Four dealt with the presentation of the results. Chapter Five discusses results of the study, showing a comprehensive analysis of findings and also looks at suggestions, recommendations and conclusions.

University of Education, Winneba http://ir.uew.edu.gh

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

The purpose of the literature review is to provide clarification and further exploration of cooperative learning for this study through an overview of the key understandings of this concept as an instructional strategy.

In addition, this review presents the connection of cooperative learning to some selected topics in integrated science, the conceptual framework for cooperative learning.

For the purpose of this study, the review is organized under the following subheadings:

1. Lecture method (teacher centered approach)
2. Cooperative method (student centered approach)
3. The role of the teacher in the cooperative method of teaching
4. The role of the pupils in the cooperative method of teaching and learning
5. Educational implication of cooperative method

2.1.0 Instructional Approaches

There are many teaching method in education that enhance the learning process of the pupils. To achieve the goal of teaching, the teacher must adopt effective teaching methods in education. Writing lesson plan is a foremost thing that a teacher must do before executing any teaching strategy in the class. The teaching method should be adopted on the basis of certain criteria like the knowledge of the pupils, the environment and the set of learning goals decided in the academic curriculum, the size of the class and the type of material land skills.

University of Education, Winneba http://ir.uew.edu.gh

Teaching methods may be defined simply as a way of carry out actual teaching in the 'classroom'. They are the means by which the teacher attempts to impart the desired learning or experience. The concern is with the way the teacher organized and uses teaching techniques or skills, subject matter, teaching aids, or resources to meet teaching objectives

Again, a teaching method is the way and manner by which the teacher presents lessons to enable learners acquire knowledge, skills and attitudes (Bell, Bush & Fox, 1998).

A number of instructional methods may be used for teaching a course. Among these are: the formal lecture, small group work by pupils, discussions, questioning sessions, the case method, laboratory sessions, demonstrations, and one-on-one mentoring .

One sure approach is the use of the child centered approach to teaching and learning of the subject .This is where the child is placed at the centre of the learning process. This approach includes activity method, discussion method, role play and field trip.

The effective teachers use a diversity of methods and approaches to assist their pupils in the learning process.

2.1.1 The lecture method (teacher centered approach)

The tradition method: Traditional teaching is concerned with the teacher being the controller of the learning environment. In these traditional teaching methods, the teacher transmits the information and the pupils have been the passive recipient of information,Power and responsibility are held by the teacher and they play the role of instructor (in the form of lectures) and decision maker (in regards to curriculum content and specific outcomes).

University of Education, Winneba http://ir.uew.edu.gh

They regard pupils as having 'knowledge holes' that need to be filled with information. In short, the traditional teacher views that it is the teacher that causes learning to occur (Novak, 1998). Learning is associated within the classroom and is often competitive. The lesson's content and delivery are considered to be most important and pupils master knowledge through drill and practice (such as rote learning). Content need not be learned in context. (Theroux 2002, Johnson &Johnson 1991) .The most common seating arrangement used by the traditionalists is rows.

2.1 .2 Student centered approaches

The teaching role in a student-centered learning environment is, at most, one of facilitator and guide. Learning may be independent, collaborative, cooperative and competitive. The utilization and processing of information is more important than the basic content. Learning takes place in relative contexts and pupils are engaged in constructing their own knowledge (Theroux, 2002). The teacher that utilizes this method effectively is constantly on the move. They may be engaged with the pupils as a classroom collective, individually or in groups. Their involvement would include questioning, disciplining, guiding, validating, monitoring, motivating, encouraging, suggesting, modeling and clarifying (McKenzie, 2002).

2.2 The Conceptual Framework of Cooperative Learning

Cooperative learning is based on a variety of theories in anthropology (Mead, 1940), sociology (Coleman, 1961), economics (Von Mises, 1949), political science (Smith, 1959), cooperative learning has its roots in social interdependence (Deutsch, 1949, 1962; Johnson & Johnson, 1989), cognitive-developmental (Johnson & Johnson, 1999; Piaget, 1950; Vygotsky, 1978), and behavioral learning theories (Bandura, 1977; Skinner, 1968).

University of Education, Winneba http://ir.uew.edu.gh

Cooperative learning is framed in the theory of social independence, grounded in the work of Koffka, Lewin, and Deutsch (Johnson, Johnson, and Smith, 1998).

2.2.1 The cognitive-developmental theory

Johnson (1998) outline the cognitive developmental perspective is grounded in the work in the work of Jean Piaget and Lev Vygotsky. Piagetian perspective suggests that when individuals work together, sociocognitive conflict occurs and create cognitive disequilibrium that stimulates perspective taking ability and reasoning.Vygotsky's theories present knowledge as societal product.

It is a supporting theoretical influence on the development of cooperative learning. The cognitive-developmental perspective provides the intrinsic motivation in cooperative learning environments in relation to resource and role interdependence, Piaget (1954). According to Piaget (1969), formal instruction by expert adults is less effective as a cognitive development stimulus than is peer-mediated instruction. Specifically children's abilities to organize patterns of behavior and thought as they formulate and interact with their environment, parents, teachers, and peer groups develop more quickly when children interact with one another than when they interact with adults (Biehler & Snowman, 1997).

Cooperation as striving to attain common goals while developing one's own feelings and perspective with a consciousness of others feelings and perspectives, Johnson & Johnson, (1999). Cooperative learning in the Piagetian tradition is aimed at increasing the student's intellectual development by requiring pupils to reach consensus with others who hold opposing viewpoints of the assigned task. Each student serves as a resource for other pupils and plays a vital role in the others gain of knowledge while working toward consensus.

University of Education, Winneba http://ir.uew.edu.gh

Developed by Piaget (1954), which emphasized that learning is based on intrinsic motivation and is constructed by the student.

Vygotsky (1962), who provided an alternate perspective on cognitive learning theory from the Gestalt School of Psychology, stated that learning and thinking involve the participation of the learner. The learner constructs knowledge through interaction with others, the learning environment and experience. Learning is student-centered and facilitated by the instructor rather than dictated, Vygotsky (1962) established.

The cognitive-developmental perspective focuses on what happens within the individual (Johnson & Johnson, 1999). At knowledge is socially constructed from cooperative efforts to learn, understand, and solve problems. Vygotsky (1978) stated that the elaboration process by the student helps the student retain the information being explained. Cooperative learning is an instructional model that draws extensively on the contributions of multiple theorists.

Vygotsky,a Russian psychologist, has critically analyzed the condition of effective instruction. According to Vygotsky (1986), well designed instruction is like a magnet that if aimed slightly ahead of what children know and can do at the present time, it will pull them along; helping them master things they cannot learn on their own. Vygotsky emphasizes that children learn more from instructional interactions with those who are more intellectually advanced. Although this approach might seem to favor a high degree of direct instruction from the "expert" educator, Vygotsky's theory is supportive of many aspects of cooperative learning, specifically the use of challenging assignments, peer modeling, positive reinforcement, frequent feedback, and strategies for helping pupils organize and understand ideas (Biehler & Snowman, 1997).

University of Education, Winneba http://ir.uew.edu.gh

2.2.2 Behavioral theory

The second supporting theory, the behavioral learning theory, provides structure and order to the classroom through extrinsic motivation and is grounded in the stimulus-response work of Bandura (1977) and Skinner (1971). Skinner (1971) defined learning as a relatively permanent change in behavior in response to stimuli.

Behaviorists focus on measuring learning through observable effects, such as written evaluations or performance checklists (Blanchard & Thacker, 1999). Defining the concept in terms of how it is measured. Behaviorists, in particular, have adopted this method of assigning a definition relative to permanent changes in behavior. Behaviorists suggested that the environment, the stimulus/response approach, controls learning. The instructor controls learning by controlling the stimuli. The learner is dependent on the instructor to determine the correct associations between the stimulus and response. In the cooperative learning classroom, the behavioral perspective assumes that pupils will work hard on a task to secure a reward, providing incentive and motivation for pupils to participate in a group effort. Behavioral learning theory assumes that cooperative efforts are generated by extrinsic motivation to achieve rewards.

2.2.3 Social interdependence

Assumes that cooperative efforts are based on intrinsic motivation to work together to achieve a common goal through positive interaction.

Social interdependence specifies the conditions under which cooperation is most effective, the outcomes most affected by cooperation, and the most effective procedures for implementing cooperative learning. The social interdependence theory is relevant when each

University of Education, Winneba http://ir.uew.edu.gh

individual's goals are accomplished under the influence of the actions of others (Johnson, 2005).

This perspective holds that pupils help each other learn because they care about the group and its members, and come to derive self-identity benefits from group membership (Slavin, 2011).

A strong relationship has been found between cooperative learning and the social interdependence theory (Johnson, 2005). Levin (1948) proposes that states of tension motivate a person's behavior and as desired goals are perceived, actions are motivated by this tension to achieve the desired goals. In cooperative situations, as argued by Deutsch (1949), the psychological processes associate with substitutability (the degree to which actions of one person substitutes for the actions of another person), inducibility (the openness to being influenced and to influencing others), and positive cathexis (the investment of psychological energy in objects outside of oneself, such as friends, family, and work) (Johnson, 2005, p.366).

The basic premise of the social interdependence theory is that the way in which goals are structured determines how individuals interact, and interaction patterns create outcomes (Deutsch, 1949).

Positive interdependence may result in promotive interaction, negative interdependence may result in oppositional interaction, and no interdependence may result in no interaction (Johnson, 2008).

University of Education, Winneba http://ir.uew.edu.gh

2.2.4 Constructivist learning theory

Cooperative learning is a student-centered learning method; therefore, it ties outcomes with the constructivist learning theory in which "learners are in control of constructing their own meaning in an active way" (Almala, 2005, p.10). To date, the constructivist theory has made a significant contribution to the student-centered learning approach (Yager,1991; Lueddeke, 1999). This theory incorporates notions from the works of Piaget (1926), Vygotsky (1978) and Bandura (1977). Originating from philosophy, constructivist theory is effectively used in several areas such as sociology, anthropology and cognitive and educational psychology (Bruner, 1966).

In the 18th century, Giambattista Vico, an Italian philosopher of the constructivist learning theory, defined knowledge as a "cognitive structure of a person so that to know something is to know how to create" (Glaserfeld, 1989). Vico argues that a person knows something clearly only when he or she can explain it (Yager, 2000). To clarify this notion, Immanuel Kant (Yager, 1991) highlights that learners cannot be persons who receive information passively. Dewey (1972) also sees education as a process of restructuring knowledge by reflecting thoughts through the growth of current knowledge of learners. He believes that knowledge is not achieved or granted by learners, but constructed through their interaction with the environment, to create their own meaningful knowledge. Learning is a social process in which knowledge is constructed by learners in a social context and then they appropriate it (Brooks, 1999).

Therefore, one of the expectations for pupils involved in the treatment group in this study is that they are encouraged to play the role of active constructors of knowledge, and they may

University of Education, Winneba http://ir.uew.edu.gh

learn more when they are in control of constructing their own meaningful knowledge through reciprocal interaction among pupils on interactive learning tasks.

Constructivist proponents believe that "learners are active organisms seeking meaning" (Driscoll, 2000, p.376). If the traditional perspective of education views learning as the process of direct provision of knowledge from teachers to pupils, the constructivist perspective views learning as a process in which pupils are active in constructing their knowledge (Huang, 2006). In the process of learning, pupils actively develop and enlarge their knowledge through observation, reflection, experimentation, discovery and especially, social interaction (Brooks, 1999).

In the constructivist learning environment, pupils must be active, social and creative persons (Phillips, 1995) because they are considered constructors of knowledge, not passive receivers of knowledge (Glaserfeld, 1989).

Almala (2005) proposes that pupils are enabled to "use knowledge in many different settings to make the learning itself as real-life as possible*"* (p.10)

In addition, teachers are encouraged to play the role of facilitators of student learning in the constructivist learning environment rather than dispensers of knowledge as in the traditional learning environment (Almala, 2005).

Accordingly, teachers as facilitators are essential to the success of pupils in the process of learning because "constructivist lessons are typically more student-centered than traditional lessons" (Mibrandt, Felts, Richards & Abghari, 2004, p.24).

Marlow & Page (2005, p.7) contrast constructivist learning with traditional learning in four basic ways:

1. "Constructivist learning is constructing knowledge, not receiving knowledge";

University of Education, Winneba http://ir.uew.edu.gh

2. "Constructivist learning is understanding and applying, not retention";
3. "Constructivist learning is thinking and analyzing, not accumulating and memorizing";
4. "Constructivist learning is dynamic, not passive" (p.7).

The effectiveness of traditional education is that pupils can receive a large amount of information from their teachers in a short time, but the rapid speed of distribution does not ensure an in-depth understanding for the receivers (Marlow & Page, 2005).

From the constructivist notion, Bruner (1966) identifies the four key features of a theory of instruction as follows:

1. The experiences which most effectively implant in the individual a predisposition toward learning – learning in general or a particular type of learning.
2. The ways in which a body of knowledge should be structured so that it can be most readily grasped by the learner.
3. The most effective sequences in which to present the materials to be learned.
4. The nature and pacing of rewards and punishment in the process of learning and teaching; (Bruner, 1966, p.40-41).

Together with constructivist learning, these four features of instruction are consistent with the cooperative learning principles. Constructivist learning theory focuses on how learners learn, not on what they learn; therefore, it can be applied to the practice of cooperative learning (Almala, 2005; Dat-Tran, 2007). If learning materials are well designed, this learning theory will offer "the necessary theoretical support" for applying cooperative learning in the class effectively (Mibrandt, 2004, p.24). Therefore, learners in cooperative

University of Education, Winneba http://ir.uew.edu.gh

learning groups are expected to learn more when they are in charge of constructing their own knowledge through reciprocal interaction with their group members.

2.3 Co-operative instructional approaches

Over the past twenty years different approaches to cooperative learning have been proposed by different individuals. The three most popular are those of David Johnson and Roger Johnson (Johnson et al, 1994). Robert Slavin (1994, 1995), and Shlomo Sharan and Yael Sharan (Sharan, 1995; Sharan & Sharan, 1994).

The way we teach and learn in modern educational environments has been transformed through the advent of cooperative learning (Johnson, 2009). Different researchers have different definitions of cooperative learning.

Johnson (1990) defines cooperative learning as *"*the instructional use of small groups so that student's work together to maximize their own and one another's learning" (p.69).

Also Sharan (1994) defines it as "a group-centered and student-centered approach to classroom teaching and learning" (p.336),

Slavin (2011) refers to cooperative learning as "instructional methods in which teachers organize pupils into small groups, which then work together to help one another learn academic content" (p.344).

Although researchers have not used the same official definition of this term, all of them refer to cooperative learning as a "set of methods in which pupils work together in small groups and help one another to achieve learning objectives" (Johnson & Johnson, 2009, p.69).

Cooperative learning is an approach to group work that minimizes the occurrence of those unpleasant situations and maximizes the learning and satisfaction that result from working on

University of Education, Winneba http://ir.uew.edu.gh

a high-performance team. Relative to pupils taught traditionally, with instructor-centered lectures, individual assignments, and competitive grading, cooperatively taught pupils tend to exhibit higher academic achievement, greater persistence through graduation, better high-level reasoning and critical thinking skills, deeper understanding of learned material, greater time on task and less disruptive behavior in class, lower levels of anxiety and stress, greater intrinsic motivation to learn and achieve, greater ability to view situations from others' perspectives, more positive and supportive relationships with peers, more positive attitudes toward subject areas, and higher self-esteem.

Cooperative learning is the pedagogy within which pupils are active constructors of knowledge in the learning process instead of passive receivers of any given knowledge (Liang, 2002).

There are three main types of cooperative learning groups, namely informal cooperative learning groups, formal cooperative learning groups, and cooperative based groups (Johnson & Johnson, 2008).

Cooperative learning is distinguished from other small group learning strategies by five elements required for effectiveness: positive interdependence, individual accountability, Promotive interaction, group processing, and team or social skills. Johnson and Johnson (1994)

2.3.1 Elements of cooperative learning

Johnson & Johnson model, cooperative learning is instruction that involves pupils working in teams to accomplish a common goal, under conditions that include the following elements:

University of Education, Winneba http://ir.uew.edu.gh

1. Positive interdependence. As Johnson, Johnson & Holubec (1993) point out," people must be taught in groups. Leadership, decision-making, trust-building, communication and conflict-management skills have to be taught just as purposefully and precisely as academic skills"(p.10). A specific goal, such as a grade or a certificate of recognition is identified for the group to attain. Team members are obliged to rely on one another to achieve the goal. If any team members fail to do their part, everyone suffers consequences.
2. Individual accountability. This feature stipulates that each member of a group has to make a significant contribution to achieving the group's goal. All pupils in a group are held accountable for doing their share of the work and for mastery of all of the material to be learned. (Holubec, 1993,p.10)
3. Face-to-face promotive interaction. Although some of the group work may be parceled out and done individually, some must be done interactively, with group members providing one another with exchanges of information and material, temporary assistance, challenging of each other's reasoning, feedback, and encouragement to keep one another highly motivated, encouraging one another and perhaps most importantly, peer tutoring. This element is made necessary by the existence of positive interdependence, (Holubec,1993,p.10).
4. Appropriate use of collaborative skills. Pupils are encouraged and helped to develop and practice trust-building, leadership, decision-making, communication, and conflict management skills. (Johnson, Johnson & Holubec (1993)

University of Education, Winneba http://ir.uew.edu.gh

5. Group processing. Team members set group goals, periodically assess what they are doing well as a team, and identify changes they will make to function more effectively in the future.(Johnson andJohnson,2005)

2.3.2 Functions of the teacher in formal cooperative method of teaching and learning (Johnson, D.W. and Johnson F. (2009).

1. Making pre-instructional decisions; In co-operative learning teachers formulate both academic and social skills objectives, decide on the sizing of groups, choose which roles to assign group members, arrange classroom and arrange the materials pupils need to complete the assignment ,by assigning pupils roles an interdependence is established. The way in which materials are distributed can create resource interdependence, arrangement of classroom can create environmental interdependence and provide the teacher with easy access to observe each group which increases individual accountability and provide data for group processing.

2. Explaining the instructional task and cooperative structures .Teachers explain academic assignment to pupils, criteria for success ,structure positive interdependence and structure individual accountability. He/she further emphasizes intergroup cooperation and the behavior pupils are expected to use. Teachers may also teach the concepts and strategies required to complete the assignment.

University of Education, Winneba http://ir.uew.edu.gh

3. Monitoring pupils learning and intervening to provide assistance in completing the task successfully or using the targeted interpersonal and group skills effectively. While conducting the lesson, the teachers monitor each learning group and intervene when needed to improve task work and teamwork. Monitoring the learning groups creates individual accountability; teachers collect specific data on promotive interaction, the use of targeted social skills, and the engagement in the desired interaction pattern. This data is used to intervene in groups and to guide group processing, (Johnson, D.W. and Johnson F. (2009).

4. Assessing pupils learning and helping pupils process how well their groups functioned. Teachers assess and evaluate the quality and quantity of student achievement, ensure pupils carefully discuss how effectively they worked together, that is processing the effectiveness of their learning groups, have pupils make a plan for improvement, and have pupils celebrate the hard work of group (Johnson, D.W.,2003.p931-945)

2.3.3 The role of the learner in cooperative method

Possible Discussion Roles, (Hill & Hill, 1990; Johnson, Johnson, & Holubec, 1993).

1. **Facilitator/Encourager**: This student gets discussion moving and keeps it moving, often by asking the other group members questions, sometimes about what they've just been saying.

University of Education, Winneba http://ir.uew.edu.gh

2. **Timekeeper**: Someone needs to make sure that the group stays on track and gets through a reasonable amount of material in the given time period.
3. **Summarizer**: Every so often (perhaps once per question for a list of questions, or at the end for one question), this student provides a summary of the discussion for other pupils to approve or amend.
4. **Reflector**: This student will listen to what others say and explain it back in his or her own words, asking the original speaker if the interpretation is correct.
5. **Elaborator**: This person seeks connections between the current discussion and past topics or overall course themes

2.3.3 Informal Cooperative Learning:

Informal cooperative learning consists of having pupils work together to achieve a joint learning goal in temporary, ad-hoc groups that last from a few minutes to one class period (Johnson, Johnson, and Holubec, 2008).

Informal cooperative learning can be used to focus student attention on the material to be learned, help set expectations as to what will be covered in a class session, ensure that pupils cognitively process and rehearse the material being taught.

The teacher's role for using informal cooperative learning is to keep pupils more actively engaged intellectually and interspersing pair discussions throughout the lesson.

The teacher also makes the task and the instructions explicit and precise and requires the various groups to produce specific product.

University of Education, Winneba http://ir.uew.edu.gh

The procedure is as follows.

1. Introductory Focused Discussion: Teachers assign pupils to pairs or triads and explain the task of answering the questions in a four to five minute time period, the positive goal interdependence of reaching consensus. The discussion task is aimed at promoting advance organizing of what the pupils know about the topic to be presented and establishing expectations about what the lecture will cover. Individual accountability is ensured by the small size of the group (Johnson, Johnson and Holubec, 2008).

2. Intermittent Focused Discussions: Teachers divide the lecture into 10 to 15 minute segments. This is about the length of time a motivated adult can concentrate on information being presented. After each segment, pupils are asked to turn to the person next to them and work cooperatively in answering a question (specific enough so that pupils can answer it in about three minutes) that requires pupils to cognitively process the material just presented (Johnson, D.W. and Johnson F. (2009).

The procedure is:

I. Each student formulates his or her answer.

II. Pupils share their answer with their partner.

III. Pupils listen carefully to their partner's answer.

The pairs create a new answer that is superior to each member's initial formulation by integrating the two answers, building on each other's thoughts, and synthesizing.

University of Education, Winneba http://ir.uew.edu.gh

Teachers should ensure that pupils are seeking to reach an agreement on the answers to the questions (i.e., ensure positive goal interdependence is established), not just share their ideas with each other. Randomly choose two or three pupils to give 30 second summaries of their discussions. Such individual accountability ensures that the pairs take the tasks seriously and check each other to ensure that both are prepared to answer. Periodically, the teacher should structure a discussion of how effectively the pairs are working together (i.e., group processing). Group celebrations add reward interdependence to the pairs.

3. Closure Focused Discussion: Teachers give pupils an ending discussion task lasting four to five minutes. The task requires pupils to summarize what they have learned from the lecture and integrate it into existing conceptual frameworks. The task may also point pupils toward what the homework will cover or what will be presented in the next class session. This provides closure to the lecture.

Informal cooperative learning ensures pupils are actively involved in understanding what is being presented. It also provides time for teachers to move around the class listening to what pupils are saying. Listening to student discussions can give instructors direction and insight into how well pupils understand the concepts and material being as well as increase the individual accountability of participating in the discussions.

2.3.4 Cooperative Base Groups

Cooperative base groups are long-term, heterogeneous cooperative learning groups with stable membership (Johnson, Johnson, & Holubec, 2008).

University of Education, Winneba http://ir.uew.edu.gh

Cooperative base group ensures that all its members are making good academic progress (positive goal interdependence), hold each other accountable for striving to learn (individual accountability), and to provide each other with support, encouragement, and assistance in completing assignments (promotive interaction).

Typically, cooperative base groups are heterogeneous in membership (especially in terms of achievement motivation and task orientation. The agenda of the base group can include academic support task, personal support task, routine tasks (such as taking attendance), and assessment task.

2.3.5 Integrated Use of All Three Types of Cooperative Learning

These three types of cooperative learning may be used together (Johnson, Johnson, & Holubec, 2008). A typical class session may begin with a base group meeting, which is followed by a short lecture in which informal cooperative learning is used. The lecture is followed by a formal cooperative learning lesson. Near the end of the class session another short lecture may be delivered with the use of informal cooperative learning. The class ends with a base group meeting.

The teacher's role in using cooperative base groups is to

1. Form heterogeneous groups of four (or three),
2. Schedule a time when they will regularly meet (such as beginning and end of each class session or the beginning and end of each week),
3. Create specific agendas with concrete tasks that provide a routine for base groups to follow when they meet,

University of Education, Winneba http://ir.uew.edu.gh

4. Ensure the five basic elements of effective cooperative groups are implemented.
5. Have pupils periodically process the effectiveness of their base groups.

Permanent cooperative base groups provide the arena in which caring and committed relationships can be created that provide the social support needed to improve attendance, personalize the educational experience, increase achievement, and improve the quality of school life.

2.3.5 Implication of teacher centered and the student centered approach

1. Assessment of student centered learning
    a. One of the most critical differences between student-centered learning and teacher-centered learning is in assessment. In student-centered learning, pupils participate in the evaluation of their learning. This means that pupils are involved in deciding how to demonstrate their learning. Developing assessment that supports learning and motivation is essential to the success of student-centered approaches.
2. In terms of curriculum practice, the student has the choice in what they want to study and how they are going to apply their new knowledge. According to Ernie Stringer, "Student learning processes are greatly enhanced when they participate in deciding how they may demonstrate their competence in a body of knowledge or the performance of skills." This pedagogical implication enables the student to establish his or her unique learning objectives, and mate them to their specific learning biases and needs. This aspect of learning holds the learner accountable for production of

University of Education, Winneba http://ir.uew.edu.gh

knowledge that he or she is capable of producing. In this stage of learning, the teacher evaluates the learner by providing honest and timely feedback on individual progress

3. A further distinction from a teacher-centered classroom to that of a student-centered classroom is when the teacher acts as a facilitator, as opposed to instructor. In essence, the teacher's goal in the learning process is to guide pupils into making new interpretations of the learning material, thereby 'experiencing' content, reaffirming Rogers' notion that "significant learning is acquired through doing".

2.4 A Comparison of Collaborative Learning and Cooperative Learning

Of all the group-based instructional strategies, cooperative learning and collaborative learning are most often compared and often with problematic confusion due to terminology. These two terms are similar from one definitional point of view.

According to Gerlach (1994), a collaborative learning is based on the idea that learning is a naturally social act in which the participants talk among themselves and through the talking that learning occurs. The views of Gerlach is in line with the African ideal of socially-centered human development theory which believed that responsible permanent behaviour is acquired by doing things together (Busia, 1964). Collaborative learning is seen as a technique designed to make learning a lively and successful process.

Both terms relate to sharing- mutual, two-way, supportive, or joint interaction as instructional strategies.

Similarities between cooperative and collaborative learning

1. Stress the importance of active learning.

University of Education, Winneba http://ir.uew.edu.gh

2. The teacher acts as facilitator
3. Teaching and learning are experiences shared by both the student and the teacher.
4. Enhance higher order cognitive skills.
5. Greater emphasis is placed on pupils' responsibility for taking charge of her or his learning.
6. Involve situations where pupils must articulate ideas in small groups.
7. Help pupils develop social and teambuilding skills.
8. Increase student success and information retention.
9. Utilize student diversity

However, there are key differences between the two models;

Collaborative and cooperative learning have been described as lying on a continuum of group-based learning strategies, with collaborative learning being the least structured approach and

Cooperative learning the most structured (Macaulay & Gonzales, 1996; Millis, 1998).

In the cooperative classroom, pupils jointly construct knowledge, reinforcing resource and role interdependency.

The behavioral perspective provides the structure for group work, in that it must be reward and task oriented, providing extrinsic motivation for learning (Johnson, Johnson, & Smith, 1998) Cooperative learning is a social process grounded by structured group work, and is concerned with promoting both social and academic outcomes; that is, pupils learn new social skills and how to work together in order to achieve academic goals. These goals are

University of Education, Winneba http://ir.uew.edu.gh

realized through the imposition of structure and control by the teacher. The teacher holds pupils accountable for learning, collectively. In doing so, the teacher acts like a manager or director who uses instructional strategies to engender social skills, positive interdependence, cooperation, and accountability (Brody, 1995).

In contrast, collaborative learning embodies free thinking and even dissent. Its end goal is to create new knowledge. In essence it is unstructured. In fact, "The goal of the collaborative learning process is to have group members think about and solve abstract problems, problems that may have no specific answers, or multiple solutions. As well, there is no commitment to group members that each will learn and be successful as a result of the process. Collaborative learning is, fundamentally, an intellectual process within a laissez-faire social framework" (Olivares, 2005).

Collaborative learning is connected to the social constructionist's view that knowledge is a social construct.

Cooperative learning is usually more structurally defined than collaborative learning (Cooper and Robinson, 1997; Smith and Macgregor, 1992; Rockwood, 1995, 1995).

Cooperative learning can be used in for any type of assignment that can be given to pupils in lecture, classes, laboratories, or project-based courses.

University of Education, Winneba http://ir.uew.edu.gh

2.4.1 Cooperative Learning Structures (Simon, 1997)

Learning structures and techniques are available for almost any learning situation. Once the objective of the lesson has been determined, the instructor can select a structure that will provide the optimal learning experience for the student.

Educational Leadership provides an excellent overview of various cooperative learning Structures, which involve:

1. If the objective of the lesson is getting to know each other then team building is a technique that can be used. Which including Class building, and Communication Building, team building has three structures: Round robin, Corners, and Match Mine.
2. If the objective of the lesson is focused on mastery of information, then one of the mastery structures would be an excellent choice. These structures include Color-Coded Co-op Cards, Pairs Check, and Numbered Heads Together.
3. When a lesson emphasizes understanding concepts, then a concept development structure Should be used. (Three-step Interview, Think-Pair- Share, and Team Word-Webbing.)
4. Multifunctional structures are used for pupils getting to know each other better, mastering information, and understanding concepts. (Roundtable, Inside-Outside Circle, Partners, Jigsaw)

University of Education, Winneba http://ir.uew.edu.gh

2.4.2 A description of some of the most commonly used structures (Roger T.Johnson & David W.Johnson, 1994).

Team Line Up: Participants line up according to some pre-established criteria. For example, by birth date (month and year). Lineups can be used to make small groups and can be used to promote communication and develop concepts.

Round Robin: This structure is designed to give everyone in the group an equal chance at participation. Starting with one participant, each person gets 1- 3 minutes going clockwise or counterclockwise, to present their point of view. This structure can be used as a warm up, evaluation, or to share something learned or a point of view.

Circle the Sage: This structure is a great way to address group questions. The steps are:

i. A question is posed by facilitator or participants
ii. The facilitator asks for 3 - 4 sages who feel they could answer the question. They do not need to be experts, just have information to share.
iii. The sages move to different locations in the room. Participants divide themselves equally around different sages.
iv. Sages answer the questions.
v. Participants thank sage for sharing knowledge and return to teams.
vi. Participants share learning with team.

Group Discussion: This is the simplest of all cooperative learning structures. At various times during a presentation, ask the participants to discuss the topic with someone sitting near them. It's a two step process talk it over and share your ideas.

Three Step Interview: This is a simple concept development structure. It works best in groups of four but can be adapted for larger groups. First, in the groups, participants pair up.

University of Education, Winneba http://ir.uew.edu.gh

One interviews the other with a question .Then they reverse roles, finally, all four group members share what they have learned.

Think-Pair-Share: This strategy is designed to encourage student involvement. First, participants listen to the teacher's question. Then they think of a response. They pair up with someone and discuss their responses. Finally, they are asked to share their responses with the whole group. Usually a time limit is set for each step.

Jigsaw II: This strategy is used with narrative material. Each team member (or "expert") is responsible for learning a specific part of the assigned topic. Members go and talk with "experts" of other groups with the same topic. After meeting with members of other groups, the "experts" return to their own groups and present their findings. Team members are then quizzed on all topics (Roger T.Johnson & David W.Johnson, 1994).

2.5 The educational implication of cooperative learning

1. Motivational Effect

Cooperative-learning methods have proven effective in increasing motivation for learning and self-esteem, redirecting attributions for success and failure, fostering positive feelings toward classmates, and increasing performance on tests of comprehension, reasoning, and problem solving (Johnson & Johnson, 1995; Johnson et al., 1995; Slavin, 1995).

The various features of cooperative learning, particularly positive interdependence, are highly motivating because they encourage such achievement-oriented behaviors as trying hard, attending class regularly, praising the efforts of others, and receiving help from one's

University of Education, Winneba http://ir.uew.edu.gh

group mates Learning is seen as an obligation and a valued activity because the group's success is based on it and one's group mates will reward it.

2. Cognitive Development Effect

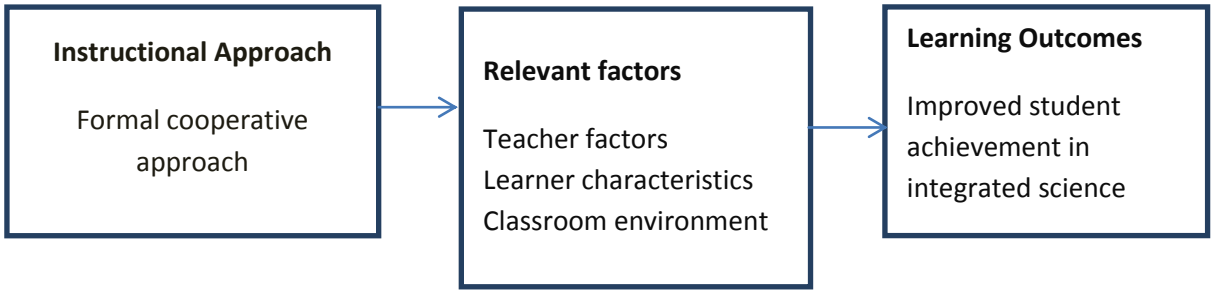
According to Lev Vygotsky, collaboration promotes cognitive growth because student's model for each other more advanced ways of thinking than any would demonstrate individually. According to Jean Piaget, collaboration among peers hastens the decline of egocentrism and allows the development of more advanced ways of understanding and dealing with the world.

New information that is elaborated (restructured and related to existing knowledge) is more easily retrieved from memory than is information that is not elaborated.

2.6 Conceptual framework

The formal cooperative approach framework is adopted for the study. This conceptual framework is illustrated in figure 1 and explained further.

Figure 1: Conceptual Framework for Using the formal cooperative approach to teach integrated science



Adopted from Wambugu, Changeiywo & Ndiritu (2013)

University of Education, Winneba http://ir.uew.edu.gh

The conceptual framework above illustrates the results of using the cooperative approach for teaching integrated science. Under the right circumstances, the teaching method would affect pupils' achievement in integrated science. The teacher characteristics here refer to the qualification and experience of the teacher. These are important because teacher characteristics may influence the effective use of the cooperative formal approach.

Learner characteristics also refer to the demographic information of the learners. The formal cooperative approach adopted should be appropriate for the age of the pupils and the group size must also be commensurate with the class behaviour of the pupils. This would ensure that groups are not too large and cumbersome to control.

The classroom environment is another very relevant factor. The classroom condition has to be favourable and at least allow room for reasonable cooperation within group members without unnecessarily disturbing work in other groups. This ensures that all pupils participate in the cooperative approach for maximum impact.

Felder and Brent (2012) observes that when instructors adopt the cooperative approach, pupils tend to exhibit higher academic achievement, greater persistence through graduation, better high-level reasoning and critical thinking skills, deeper understanding of learned material, greater time on task and less disruptive behavior in class, lower levels of anxiety and stress, greater intrinsic motivation to learn and achieve, greater ability to view situations from others' perspectives, more positive and supportive relationships with peers, more positive attitudes toward subject areas, and higher self-esteem. Another nontrivial benefit for instructors is that when assignments are done cooperatively, the number of papers to grade

University of Education, Winneba http://ir.uew.edu.gh

decreases by a factor of three or four while still ensuring productivity (Hinde & Kovac, 2001).

2.7 Summary

The majority of the material consulted revealed that student-centered strategies are key to unlocking student's potentials. This is because, pupils receive hands on experience. Student-centered learning enables pupils to interrupt more with their lecturers as well as their peers.

Cooperative learning has theoretical grounding in various theories of psychology. The idea is that man is a social being as such various form of social interaction is essential for human societal survival. Within the classroom the concept of cooperation can be promoted since individuals will be learning to work together for the overall benefit of the group. The studies indicate that cooperative learning is a very useful and beneficial strategy.

University of Education, Winneba http://ir.uew.edu.gh

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

This chapter comprises of the research design, the population, sample and sampling techniques, research instrument, reliability of instrument, validation of instrument, data collection procedure and data analysis procedure

3.1 Research Design

The design of a study is the basic plan for a piece of empirical research (Johnson & Christensen, 2008). Among the ideas that are included in a redesign are the strategy, who and what will be studied, and the tools and procedures to be used for collection and analyzing empirical materials (Punch, 2006).

The research design for the study was made up of four phases. The first phase addresses the design of the instruments. In implementing the first phase, a questionnaire and two sets of test items were constructed for the pupils and the teachers. The tests were piloted tested and the feedback obtained from the pilot test was used to refine the test items.

The second phase of the study was the administration of the pre-test based on student's knowledge on some selected topics in integrated science which included; the carbon cycle, forces and mixtures and the marking of the tests.

The third phase was the implementation of the intervention. The intervention took a form of cooperative instructional approach.

University of Education, Winneba http://ir.uew.edu.gh

The study specifically looked at achievement and interest in science learning by J.H.S two pupils through cooperative learning approach in the teaching and learning process

The fourth phase of the study was posttest activities. This included the administration of the posttest after its administration the tests were collected and marked.

The final phase of the study involved the data analysis.

3.2 Population

Johnson and Christensen (2008) define a population as the set of all elements .Population is a large well-defined collection of individuals or objects having similar characteristics (Castillo, 2009). As at August 2013, the total population of pupils in the Asuotiano Presby Junior High School was two hundred and twenty (220) with twelve (12) teachers.

The sample frame was J.H.S two (2) pupils of the school forming a population size of seventy-seven (77) including integrated science teachers in the school.

3.3 Sample and sampling procedure

A sample is a set of elements taken from a larger population according to certain rules (Johnson &Christensen, 2008) In other words; it is a proportion of the population selected for observation and analysis.

According to Johnson and Christensen (2008), sampling is the process of drawing a sample from a population. Technically sampling can also be defined as the process by which inference is made to population characteristics by examining sampling characteristics.

University of Education, Winneba http://ir.uew.edu.gh

Purposive sampling technique was employed in this study. Purposive sampling represents a group of different non-probability sampling techniques and it relies on the judgment of the researcher when it comes to selecting the units' examples include (people, cases/organizations, events and pieces of data).

Purposive sampling was used because it has a wide range of sampling technique that can be used across such qualitative research designs. It also has advantage of providing the researcher with the justifications to make generalizations from the sample that is being studied, whether such generalization is theoretical, analytic and /or logic in nature. Moreover, only those who are actually affected (suitable people) are used for the study. Those who do not fit the bill were eliminated using the purposive sampling.

The sample size for this study was fifty (50) pupils in form two from Asuotiano Junior High School.

3.4 Research instrumentation

The instruments used to gather data in this research work were questionnaire, interview and pre test and post test (writing test). A questionnaire according to Patton (2002) is a self-report data-collection instrument that each research participant fills out as part of a research study.

Questionnaires were adopted from the studies conducted by Goodrum, Hackling & Rennie (2001), Goodrum & Hackling (2003) and TIMSS (1998) and were modified by the researcher to suit the purpose of this study.

University of Education, Winneba http://ir.uew.edu.gh

Each of the five (5) items on the questionnaire was scored on a five –point likert scale; 1-Strongly disagree, 2-Disagree, 3- Neither Agree nor disagree, 4-Agree, 5-Strongly agree. The likert scale was chosen because, it is easier to create or construct, interpret and also provide the opportunity to compute frequencies and percentages as well as statistics such as the mean and standard deviation of scores (Muijs, 2004). In the development of the questionnaires, particular attention was given to ensure that questions are lucid and relevant.

A Semi structured interview was also developed for this research work. This is to cheek lecturer's views concerning the use of cooperative instructional approach in the teaching and learning process.

Cohen, Swerdlik and Philips (1996) define testing as "the process of measuring variables by means of devices or procedures designed to obtain a sample of behavior" (p.6). Two sets of test items were constructed for this study. These were the Pre test and the Post test. The pre test consisted of fifteen (15) sets of questions on these concepts; carbon cycle, forces and mixtures. The tests items were specifically on these selected topics above. The question items as seen in appendix C was used to gather information about the understanding of pupils on the concept of carbon cycle, forces and mixtures.

The post test also consisted of fifteen (15) items which include; carbon cycle, forces and mixtures. The post test item was similar to the pre test items. The post test items as seen in appendix D were used to find out about the effectiveness of using the cooperative learning approach in the study of these selected topics in integrated science.

University of Education, Winneba http://ir.uew.edu.gh

3.5 Pilot-testing the instrument

An important component in the data collection process it that of the pilot study, which is "… a small-scale trial run of all the procedures planned for use in the main study" (Monette 2002, pg 9).

This enables researcher to seek information from the participant in the pilot study to determine the degree of clarity of questions and to identify problem areas that need attention (Neuman, 1997, Borg & Gall 1979).

This is emphasized by Johnson and Christensen (2008) who state that pilot-testing of instrument can reveal ambiguities, poorly worded questions, questions that are not understood, to check how long it takes participants to complete the test under circumstances similar to those of the actual research study. Johnson and Christensen (2008) add that pilot testing should be conducted with a minimum of five (5) to ten (10) people. The pilot testing of the instrument for this study was conducted using ten (10) J.H.S two pupils of Asuotiano Presbyterian Junior high school. The ten (10) J.H.S two pupils were used for the pilot-testing because they had similar features with the participants of the study. The student for the pilot testing had completed a study in the selected topic which included carbon cycle, forces and mixtures in integrated science through a cooperative learning approach. Through the pilot testing it was revealed that the one hour initially allocated to complete the fifteen item questions each in the pre-test and post-test was not enough to complete the questions. The duration for completing the pre and post-tests was adjusted to one hour 30 minutes for each. The researcher administered the pilot testing herself. Ambiguous and poorly worded questions were refined using the results from the pilot test to ensure reliability.

University of Education, Winneba http://ir.uew.edu.gh

3.6 Reliability of instrument

Reliability refers to the consistency or stability of a set of scores .it is often defined as the degree of stability or consistency of a measure (Acron, Acron & Coups, 2004).That means that the reliability of a score is how much one would generate consistent responses over several trials with different respondents in the same setting or circumstances.

According to Johnson and Christensen (2008), reliability is determined by the methods of repeated forms (test-retest), internal consistency, interscorer and equivalent forms. The internal consistency of the items on the instrument was verified after obtaining the scores from the pilot test by examining the coefficient alpha of the various items in the instrument. Coefficient alpha provides an estimate of the reliability of a homogenous test or an estimate of the reliability of each dimension in a multidimensional test (Acron, 2004)

A Statistical Package for Social Science (SPSS), version 17.0 for windows (SPSS Inc., 2007) computer software was used for the analysis of the items on the instruments. The overall reliability coefficient alpha for test and the questionnaire instrument was found to be 0.70.the results proved that the items in the instruments had a good internal consistency and therefore capable of measuring what they were purported to measure. The reason being that, according to Johnson and Christensen (2008),as a popular rule, the size of coefficient alpha should generally be at a minimum, greater than or equal to 0.70 ($\geq$0.70) for research purposes and somewhat greater than that valve (e.g.$\geq$0.90) for clinical testing purposes.

University of Education, Winneba http://ir.uew.edu.gh

3.7 Validation of instruments

It is the extent to which an instrument measure what it is supposed to measure and performs as it is designed to perform. The quality of a research instrument or a scientific measurement is determined by both its validity and reliability (Aikenhead, 2005). Validity is defined by Johnson and Christensen (2008) as "the accuracy of inferences, interpretations or actions made on the basis of test scores" (p.150).

Patton (2002) also refers to validity as the appropriateness, correctness, meaningfulness, and usefulness of the specific references researchers make based on the data they collect.

Validation involves collecting and analyzing data to assess the accuracy of an instrument.

According to Johnson and Christensen (2008) one method for obtaining validity evidence of an instrument is to study the construct to measure, examine the test content, and make decision whether the test content adequately represents the construct. This is usually done by experts according to Johnson and Christensen (2008).Another method for validating an instrument according to Johnson and Christensen (2008) is to relate the test scores to a known criterion by collecting concurrent and /or predictive evidence.

The researchers cross checked to see whether the test items and the questionnaire covered the entire research question posed in this study. Also the test items prepared on the bases of selected topics were submitted to some experience integrated science teachers in two Junior High Schools and the researcher's supervisor for scrutiny. The items were subjected to critical examination to ensure that they measured the predetermined criteria; objectives or content of the study. The necessary corrections were made and so the items were certified adequately.

University of Education, Winneba http://ir.uew.edu.gh

3.8 Data Collection procedure

The researcher sought permission from the Headmaster of the school to carry out an action research using the J.H.S two pupils of the school which was granted. Since the researcher is a teacher in the school, there was no need for an introductory letter to the school authorities.

In this study, the researcher selected a sample of respondents from Junior High School two (JHS 2), and gave them orientation on the purpose and benefits of the study. Again the researcher briefed the pupils on how the various items were to be responded to. Concerns raised by the pupils were addressed and clarified to enable them understand issues and provide the appropriate responses.

The researcher personally administered the questionnaire (see Appendix A for the questionnaire) and the test items (pre-test) to the student in the classroom.

The test which lasted one hour thirty minutes (1hour 30 minutes) was supervised by the researcher and other science tutors. But those who couldn't finished within the given time period were given extra time to complete the task. The respondents were assured of anonymity and this encouraged them to be part of the study. The entire questionnaire and the pre-test administered were collected by the researcher on the same day in the classroom. None of the questionnaire and the test items was missing. The test items was marked and scored over 100% and the scores recorded.

The researcher carried out intervention activities after two weeks of administrating the pre-test on the same selected group of pupil. The intervention was carried out in four consecutive days.

University of Education, Winneba http://ir.uew.edu.gh

The test item (post test) in the form of class test was administered after two weeks of the intervention activities. Duration for posttest items was one hour thirty minutes (1hr.30mints) and extra time was given to pupils who couldn't finish within the defined time period. The test items (post test) were supervised by the researcher and other two tutors in the school. Again the post test items were administered and collected by the researcher the same day and none was found missing. The responses of the pupils on the posttest were marked over 100% and the scores recorded and tabulated

The questionnaires were administered to both teachers and pupils of the accessible group after the research period. The study was conducted during lecture periods for ten times. The questionnaires were answered individually and collected back the day they were administered. The questionnaire items were then scored based on the responses for the final analysis.

The researcher established a good rapport with the pupils which made them express their views without fear. The questionnaire were distributed and filled without putting pressure on respondents.

Interviews were also conducted among two teachers. The interview guides used this were developed by the researcher based on the objectives of the study. The interview helped the researcher to collect information on teachers' opinions with regard to the use of cooperative approach to teaching.

3.9 Hypothesis testing

The two hypotheses for this study were tested using t-test. The t-test was used to compare the performance of pupils before and after the intervention. The dependent t-test was used for

University of Education, Winneba http://ir.uew.edu.gh

this study because dependent-samples t-test compares the average values of a characteristic measured on a continuous scale between two conditions of the same group. Thus, the performance of the same group of pupils was assessed pre-test and post-test.

3.10 Data Analysis

Data analysis is the process of simplifying data in order to make it comprehensible (Cohen et al, 1996).Therefore in data analysis any statistical techniques both descriptive and inferential used should be described. A descriptive analysis was adopted analyzing the questionnaires. After recording the scores from the pre-test and post-test the Statistical Package for Social Sciences (SPSS) version 17 for windows 2007 was used for analyzing the data. This is because it provided among other things, variety of ways to summarize data and accurately describes variables of interest (Easterby-Smith, Thorpe & Lowe, 1991). The results were then summarized as the major findings of the study. The discussion was done according to the major findings identified in the study and were used to answer the research questions.

University of Education, Winneba http://ir.uew.edu.gh

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Overview

This chapter of contains the major findings obtained on the field. It presents the statistical analysis and discussion of attitudes and academic results of Asuotiano Presby JHS pupils before and after the administering the intervention. The chapter is categorized under sub-headings according to the research questions.

4.2 Findings and discussion

A size sample of 50 JHS 2 pupils of Asuotino Presbyterian JHS and 2 teachers of integrated science from the same school participated in this study. The researcher conducted two tests (pre-test and post-test) on pupils. The pupils were also made to complete questionnaires whilst teachers were interviewed. The findings reported in this section are therefore the results of the action research conducted through tests, questionnaire and interview.

4.2.1 Demographic Characteristics of Respondents

The first section of the questionnaire solicited information on the demographic characteristics of respondents. Two demographic variables were investigated for this study, these were sex and age. It was realized that majority-27 (54%) of respondents were female and 23 (46%) were male. Most respondents -28 (56%) were 11-14 years old; whilst the remaining 22

University of Education, Winneba http://ir.uew.edu.gh

accounting for 44 percent of the sample also were 14-17 years of age. The demographic characteristics of respondents are presented in table 4.1.

Table 4.1: The Demographic Characteristics of Respondents

Variable		Frequency	Percentage
Gender :	Male	23	46%
	Female	27	54%
Total		**50**	**100**
Age:	11-13 years	28	56%
	14-17 years	22	44%
Total		**50**	**100**

4.3 The effect of learner centered approach on Academic results

RQ1. What is the effect of a learner centered instruction (cooperative approach) on the academic achievement of basic science studies?

The first research question sought to establish whether educational intervention in the form cooperative approach would yield any significant effect on academic results of the sampled pupils that participated in the study. In the light of this, the group mean of the results of pupils before and after the intervention was recorded and subjected to t-test.

University of Education, Winneba http://ir.uew.edu.gh

The dependent-samples t-test is used to compare the average values of a characteristic measured on a continuous scale between two conditions of the same group. In this case, it was used to measure the average scores of the sample before and after administering the intervention to the sampled group.

A hypothesis was formulated to help establish the effects of the cooperative approach to teaching on the academic results of pupils. The hypothesis was developed as;

Ho_1 There is no significant difference in the academic achievement of basic school pupils exposed to learner centred instruction (cooperative approach).

This hypothesis was tested on a 95% level of confidence and a significance level of 0.05. The results of the dependent t-test are illustrated in table 2.

Table 4.2: t-test Results indicating the effects of cooperative approach on academic results

	Number	Mean	Standard Deviation	*T*
Pre-intervention	50	28.21	6.03	-.513*
Post-intervention	50	41.52	14.15	

*$p < -513$

As shown in Table 2, the probability value of -.513 is less than 0.05 and hence an indication of a statistically significant difference. Suffice to say the variation in the academic results of pupils before and after the intervention is not due to chance but as a result of the learner-centered approach adopted as the null hypothesis is rejected for that matter.

University of Education, Winneba http://ir.uew.edu.gh

This finding is in agreement with Brody, (1995) and Olivares, (2005) that the leaner centered approach is a more intellectual process and hence pupils get to have a better appreciation of abstractions and hence the improved academic results. The improvement in academic results also is because; the learner-centered approach reduces the occurrence of the unpleasant situations and boosts the learning and satisfaction that result from working on a high-performance group with peers.

Comparative to the traditional approach that was used before the intervention; the learner centered approach is more desirable and has better outcomes. This is because the traditional approach is characterized activities such as instructor-centered lectures, individual assignments, and competitive grading. Meanwhile, the learner-centered approach produces pupils that show higher academic achievement, greater persistence through graduation, better high-level reasoning and critical thinking skills, deeper understanding of learned material, greater time on task and less disruptive behavior in class, lower levels of anxiety and stress, greater intrinsic motivation to learn and other high achievement attributes.

The results of the study imply that, adopting the learner-centered approach to class room instructions has enormous positive effects on the academic performance of pupils. It therefore makes a case for the introduction and consistent use of the learner centered approach in integrated science classrooms. This is especially important because it makes lessons enjoyable to pupils improves their academic results as well. Teachers interviewed for the study also indicated that, beyond improving the academic results of pupils, the learner centered approach also encourages participation and pupils' ability to apply the knowledge acquired in the class room in other areas is also enhanced.

University of Education, Winneba http://ir.uew.edu.gh

4.4 Effective use of cooperative learning

RQ 2: How can cooperative learning instruction be used to enhance the understanding of pupils in some specific topics in integrated science, such as carbon cycle, forces and mixtures?

The second research question of the study sought to examine how creatively and effectively the cooperative learning approach could be employed to enhance pupils' understanding of some specific integrated science topic areas. This research question was addressed through interviews with teachers of integrated science. In all two (2) interviews were conducted with each lasting thirty five (35) minutes. The proceedings were recorded and later transcribed for analysis. Teachers indicated during the interviews that both pupils and teachers have significant roles to play in ensuring the effectiveness of the cooperative approach.

4.4.1 The role of teachers

Even the most effective instructional technique does not work in all situations. In the light of this, it is helpful to have a repertoire of teaching strategies. As a result, teachers need to have multiple techniques available to allow them to be flexible and shift as the situation requires. Respondents indicated that, since there is no off-the-shelve approach to teaching, one important way of helping improve pupils' understanding in selected topics is to be flexible. Flexibility in this sense means being adaptable and having the resilience to alter the teaching approach when the need be.

However, the central role of the teacher in the cooperative approach remains to facilitate or manage the class room situation in a way that all pupils successfully participate in their

University of Education, Winneba http://ir.uew.edu.gh

groups. Teachers should carefully observe group so they can serve as effective resources and assess performance. Respondents agreed that teachers must evaluate the performance of their pupils on at least three core aspects of performance. The core aspects of performance necessary for measurement are as follows;

1. How pupils approached their tasks. This entails addressing questions such as what strategies were considered, which approaches were rejected and why?
2. Did pupils check and evaluate their work?
3. What ideas were generated by pupils, and
4. How well did the groups function as cooperative learners?

These questions would help teachers play their facilitation role more effectively. It would also help to track the performance of pupils individually and also how the groups function. This technique would also make it possible for teachers to identify individual pupils who still cannot fully grasp science lessons and help them improve their performance. This finding is in agreement with Johnson, Johnson and Holubec (2008) as the researchers ascribe specific roles that must be played by teachers in ensuring that the cooperative learning approach is effective.

Another important role of teachers is making pre-instructional decisions. This is very important because ill prepared lessons would have ineffective results. This activity ensures that teachers prepare ahead of the class and make provision for all teaching aids and other requirements that would make the lesson a success are available.

Also, sometimes, it is a good idea to pick formal roles and to give them to the pupils; at others, it is best to give pupils a list of suggested roles and let them sort out their group's

University of Education, Winneba http://ir.uew.edu.gh

internal dynamics themselves. Teachers must however ensure that the roles rotate among the group members. Teachers may do this by randomly assigning roles to group members or randomly determine an order for pupils to pick their role for the activity. This kind of randomization will help avoid rigid group structures and expectation effects. It also allows different individuals to develop and utilize different competencies. With regard to assigning random roles, one teacher stated;

"Random procedures help minimize potential prejudices associated with roles - for example, I usually want to avoid allowing males to serve as leaders, while females serve as the secretaries"

Furthermore, random procedures also create a non-threatening means for pupils to share personal information and to develop closer relationships. This is in agreement with the position of the cognitive development theory as Biehler and Snowman (1997) opined that through interaction with peers, pupils' abilities to organize patterns of behavior and thought are enhanced. Meanwhile, appropriate roles will depend on group size and the nature of the cooperative learning task.

4.4.2 Role of pupils

Like teachers, pupils also have a very important role to play in ensuring the success of cooperative learning. The role of pupils in the cooperative approach is perhaps even more important because the approach is learner centered. In order for pupils to better understand some selected topics using the student centered approach, there is need for cooperation with peers.

University of Education, Winneba http://ir.uew.edu.gh

It was found that in improving the outcomes of the learner centered approach, pupils need to cooperate with each other to maximize their own and each other's learning. This is important because it was found that cooperative learning encourages mutual interaction and by increasing the number of opportunities available for collaborative activity, provides opportunities for a wider range of communicative functions than those found in traditional classroom;

Slavin (2011) refers to cooperative learning as "instructional methods in which teachers organize pupils into small groups, which then work together to help one another learn academic content" (p.344).

On the other hand, in traditional learning method, pupils rather try to compete with each other. As a result the respondents indicated that the traditional learning methods often ends up preventing pupils having genuine interactions or negotiating meaning with the teacher and fellow pupils because the teacher initiates and controls the interaction, constantly orienting it towards the achievement of his instructional objectives.

In the light of this, in improving pupils understanding of selected topics it is important for teachers and pupils to work together. Teachers must manage the class room situation through efficient assignment of roles, monitoring and assisting group interactions. On their part, pupils must also cooperate with each other and take advantage of the peer-to-peer interaction to have a fuller understanding of the lessons taught in class.

4.5 Pupils' attitude towards science lessons

RQ 3: What are Pupils attitudes towards science lessons?

University of Education, Winneba http://ir.uew.edu.gh

The third research question explored pupils' attitudes towards Science lessons. This research question was addressed by examining the pretest and post-test attitudes of pupils towards integrated science lessons. Meanwhile, the general attitude of pupils was also rated on a 5-point likert-like scale. The results of the general examination of pupil's attitude towards integrated science lessons are illustrated in ensuing table.

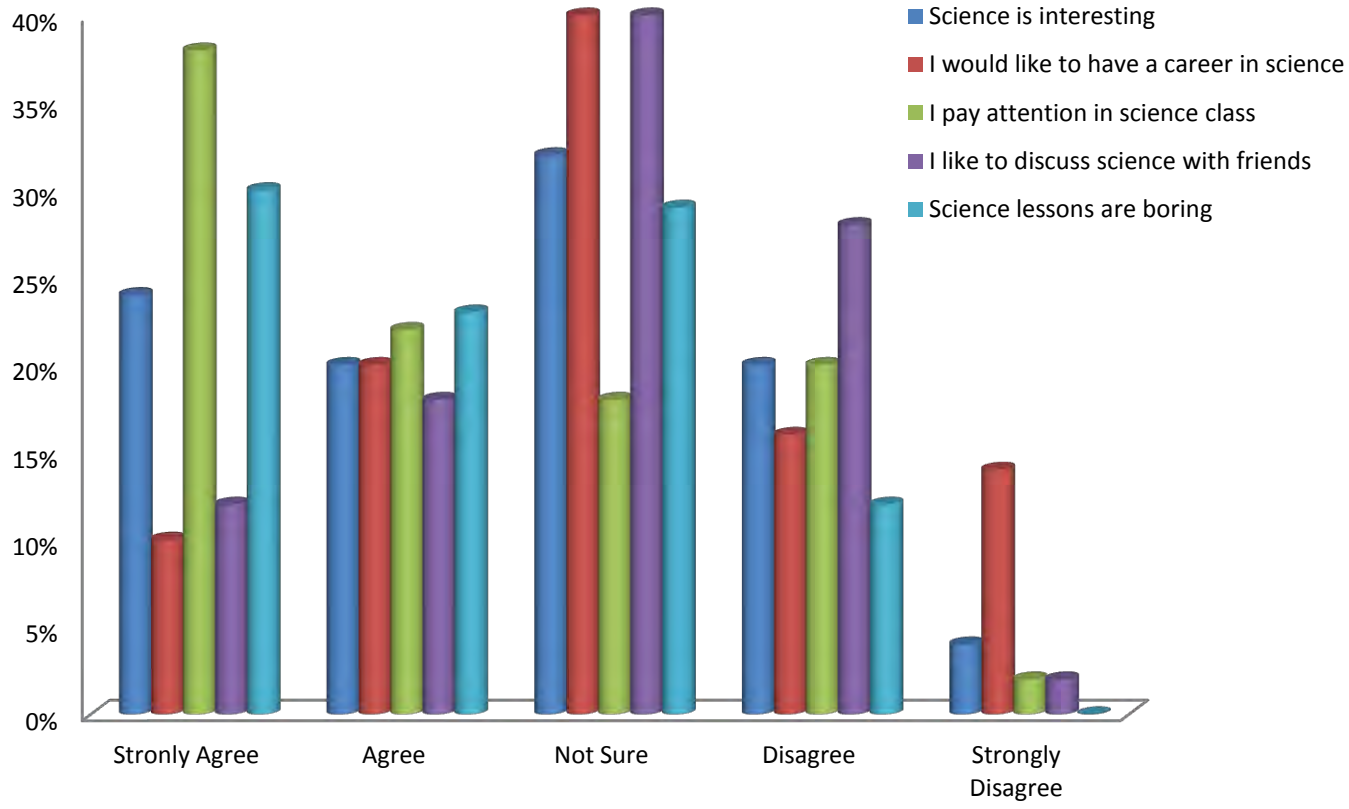
Table 4.3 Frequency table on pupils' attitude to integrated science lessons

Response	Freq.	%	Freq.	%	Freq.	%	Freq.	%.	Freq.	%
Science is interesting	12	24%	10	20%	16	32%	10	20%	2	4%
I would like to have a career in science	5	10%	10	20%	20	40%	8	16%	7	14%
I pay attention in science class	19	38%	11	22%	9	18%	10	20%	1	2%
I like to discuss science with friends	6	12%	9	18%	20	40%	14	28%	1	2%
Science lessons are boring	15	30%	12	23%	15	29%	6	12%	0	0%

The responses are further illustrated in figure1.

University of Education, Winneba http://ir.uew.edu.gh

Figure 1: Responses on general attitude towards science lessons



The results show that majority of respondents 40% are unsure whether they would like to have a career in a science-related discipline on not. Meanwhile 10% of respondents strongly agreed and 20% agreed strongly. In addition 24% of respondents strongly agreed and 20% agreed that science is interesting however, 20% disagreed and 4% strongly disagreed. Furthermore, 30% of respondents agreed before the adoption of the cooperative teaching technique that science is boring but 12% disagreed. Also, with regard to how attentive pupils are in class during science lessons, majority (38%) strongly agreed that they pay attention during science lessons, 22% agreed but 20% disagreed.

University of Education, Winneba http://ir.uew.edu.gh

It can be inferred from the responses that, pupils do not enjoy science lessons which may be because of the approach to teaching the subject. Pupils disinterest in the course is high even though majority of them indicated that they pay attention during science lessons. Suffix to say without the right approach it may be difficult for pupils to enjoy science lessons even if they give it attention. This brings to the fore the important features of cooperative or student centered learning such as collaboration, knowledge construction, modeling and clarifying as posited by McKenzie, (2002) and Theroux (2002).

The general attitude of pupils towards science is may be attributed to their orientation to the course which is through the traditional learning approach. The attitudes recorded are undesirable and could affect the academic results of pupils in the integrated science since the attitude or approach to the learning of a subject influences overall performance in that subject. This makes it imperative for an instructional approach that improves student attitude towards integrated science lesson to be adopted.

Meanwhile, researcher formulated another hypothesis to test whether the cooperative approach to would have a significant effect on the pupils' attitude towards integrated science lessons. A dependent t-test was conducted to test the second hypothesis;

Ho_2 There is a no significant difference in pupils' attitude towards science lesson after being exposed to the cooperative approach.

This test was necessary to ascertain the effects of the intervention after the intervention period. The same pupils who participated in the first test were made to respond again to the same questions to ascertain whether their attitude towards the science lessons has been significantly changed the intervention period. Table 4.3 illustrates the t-test results of pupils'

University of Education, Winneba http://ir.uew.edu.gh

attitude towards science lessons before and after the adoption of the cooperative learning approach or the student centered learning approach.

The results show a statistically significant difference of -4.31. Measured at a 95% confidence level, the Probability value of statistically significant and hence the null hypothesis is rejected.

Table 4.4: t-test results on the difference in attitude of pupils towards integrated science lessons

	Number	Mean	Standard Deviation	*T*
Before	50	41.73	8.03	-4.71*
After	50	88.94	11.17	

*P< -471

The positive results of using the cooperative approach is because as found by (Slavin, Johnson and Johnson, 1995) the characteristics of cooperative learning, such as positive interdependence and knowledge construction are highly motivating to pupils. This stems from the fact that the student centered approach encourages achievement-oriented behaviors as trying hard, attending class regularly and praising the efforts of others. This approach also entails receiving help from one's group mates as learning is perceived as an obligation and a valued activity because the group's success depends on the individual performance of members and the overall cohesion of the group.

University of Education, Winneba http://ir.uew.edu.gh

Suffice to say the cooperative approach makes studies interesting as pupils are placed in the center of learning activities and become the focus of learning in the classroom. This approach enhances pupils' self-confidence as it is dialogic and enlists the participation of all group members and in effect the entire class. Cooperative learning is thus suitable for teaching courses such as integrated science which may include some abstractions or concepts that might not be easily grasped by pupils until they are fully engaged through the cooperative learning approach.

Again, the cooperative approach may alter the attitude of pupils towards science lessons as these results show because of what Vygotsky reports as the cognitive development approach. In effect the cooperative approach has implication for science education because new information that is elaborated is more easily retrieved from memory than information that is not elaborated. The collaborative approach employs an effective way of doing this by making pupils explain their point of view to each other which is a particularly effective means of elaboration.

Another positive effect of cooperative learning also is that according to teachers' comments cooperative learning seemed to reduce anxiety and develop pupils' self-esteem and self-confidence in the study of integrated science. This is because of the peer to peer or face to face personal interaction which enables pupils to explain how they understand the lesson to their colleagues while their colleagues also do same in turns.

However, participants who attended the class regularly during the treatment had a more positive attitude towards the science lessons after the implementation of the activities. In particular, they indicated that they felt more comfortable during science lesson, especially in

University of Education, Winneba http://ir.uew.edu.gh

answering questions from the teacher. The pupils also reported that they felt they had more opportunities to ask and answer questions with their classmates in groups and so had more interest in science lessons. The findings of this study were consistent with the findings of Deutsch (1949) who found that cooperative learning activities allowed pupils to ask questions to their group members and discuss the answers of these questions to understand the academic language and concepts in the science syllables.

University of Education, Winneba http://ir.uew.edu.gh

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Overview

This final chapter presents a summary of all major findings of the study based on which conclusions are drawn and recommendations are made.

5.2 Summary

This study is an action research which entailed using the cooperative approach to assist J.H.S 2 pupils at Asuotiano Presbyterian JHS to understand selected topics in integrated science. The study specifically involved investigating the effect of the cooperative approach on the academic results of pupils, examining the pretest and posttest attitude of pupils towards integrated science and exploring how the cooperative approach could be used to improve pupils understanding in selected integrated science topics.

The action research involved the conduct of test, use of the cooperative approach, interviews and observation. A sample of 50 pupils and 2 teachers participated in the study. The study also entailed the formulation of two hypotheses to test the significance of the effect of the cooperative approach on the academic results of respondents and also the difference in the pre-test and post-test attitude of pupils towards integrated science lessons.

The study revealed that the cooperative approach has a significant effect on the academic results of pupils. As a result of this null hypothesis positing that there is no significant effect on the academic results of pupils after the adoption of the cooperative approach was rejected.

University of Education, Winneba http://ir.uew.edu.gh

The significant effect of the cooperative approach is as a result of the features of this pedagogy such as group activity, constructive knowledge sharing and personal interaction.

It was also found out that, to enhance pupil's understanding in selected integrated science topics, both teachers and pupils must play certain roles. Teachers must manage the classroom situation in a way that all pupils are involved in their group tasks. Again, the randomization of roles was found to be very effective when teachers partly controlled the roles by occasionally appointing pupils to undertake particular group tasks whilst allowing the group dynamics to still thrive. Pupils also have to be cooperative and participate fully in the knowledge sharing. It was also found out that this approach improved the understanding of pupils because it reduced the anxiety associated with the competitive traditional classroom. In addition, teachers must be flexible and be ready to adopt different approaches to instruction because there is no single approach that fits all classroom situations and is suitable for all lessons.

Furthermore, regarding the third research question, it was found out that the general attitude of pupils towards integrated science was one of disinterest, perception of science as boring although pupils reported that they paid attention during science lessons. However, after adopting the cooperative learning approach during the intervention period, this attitude changed significantly. As a result the null hypothesis formulated to test the difference in the pre-test and post-test attitude of pupils towards integrated science lessons was rejected.

University of Education, Winneba http://ir.uew.edu.gh

5.3 Conclusion

Using a co-operative approach to assist J.H.S 2 pupils at Asuotiano Presbyterian J.H.S to enhance their understanding of selected topics in integrated science, the cooperative approach was proven to be a very effective approach to integrated science studies at the J.H.S level.

The action research showed that, cooperative approach positively affected the academic performance of pupils. It as well altered their undesirable attitude towards science lessons for more desirable attitudes. Furthermore, it is also apt to conclude from the results of the action research that, in enhancing the understanding of pupils in selected integrated science topics, both teachers and pupils have unique roles to play and teachers must remain flexible.

The cooperative approach to learning is a very effective approach to integrated science education because it involves teachers and pupils in a dialogic process of knowledge sharing. By implication, learning outcomes are enhanced when pupils are placed in the center of learning activities and teaching can still be effective in a flexible environment where pupils interact with each other, have fun and learn as well.

5.4 Recommendations

Based on the major findings of the study and the conclusions drawn, some recommendations are made here for consideration.

1. The cooperative learning approach should be introduced and used for science instructions at the JHS level. This approach has been shown to have a positive effect on the academic results of pupils and hence when used continuously the

University of Education, Winneba http://ir.uew.edu.gh

overall class performance may improve which may eventually leading to high performance examination.

2. Teachers must be supported to adopt the cooperative approach because this approach is different from the everyday traditional classroom situation. This is important because some teachers are more skilled in the use of the traditional approach and may be reluctant in introducing the cooperative approach when they do not receive support in the form of continuous professional development and an enabling classroom environment among others.
3. Also, it is important for teachers to remain flexible in order to improve pupils understanding of some integrated science topics. Flexibility in this regard implies that teachers are able to adapt to the demands of the classroom situation and introduce teaching approaches that fit in context.
4. Again, the classroom situation should be managed in manner that student groups are cohesive and all pupils play roles in their groups. This may be ensured by the teacher to the random assignment of roles to pupils but this should also not compromise individual liberty and group dynamism.
5. It is important for teachers and educational authorities to reorient pupils towards science lessons through encouragement. This would also change their attitude towards integrated science lessons in addition to the use of the cooperative approach
6. Head-teachers and other educational authorities could also advocate for the use of the cooperative approach in basic schools under their supervision to improve the academic performance of pupils.

University of Education, Winneba http://ir.uew.edu.gh

5.5 Suggestion for Future Studies

1. Future studies should have a control and experimental group in order to ascertain the effect of the intervention on different groups after a period of time.
2. It is also important for future studies to adopt the action research strategy in examining the effect of the cooperative approach in the study of other courses such and mathematics or English language. The investigation may also be done at different educational levels such as Senior High School or at the Upper Primary level.
3. Future studies may also consider increasing the sample size of teachers to be interviewed and also using the maximal variation sampling design to select some pupils to be interviewed for an in-depth understanding of how the cooperative approach could positively affect attitude and academic results.

University of Education, Winneba http://ir.uew.edu.gh

REFERENCES

Acron, G. Acron A. & Coups B. K. (2004). Effects of Pupils Teams- Achievement Divisions strategy and Mathematics Knowledge on Learning outcomes in Chemical kinematics. *Journal of International Social Research, 2*(6).

Aikenhead, V. (2005) Early Determinants of Women in the IT Workforce: A Model of girls' career choices. *Information Technology and People, 18*(2), 30-259.

Bandura, A. (1977). Social Learning Theory

Bell, T. B. & Fox D. B. (1998) The Effect of Concept Mapping on Pupils' Learning Achievement and Interests. *Innovations in Education and Teaching International, 145*(4), 375-387.

Bhattacherjee, A. (2012). Social science research: principles, methods, and practices.

Biehler, D., & Snowman, J. (1997). Educational psychology: What do we teach, what should we teach?. *Educational Psychology Review*, *9*(2), 151-170.

Blanchard A., & Thacker E. (1999). Predictors of Academic Achievement of student ICT Teachers with Different Learning Styles. *International Journal of Psychological and Behavioral Sciences, 2*(3), 145-151.

Brooks G., & Brooks, A. (1999). Experiential Learning in Secondary Agriculture Education Classrooms. *Journal of Southern Agricultural Education Research, 30*(1).

Brooks, J., & Brooks, M. (1999). *In search of understanding: The case for constructivist classrooms*. Alexandria, VA:

University of Education, Winneba http://ir.uew.edu.gh

Bruner, J. (1966). *Toward a theory of instruction*. Cambridge, MA: Harvard University press.

Bruner, J. (1973). *Going beyond the information given*. New York: Norton.

Bruner, J. (1990). *Acts of meaning*. Cambridge, MA: Harvard University Press

Changeiywo J. M., Wambugu P. W. & Wachanga S. W. (2011). Investigations of Pupils' Cliffs, NJ: Prentice Hall.

Coleman U. (1961) Teacher role options in peer discussions about literature (National Reading Research Center). *The Reading Teacher, 48,* 354-356.

Cooper T. & Robinson D. J. (1997). *Educating the reflective practitione1:* San Francisco: Jossey-Bass.

Cooper, R. (1999). Improving intergroup relations: Lessons learned from cooperative learning programs. *Journal of Social Issues*, *55*(4), 647-663.

Littlefield-Cook, J., Cook, G., Berk, L. E., & Bee, H. (2005). *Child development: Principles and perspectives* (Vol. 55, pp. 23-38). Allyn and Bacon.

Newsome, L. A., Wardlow, G. W., & Johnson, D. M. (2005). Effects of lecture versus experiential teaching method on cognitive achievement, retention, and attitude among high school agriscience students. *Agricultural Education*.

University of Education, Winneba http://ir.uew.edu.gh

Wambugu, P. W., Changeiywo, J. M., & Ndiritu, F. G. (2011). Effects of Experiential Cooperative Concept Mapping Instructional Approach on Secondary School Students' Achievement and Motivation in Physics in Nyeri County, Kenya. *Unpublished Doctoral Dissertation, Egerton University, Kenya*.

Gillies, R. M. (2003). The behaviors, interactions, and perceptions of junior high School pupils during small-group learning. *Journal of Educational Psychology, 95*(1), 137-47.

Gillies, R. M. (2003). The Effects of Cooperative Learning on Junior High School Pupils, During Small Group Learning: Learning and Instruction. *Journal of Educational Psychology , 14* (2), 197-213.

Gillies, R. M. (2008). The effects of cooperative learning on junior high school pupils' behaviours, discourse and learning during a science-based learning activity. *School Psychology International, 29*(3), 328-347.

Gillies, R. M. (2002). The residual effects of cooperative-learning experiences: A two-year follow-up. *The Journal of Educational Research*, *96*(1), 15-20.

Glaserfeld, E. (1989). The Influence of Laboratory Instruction of Science Achievement for an effective classroom *Education*, 130(2), 241-250.

Goodrum, W., & Hackling S. (2003). Integration of studio and theory in the teaching of graphic design. *Art. Design & Communication in Higher Education, 3,* 163-174.

University of Education, Winneba http://ir.uew.edu.gh

Hanson, J. M., & Sinclair, K. E. (2008). Social constructivist teaching methods in Australian universities–reported uptake and perceived learning effects: a survey of lecturers. *Higher Education Research & Development*, *27*(3), 169-186.

Herreid, C. F. (2009). The wisdom of groups. *Journal of College Science Teaching*, *39*(2), 62-64.

Hrepic, Z., Zollman, D. A., & Rebello, S. N. (2007). Comparing pupils and experts' understanding of the content of a lecture. *Journal of Science and Educational Technology , 16*(3), 213-224

Jacka, B (1984)' Assumptions and Theory Underlying Educational Practice'. In McVitty ed.(1984), *Children and Learning;*Primary English Teaching Association, Australia,16 (31)

Johnson, D., Johnson, R. (1991) Learning Together and Alone ed3. Allyn & Bacon, Sydney

Johnson, D. W., & Johnson, R. T. (1999). Making cooperative learning work. *Theory into practice*, *38*(2), 67-73.

Johnson, D. W., & Johnson, R. T. (2005). New developments in social interdependence theory. *Genetic, social, and general psychology monographs*, *131*(4), 285-358.

Johnson, D. W., & Johnson, R. T. (2005). Training for cooperative group work. *The Essentials of Teamworking: International Perspectives*, 131-147.

Johnson, R. B., McGowan, M. W., & Turner, L. A. (2010). Grounded theory in practice: Is it inherently a mixed method. *Research in the Schools*, *17*(2), 65-78.

University of Education, Winneba http://ir.uew.edu.gh

Johnson, B., & Turner, L. A. (2003). Data collection strategies in mixed methods research. *Handbook of mixed methods in social and behavioral research*, 297-319.

Johnson, R. B., & Christensen, L. (2000). *Educational research*. (3_{rd} ed.). Los Angles: Sage Publications.

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational researcher*, *38*(5), 365-379.

Johnson, D. W., & Johnson, R. T. (2002). Cooperative learning and social interdependence theory. In *Theory and research on small groups* (pp. 9-35). Springer US.

Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1993). *Cooperation in the Classroom* (6th ed.). Edina, MN: Interaction Book Company.

Johnson, D., & Johnson, R. (1991). *Learning together and alone*. (*3_{rd} Ed.*). Upper Saddle

Johnson,D.W. (2009). Reaching out: Interpersonal effectiveness and self- actualization (10th ed.). Boston: Allyn & Bacon.

Johnson, D. W., & Johnson, R. T. (1999). Making cooperative learning work. *Theory into practice*, *38*(2), 67-73.

Johnson D. W., & Johnson, R.T. (1989). Leading the Cooperative School, Edina, MN: Interaction Book Company.

Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1993). Circles of learning (4th ed.). *Edina, MN: Interaction Book Company*.

University of Education, Winneba http://ir.uew.edu.gh

Johnson, D. W., Johnson, R. T., & Johnson, H. EJ (1993): Cooperation in the classroom, (6th.ed). *Edina, MN: Interaction Book*.

Kagan, S. (2003). Cooperative-learning structures for brain-compatible instruction. *Small group instruction in higher education. Stillwater, OK: New Forums Press. Pp*. 303-304.

Koutselini, M. (2008). Teacher misconceptions and understanding of cooperative learning: An intervention study. *The Journal of Classroom Interaction*, 34-44.

List, S., & Hiscock, J. Using student feedback to improve design of content delivery, improves attitudes and outcomes.

Li, M., & Lam, B. (2005). Cooperative learning.

Levin E. (1948). Comparing the quality of pupils' experiences during cooperative learning and large-group instruction. *The Journal of Educational Research,* 97,123-133.

Macaulay, T. & Gonzales F. (1996). *How to Design and Evaluate Research in Education* (5th ed.). New York: McGraw Hill Companies Inc.

Marlow, G. & Page B. (2005). *Kagan cooperative learning.* San Clemente: Author.

Mibrandt E. A., Felts, T. Richards T. M. & Abghari O.(2004). *The crit: An architecture* student:*handbook* (2nd ed.). Oxford, UK: Architectural Press.

Mille, D., & Jrees, M. A. (2003). Using Group Discussion to Improve Achievements in Science Classes. *Science Education* , 129-137.

Murphy, P., & Whitelegg, E. (2006). Girls in the Physics Classroom: A Review of the Research on the Participation of Girls in Physics.

University of Education, Winneba http://ir.uew.edu.gh

Nagata, K., & Ronkowski, S. (1998). Collaborative Learning: Differences Between Collaborative and Cooperative Learning, The Office of Instructional Consultation, University of California Santa Barbara.

Narrow, S. (1998). Attitudes towards Science and Mathematics: A review of the Literature and its implications in schools. *International Journal of Education , 25* (9), 1039-1045.

Newsome, L. A., Wardlow, G. W., & Johnson, D. M. (2005). Institutional impediments associated with students‟ failure in secondary school in Adamawa state. *Journal of Educational studies,* 14(1), 93-98.

Novak, J. (1998) *Learning, Creating and Using Knowledge: Concept Maps as Facilitative* Transfer from Cooperative to Individual Studying. Journal of Reading, 10 (2), 10-12

Novak, J. D. (1998). The use of Concept Mapping and Knowledge Mapping with Junior High School Science Pupils. *Science Education, 67*(5), 625-645.

Patton F. (2002). *Cooperative learningfor higher education faculty.* Westport: The Oryx Press.

Powell, K. C., & Kalina, C. J. (2009). Cognitive and social constructivism. Albama: Heldref Publications.

Ray, A. (2008). Research on Cooperative Learning: Consensus and Controversy. *Journal of Educational Leadership* 47 (4) 79-87

University of Education, Winneba http://ir.uew.edu.gh

Reeves, C., McKenney, S. & Herrington, J. (2010). Publishing and perishing: The critical importance of educational design research and practice. American Psychologist, 58(11), 931-945.

Richmond, P. (1970). *An Introduction to Piaget*. London: Rutledge

Roger, T. J. David W. J., & Edythe J. H, (1994) Cooperative learning in the classroom. *Educational Technology & Society* 6(1) 86-97.

Roger, T., & Johnson, D. W. (1994). An overview of cooperative learning. *Creativity and collaborative learning*.

Shepard, L. A., & Sheppard, L. A. (2000). The role of classroom assessment in teaching and learning.

Sharan, D. (1994). Concept Mapping in Sciences Class. A Case Study of Fifth Grade Pupils. *Educational Technology & Society, 10*(1), 186-195.

Simon, J. (1997). Graphic design: Can it be something more? Report in progress. *Art, Design & Communication in Higher Education, 6,* 201-207.

Skinner A. (1971). Peer Instruction: Ten Years of Experience and Results. *American Journal of Physics, 69*, 970-977.

Slavin, R. (1990). *Cooperative learning: Theory, Research, and Practice*. Los Angeles: Englewood.

Slavin, R. (1991). Synthesis of research on cooperative learning. *Educational leadership* 46(3), 1-13.

University of Education, Winneba http://ir.uew.edu.gh

Slavin, R. E. (1998). Cooperative learning and student achievement. *Educational Leadership 46*(2), 31-33.

Slavin, R. (2003). Educational Psychology: Theory and Practice. (7th ed.).Boston: Allyn and Bacon

Smith, B. L., MacGregor, J, Matthews, R. & Gabelnick, F. (2004). *Learning Communities: Reforming Undergraduate Education.* Indianapolis: Jossey-Bass.

Stahl, R. J. (1994). The Essential Elements of Cooperative Learning in the Classroom. ERIC Digest.

Tongco, C. D. M. (2007). *Purposive sampling as a tool for Informant selection: Ethnobothany research and applications*. New Jersey: Lawrence Erlbaum Associates Inc.

Van den Akker, J. (2005, December). Curriculum development re-invented: evolving challenges for SLO. In J. Letschert (Ed.), *Proceeding of the invitational conference on the occasion of 30 years SLO 1975-2005* (pp. 16-31).

Vygotsky, L. (1978). *Mind in Society: The development of higher psychological processes.* Cambridge: Harvard University Press.

Vygotsky, L. (1986). *Thought and language*. London, UK: The MIT Press

Wambugu, W. P., Changeiywo, M. J. & Ndiritu, G. F. (2013). Effects of experiential cooperative concept mapping instructional approach on secondary school pupils' achievement in Physics in Nyeri County, Kenya. *Asian Journal of Social Sciences & Humanities* 3(2) 6–9.

University of Education, Winneba http://ir.uew.edu.gh

APPENDIX

Appendix A

Questionnaire for the pupils

The purpose of this questionnaire is to obtain data and elicit your views on the effects of the use of cooperative learning approach on some selected topics in the teaching and learning of Integrated Science in Asuotiano Presbyterian junior high school in Dormaa East district. All information provided will be treated confidential. No respondents will be identified in either the summaries or the findings arising from this study. Please, do well to answer all the questions. Each question has a definite reason for being included. Thank you for your co-operation.

INSTRUCTION: **For each of the question item below, <u>PLEASE TICK</u> the number from the scale 1 – 5, at the right end of the item to indicate your level of agreement or disagreement to the question item.**

<u>NOTE THE SCALE</u>:

SA – Strongly Agree

A - Agree

N - Neutral

D - Disagree

SD - Strongly Disagree

University of Education, Winneba http://ir.uew.edu.gh

	SA	A	N	D	SD
A. Is science lesson interesting?	☐	☐	☐	☐	☐
B. I would like to have a career related to science.	☐	☐	☐	☐	☐
C. I pay attention in class during science lesson.	☐	☐	☐	☐	☐
D. Is science lesson boring?	☐	☐	☐	☐	☐
E. I like to discuss science with friends (group discussion).	☐	☐	☐	☐	

University of Education, Winneba http://ir.uew.edu.gh

Appendix B

Lecturers' Interview Schedule

A. What methods do you use most during the teaching of science?
B. Which teaching method(s) would you recommend for science teaching?
C. How can the cooperative method be effectively use to teach science?
D. What would you do to promote your pupils' interest in science at the basic level?
E. Pupils are thought to be rarely interested in participating in group activities. Is this the case in your classes? If yes, are there any strategies you utilize to combat this attitude?
F. Do you notice an increase in student performance when they work in groups?
G. Is student participation increased when you incorporate cooperative learning strategies?
H. It is believed that pupils are more comfortable with teacher-centered learning strategies.
    a. What is the case in your classroom?
I. What are the cooperative learning strategies you utilize within your classroom?
J. Have you found that cooperative learning makes the teaching-learning experience more dynamic and enjoyable?
K. When/ in what situations do you find cooperative learning most useful?
L. How do you prepare pupils for working in groups?

University of Education, Winneba http://ir.uew.edu.gh

Appendix C

Test Items for Pupils (pre-test)

1. Which word means the same as burning?
    a. Combustion
    b. Respiration
    c. Photosynthesis
    d. Perspiration
2. All the following are gases found in the atmosphere except:
    a. Oxygen
    b. Carbon dioxide
    c. Carbon
    d. Water vapor
3. Which substance is needed to complete the following word equation?

Hydrocarbon +…… ⟶ carbon dioxide+ water

    a. Oxygen
    b. carbon
    c. Glucose
    d. Chlorophyll
4. Which of the following is a product of respiration?
    a. Oxygen
    b. Water
    c. Air

University of Education, Winneba http://ir.uew.edu.gh

d. Glucose

5. What form does carbon travel in throughout the atmosphere?
6. A plastic pen on rubbing in the hair attracts pieces of paper .what force is responsible for the attraction?
    a. Electrostatic force
    b. Frictional force
    c. Gravitational force
    d. Magnetic force
7. One Newton is defined as the force required to give a mass of 1kg an acceleration of
    a. $10m/s^2$
    b. $1m/s^2$
    c. $9m/s^2$
    d. $100m/s^2$
8. Explain the term mixture.
9. List four examples of mixtures.
10. Give two uses of mixtures in everyday life.
11. Mention four components of air.
12. Explain what is meant by the term force.
13. When a person jumps up he or she is able to come down because of
    a. The pull of the earth's gravitational force
    b. The pull of the earth magnetic force
    c. The resistance of the earth's atmosphere toward motion

University of Education, Winneba http://ir.uew.edu.gh

d. The pressure of the earth's atmosphere on the person

14. The force that is exist in a pulled string is

a. Tension

b. Frictional force

c. Centripetal force

d. Gravitational force

15. Which of the following forces will cause an object to move in a circular path?

a. Centripetal force

b. Gravitational force

c. Tensional force

d. Frictional force

University of Education, Winneba http://ir.uew.edu.gh

Appendix D

Test Items for Pupils (post-test)

1. More carbon can dissolve in cold water than in warm water.

   True **OR** False

2. Match the column on the left with the process it corresponds to on the right.

Release carbon dioxide	Photosynthesis
Take in carbon dioxide	Respiration

3. Name six (6) sources of carbon.
4. Carbon dioxide is a green house gas; what is meant by the term green house gas?
5. List some effects which may results from the increase in green house gases.
6. The force which opposes the motion of one body on another body is called
   a. Adhesion
   b. Cohesion
   c. Friction
   d. Tension
7. The force which comes into operation when a ball rolls on the ground is
   a. Gravitational force
   b. Frictional force
   c. Magnetic force
   d. Electrostatic force

University of Education, Winneba http://ir.uew.edu.gh

8. Which of the following forces tends to pull objects towards the centre of the earth?
    a. Centrifugal force
    b. Electrostatic force
    c. Force of gravity
    d. Frictional force
9. Describe these types of forces.
    a. Gravitational force
    b. Electrostatic force
    c. Frictional force
    d. Tensional force
10. State three effects of forces on objects
11. State one solvent for each of the following substance
    a. common salt
    b. oil paint
    c. sucrose
    d. chlorophyll
12. Smoke is an example of a mixture of
    a. gases
    b. liquids in gases
    c. solids in gases
    d. solids in liquids

University of Education, Winneba http://ir.uew.edu.gh

13. Gin can be obtained from palm wine by

    a. condensation

    b. freezing

    c. sedimentation

    d. distillation

14. All the following substances are mixtures except

    a. Blood

    b. Palm wine

    c. Air

    d. Carbon dioxide

15. Define the following;

    a. Solute

    b. Solvent

    c. solution