UNIVERSITY OF EDUCATION, WINNEBA

USING COOPERATIVE TEACHING AND LEARNING APPROACH TO IMPROVE STUDENTS' ATTITUDES AND ACHIEVEMENT IN BIOLOGY: A CASE STUDY OF TAMALE BUSINESS SENIOR HIGH SCHOOL IN THE NORTHERN REGION OF GHANA

MARY WEJAAMO AYERIGA

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MARY WEJAMMO AYERIGA

A Thesis in the Department of Science Education, Faculty of science Education, submitted to the School of Graduate Studies, University of Education, Winneba in partial fulfillment of the requirements for award of Master of Philosophy (Science Education) degree.

OCTOBER, 2014

DECLARATION

STUDENT'S DECLARATION

I, Mary Wejaamo Ayeriga declare that this thesis, with the exception of quotations and references contained in published works, which have all, to the best of my knowledge, been identified and acknowledged, is entirely my own original work, it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: ....

Mary Wejaamo Ayeriga Date:

SUPERVISORS' DECLARATION

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

SIGNATURE: ....

DR. E. K. OPPONG Date:

SIGNATURE: ....

DR. ERNEST NGMAN-WARA. Date:

DEDICATION

This study is dedicated to the Almighty God for good health, my family for their continuous support, prayers and encouragement to me at all levels of my education. To my daughter Mellisa, for your sacrifices at such a tender age which strengthened me and to my late dearest husband Donatus, for the wonderful care you gave us on planet earth. Your memories will forever remain in our minds and may your soul find rest in His kingdom.

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My profound gratitude goes to the Almighty God for His guidance and protection, which has brought me this far in the educational ladder. I fervently wish to render my deepest appreciation to my supervisors, Dr. E. K. Oppong and Dr. Ernest Ngman-Wara, both Senior Lecturers in the Department of Science Education, University of Education, Winneba for their technical guidance, scrutiny, encouragement and insistence on quality throughout the supervisory work on the thesis. In addition, I sincerely thank all my Lecturers for their unique suggestions and assistance right from the proposal to the completion of this thesis.

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Again, I am highly indebted to the head master of Tamale Business Senior High School and the biology teachers. To Mr. Kenneth for your assistance in typing out the work, I say God richly bless you and Home Economics students of the selected school for the study. Finally, to my lovely daughter Mellisa who missed my company for most of the time, I say, God bless you.

The contribution of others whose names I have not been able to mention here are also very much acknowledged.

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ACRONYMS

ABL	Activity-based learning
BISCO	Business Senior High School
CTL	Contextual teaching and learning
HESAB	Home Economics students‟ Attitudes toward Biology
INSET	In-service training
MoE	Ministry of Education
S H S	Senior High School
SPSS	Statistical Package for the Social Science
TLMs	Teaching learning materials
WASSCE	West African Senior School Certificate Examination

ABSTRACT

The study sought to improve the attitudes and achievement of Home Economics students in Biology through cooperative teaching and learning approach. The study used action research design. A sample of 66 S H S Home Economics Students was selected from Business Senior High School for the study. Data for the study were collected using questionnaire and tests. The questionnaire sought response on Home Economics students‟ attitude towards Biology. Two tests thus; pre and post-tests were administered before and after intervention respectively to determine the academic achievement of the students in Biology. Descriptive statistics was used to organise the data from the questionnaire into means and standard deviations whiles percentages were also expressed from the responses. A paired t-test statistic was used to establish the significance of the Cooperative approach on students‟ academic achievement. Results from the questionnaire before the intervention demonstrated that Home Economics students indicated poor attitudes towards biology since a significant number of the students‟ responses revealed mean values indicating attitudes and the pre-test also revealed poor performance of the students. The post-intervention findings indicated positive attitudes and a significantly improved performance of the students. It is recommended among other things that cooperative teaching and learning should be employed in teaching Biology at SHSs to help instil positive attitudes in students by addressing the various factors responsible for poor attitudes towards the subject. Implementation of Cooperative approach should help teachers identify the weakness of students and address them to improve their academic achievement.

CHAPTER ONE

INTRODUCTION

Overview

This chapter presents the background to the study. The research seeks to improve the attitudes and academic achievement of Tamale Business SHS Home Economics students in Biology using the Cooperative teaching and learning approach, the statement of the problem looks at the attitude and performance of Senior High School Home Economics students in Biology. The problem diagnosis and causes have also been stated. The purpose of the study is also stated. Four research questions have been stated whilst the significance of the study has been discussed. The compilation of the various chapters has been considered in the organization of the study. Finally, the operational terms are also stated.

Background to the Study

Research on the relationship between learners‟ attitude and achievement is fundamental in science education (Weinburgh, 1995). In general, attitudes and interest have been identified as important for students‟ understanding, learning and their academic success. Attitudes toward biology and learning in general are areas of interest to educators past and current. The term attitude (toward science) should be used to refer to a general and enduring positive or negative feeling about science (Koballa & Crawley, 1985).

Home Economics is an applied, multi-disciplinary subject that provides students with a wide range of learning experiences, knowledge, and skills necessary for living as individuals and as a family (Darling, 1995; Davis, 1993; Richards, 2000). Home Economics is part of the Ghanaian Senior High School level curriculum and offered as a course.

The Home Economics Curriculum in Ghana places emphasis on the physical, emotional, intellectual and social needs of the individual, the family and society (Curriculum Research Division and Development, 2008). The welfare of the individual, the family and society is therefore the primary concern in Home Economics. This concern is manifested by assisting the student to acquire skills that he/she will need to be able to improve the quality and meaning of life in a changing society. Home Economics has made several claims about its educational purpose. One claim which has persisted is that Home Economics is an applied science, applying the principles of science to everyday living, encouraging reasoning about the tasks of daily living, contributing to an appreciation of right living, and in general, improving the quality of life.

Food preparation is nearly always included in Home Economics lessons. When preparing food, the pupils have to measure, mix and usually also heat substances. Changing conditions allow pupils to follow reactions and make observations. A deeper understanding of reactions and phenomena require, however, that pupils master the basics of Chemistry, Biology and Physics. It is in this direction that Home Economics Students are required to select one of the sciences as an elective which is also a requirement for admission into most tertiary institutions.

Biology or Chemistry is one of the four elective subjects alongside Food and Nutrition, Management In-living and Economics under the vocational category. Many Home Economics students often opt for Biology. However, the Home Economics students‟ attitude toward Biology and performance has been very poor as compared to their counterparts who offer general science programme.

Several efforts have been made by stakeholders to improve students‟ attitude toward science and achievement in science. This has been done through organising science programmes such as Science, Technology, and Mathematics clinics and Vocational training for science students and girls in particular in the Metropolis. Yet, current statistics still indicate an abysmal achievement in biology by Home Economics Students.This underscores the desire to investigate the attitude of Home Economics Students towards Biology and to employ the Cooperative teaching and learning approach to improve upon their academic achievement.

Statement of the Problem

The general performance of Tamale Business S H S Home Economics students in Biology since its inclusion in the Vocational programme in 2001 has been poor (Table 1). Several factors such as lack of well-equipped laboratories, unqualified teachers, and lack of teaching-learning materials as well as the students‟ attitudes account for the poor achievement of Home Economics students in Biology (George, 2006). Also, many factors influence attitudes and achievement among adolescents. Some of the factors are associated with parental background and family environment. Other factors relate to

individual characteristics such as self-concept, locus of control, achievement and motivation. Still other variables are associated with schools influences such as class climate, teachers, and administrative styles (Talton & Simpson, 1985). These factors are reflected in numerous attempts to ascertain which factors are responsible for students varied attitudes towards science.

According to Osborne, Simon and Collins (2003), researchers have incorporated a range of components in their measures of attitudes to science including: the perception of the science teacher; anxiety toward science; the value of science; self-esteem at science; motivation towards science; enjoyment of science; attitudes of peers and friends towards science; attitudes of parents towards science; the nature of the classroom environment; achievement in science; and fear of failure in course. These and many other factors are responsible for poor attitudes and achievement in biology by these students. However, recent researches example, Attitudes toward biology (Prokop, Leskova, Kubiatko, & Diran, 2007) as well as the Chief examiners‟ report (2009) on Biology have indicated that, the performance of Ghana‟s Home Economics students in biology has been poor due to their inability to provide descriptive answers to questions, spelling mistakes of biological terminologies and candidates‟ lack of knowledge of the subject matter.

Problem diagnosis

The researcher, a Biology teacher in Tamale Business SHS has observed and noticed during Biology instructions over the years the attitudes of Home Economics students towards Biology. Students come to classeslate, do not participate actively during lessons

and fear of failure in Biology thus; negative attitudes. Their academicachievements in Biology examinations have also been revealed to be poor. A sample of results from Tamale Business Senior High School in the Metropolis is presented in Table 1. This shows very poor performance of Home Economics Students in Biology.

Table 1:

Tamale Business S H S Home Economics Students' performance in WASSCE

Year	Number that wrote	Pass rate %	Remarks
2008	58	48	This is generally below average
2009	127	45	There was a decline in overall performance as compared to the previous year considering the total number of candidates
2010	-	-	There was no exam taken in Ghana due to the introduction of the four years programme
2011	78	65	There was an increase in pass rate from 2009
2012	124	55	A decline in the performance as compared to 2011
2013	378	48	There was a decline in the overall performance with respect to the total number of candidates

Source: Records from Business S H S, Tamale.

Causes of the problem

This may be as a result of several factors including inadequate materials and equipment, the poor entry grades in science (biology) of Home Economics students, lack of qualified

Biology teachers, and the students own attitude towards the subject. The main cause attributing to the students‟ negative attitude and poor achievement is the teaching approaches and professional qualification of teachers. The factors that account for the poor achievement could then be categorized as the teacher factor (teaching approaches, professional qualification and use of TLMs) and the learner factor (entry behaviour, relevance of the subject, future prospects/jobs and students‟ attitudes).

Both teacher and learner factors need to be addressed if the students‟ attitude has to be improved to impact positively on their achievement in the subject. This calls for innovative ways of teaching biology that will address the factors outlined. One of such innovative approaches is Cooperative teaching and learning.

Cooperative learning is a mode of learning in which students work in small groups to achieve a purpose. Here, there is an emphasis on the importance of group work. Students in a group help each other in learning the content, but achievement is judged individually (Ronsini, 2000).Cooperative Learning is the instructional use of small groups so that students work together to maximize their own and each other‟s learning (Johnson, Johnson, & Holubec, 1993). It is a successful teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject. Each member of the team is responsible not only for learning, but also for helping teammates learn. In cooperative learning, the teacher establishes the structure to achieve heterogeneous groups of students working collaboratively toward some common learning goal or task (Scaglione & Blank, 1997). This approach has been highly recommended for teaching at all levels, as stated by the Federal Government of Nigeria (2004), in the National Policy on Education. This,

therefore, tends to suggest that as most teachers are not sensitized on the advantages of the use of cooperative learning, it is believed that the manner in which most schooling occurs may not be teaching students to become aware of their own learning, to think critically and to derive their own pattern of thought and meaning from content presented through interaction as a result of cooperative learning. It was purely in an attempt to bridge the wide gap on the knowledge of the effects of cooperative learning on biology students‟ achievement using our local environment that, this study was carried out. In the study attempt is made to find out the effects of cooperative learning on Senior High School (SHS) Home Economics students‟ achievement in biology and attitude towards their studies.This indeed could help Home Economics Students develop positive attitudes towards Biology and also overcome the problem of poor performance in the subject.

As far as previous research work on biology is concerned, a number of the studies focused on Biology students‟ attitudes, and the relationship between their attitudes and achievement regarding science and Home Economics. Also, attitudinal studies in science education are mostly common to elementary, middle and high school students‟, and in some cases college students (Turkmen, 2007). But Home Economics students studying Biology as an elective has not been extensively studied. In this regard, this research would partially fill the gap in the literature and provide a strong base for future studies in this area.

Purpose of the Study

This study sought to improve the attitudes and academic achievement of Home Economics students in Biology through Cooperative teaching and learning approach.

Objectives of the Study

The main objective of this research was to improve Tamale Business S H S Home Economics Students‟ attitudes and achievement in Biology through the use of the Cooperative teaching and learning approach.

The Specific objectives of the study were to:

1 determine the attitude of Tamale Business S H S Home Economics students towards Biology before the intervention.

2 find out the factors responsible for Home Economics Students‟ poor attitudes towards Biology.

3 ascertain the effect of Cooperative teaching and learning approach on Tamale Business S H S Home Economics students‟ attitudes towards Biology.

4 examine the impact of the Cooperative teaching and learning approach on Home Economics students‟ academic achievement in Tamale Business S H S.

Research Questions

The following research questions guided the study:

1. How are the attitudes of Tamale Business Senior High School Home Economics Students towards Biology before the intervention?
2. What factors account for Home Economics Students‟ poor attitude towards Biology?
3. What is the effect of the Cooperative teaching and learning approach on Home Economics students‟ attitude towards Biology in Tamale Business S H S?
4. Is there any improvement in the academic achievement of Tamale Business S H S Home Economics students in biology using the cooperative teaching and learning approach?

Significance of the Study

If the work is published, schools with similar problems can adapt the method rather than the traditional methods that are used in majority of schools in the Metropolis.

The study would help students through working together to develop a much more positive attitude towards the learning of biology. The study would also help address the persistent poor academic achievement of students in the subject. Again, when the findings are made available to teachers and other stakeholders in science education, it would help in their decision making concerning methods of teaching biology to non-science students at the S. H. S. level.

It is hoped that the outcome of this research work would motivate biology teachers to incorporate the approach into the teaching and learning of biology which would improve biology teaching and learning in Business S H S. Finally, the outcome of the study would

form a basis for the organization of in-service training (INSET) for teachers of Biology in S. H. Ss. by the Tamale Metropolitan Division of G E S.

Delimitation

The research was restricted to only Home Economics Students in Business Senior High School in Tamale Metropolis because these students" performance had been noted to be poor. In addition, the study was delimited to only some topics in the biology syllabus.

Limitations

The main limitation of the study was the selection of Home Economics students from only one class in Tamale Business Senior High School. This was due to time constraint, where all the three Home Economics classes could not be considered for the study and this might not give a true reflection of the rest of the Home Economics students in the school. In addition, limitation may be due to the commitment levels of the students to learn through the cooperative teaching and learning approach. Finally, other instruments such as observations and interviews could have made the study more comprehensive.

Organisation of the study

The research was organised into six chapters. Each chapter begun with a brief overview dealing with what the chapter entailed followed by the main content of the chapter.

Chapter two, deals with review of literature. This covers the topical issues raised in the research questions and the purpose of the study. It ends with a summary of literature reviewed.

Chapter three deals with the methodology of the study, which consists of the research design, population, sample and sampling procedure, research instruments, data collection procedure, pilot test, pre-intervention, intervention and post-intervention and finally, the data analysis procedure. Chapter four, dealt with the results of the study while chapter five focuses on discussion of the results. The last chapter being six presents the summary, conclusion, suggestions and recommendations based on the outcome of the study.

Definition of operational terms

Home Economics: a Vocational course studied in Tamale Business Senior High School with electives as; Biology, Food and Nutrition, Management in Living and Economics.

Home Economics Students: students who offer Home Economics as a course.

Home Economics Students‟ attitudes: their confidence in Biology, concerns about teachers‟ lessons in Biology and relevance of Biology to them.

General Science: a Science course studied in Tamale Business Senior High School with electives as; Biology, Chemistry, Physics and Mathematics.

Biology teachers: teaching staff who handles Biology instructional lessons.

Cooperative teaching and learning approach: using group investigation of ten groups with six (6) students in each to work on the same topics.

Tamale Business Senior High School: a second cycle institution in the Northern region of Ghana.

Records of Business Senior High School: analysis of WASSCE results.

CHAPTER TWO

LITERATURE REVIEW

Overview

Understandably there has been a significant quantum of research work done in science education on students‟ attitudes and other related issues, but comparatively research attempts are less or absent on Home Economics students‟ attitudes and achievement in biology in second cycle institutions. The main purpose of this study is to improve the attitudes and achievement of S. H. S. Home Economics students in biology. It is aimed at finding out the attitudes of Home economics students towards biology and their achievement as well as improving them using cooperative teaching and learning approach. This chapter discusses the literature related to the subject under study. A brief description of the constructivist‟s and the cognitivist‟s theories have been discussed. Cooperative learning which is a contextual teaching and learning approach and the importance of the contextual teaching/ learning approach have also been discussed. It also discusses the need for the use of the contextual teaching and learning approach in teaching biology which transcends the boundaries of other methods of teaching especially the lecture method and the pedagogical practices of teaching biology to students. The literature related to this research and reviewed are as follows:

1. Theoretical framework
2. Cooperative learning
3. Attitudes of non-science and Home Economics students towards biology

Theoretical framework

The theoretical base of this research is embedded in the Constructivist and Social cognitivist theories of learning. Constructivism is an approach to teaching and learning based on the idea that learning is the result of mental construction. Students learn by fitting new information together with their past experience. Constructivists believe that learning is affected by the context in which an idea is presented as well as by the students‟ personal beliefs and attitudes. One definition is a conception of teaching and learning that helps teachers relate subject matter content to real world situations (United States Department of Education Office of Vocational and Adult Education, 2005). On the other hand, Berns and Erickson (2001) defined the concept as an innovative instructional process that helps students connect the content they are learning to the life contexts in which that content could be used. Constructivism calls for active participation in problem solving and critical thinking regarding an authentic learning activity that students find relevant and engaging (Briner 1999).

The social learning theory of Bandura emphasizes the importance of observing and modeling the behaviours, attitudes, and emotional reactions of others.

States that: Learning would be exceedingly laborious

not to mention hazardous, if people had to rely soley

on the effectsof theirown actions to inform them what

to do. Fortunately,most human behaviour is learned

observationally through modeling: from observing others

one forms an idea of how new behaviours are performed,

and on later occasions this coded information serves

as a guide for actions 1977, (p22).

Social Cognitive theory revolves around the notion that learning correlates to the observation of role models. In education, for example, teachers play the role of a model in a child‟s learning acquisition. Social learning theory has been applied extensively to the understanding of aggression (Bandura, 1973) and psychological disorders, particularly in the context of behavior modification (Bandura, 1969). It is also the theoretical foundation for the technique of behavior modeling which is widely used in training programmes. In recent years, Bandura has his work on the concept of self-efficacy in a variety of contexts (Bandura, 1997). According to Schunk (2004), the theory stresses the idea that human learning occurs in a social set up. He argues that through observation, people acquire knowledge, rules, skills, strategies, beliefs, and attitudes. Further, he states that individuals also learn from models that focused on usefulness and appropriateness of behavior and the consequences of modeled behavior, and they act in accordance with beliefs about capabilities and expected outcomes of their actions.

Cooperative learning

Cooperative learning is a component of the contextual teaching learning approach. According to Johnson and Johnson (1989), cooperative learning experiences promote more positive attitudes toward the instructional experience than competitive or individualistic methodologies. Johnson and Ahlgren (1976) examined the relationships between student‟s attitudes toward cooperation, competition, and their attitudes toward education. The results of the study indicated that student cooperativeness, and not competitiveness, was positive related to motivation to learn. Tjosvoild, Marine and

Johnson (1977) found that cooperative strategies promoted positive attitudes toward both didactic and inquiry methods of teaching science and students taught by cooperative strategies believed they had learned more from the lesson than did students taught by competitive strategies. It is in this regard that the cooperative strategy which is a contextual teaching and learning (CTL) approach is employed for this study.

Contextual Teaching and Learning approaches (Johnson, 2002; Sears, 2002; Sears & Hersh, 2000), like any approach to instruction, are characterized by the use of some learning strategies more than others. Below are five main components of CTL approach:

1. Inquiry learning. Students learn science in much the same way that science itself is carried out. Inquiry refers to those processes and skills used by scientists when they investigate natural phenomena. Inquiry involves an understanding of "how and why scientific knowledge changes in response to new evidence, logical analysis, and modified explanations debated within a community of scientists" (NRC, 2000, p. 21).

2. Problem-based learning. Students are given either a real or simulated problem and must use critical thinking skills to solve it (Gallagher, Stepien, Sher, & Workman, 1995). Ideally, they will need to draw information from a variety of disciplines. Problems that have some personal relevance to the students are often good choices because they encourage strong participation, learning, and perseverance.

3. Cooperative learning. Students work together in small groups and focus on achieving a common goal through collaboration and mutual respect (Tippins, Koballa, & Payne, 2002). Each student within the group is viewed as making a significant contribution to the goal.

4. Project-based learning. Students work independently or collaboratively on projects of personal interest (Blumenfeld, Krajcik, Marx, & Soloway, 1994). There is an emphasis on constructing realistic and valuable work products. When these projects benefit others, and have wider social relevance, they are often described as service learning (Billig, 2000).

5. Authentic assessment. Students are evaluated by means of their performance on tasks that are representative of activities actually done in relevant, real-life settings, often associated with future careers. An example of an authentic assessment is a portfolio, which is "a purposeful and representative collection of student work that conveys a story of progress, achievement and/or effort" (Atkin, Black, & Coffey, 2001, p. 31). For this study, the cooperative learning strategy is employed based on the objectives of the study, attitudes of Home Economics students revealed in the results of the HESAB instrument before the intervention and its advantages.

Cooperative Teaching and Learning, a CTL approach is based on situated cognition research (Cobb & Bowers, 1999; Kumar & Voldrich, 1994) which has found that constructivist processes such as critical thinking, inquiry learning, and problem solving should be situated in relevant physical, intellectual, and social contexts (Brown, 2000; Cavallo, Miller, & Saunders, 2002; Downing & Gifford, 1996; Driver, Asoko, Leach, Mortimer, & Scott, 1994; Glynn & Duit, 1995).

The subject matter can be delivered using the Contextual Teaching and Learning pedagogical model while also building critical and problem solving skills and social skills (Medrich, Calderon, & Hoachlander, 2002). However, to use the Contextual Teaching and Learning pedagogical model skillfully, teachers need to think and act in certain ways.

For example, there is less direct instruction on the part of the teacher, yet students are provided with a clear set of learning objectives. The teacher‟s role is to guide, discuss, question, listen, and clarify (Souders, 1999); a facilitator of knowledge rather than a dispenser of knowledge. In order to accomplish these roles, the teacher must be actively engaged with students. In using Contextual Teaching and Learning, teachers often need new equipment as well as new skills (Predmore, 2005; Souders, 1999), and sometimes an adjusted or new philosophy of teaching. Teachers interested in implementing Contextual Teaching and Learning should participate in professional development.

Cooperative learning is a mode of learning in which students work in small groups to achieve a purpose. Here there is an emphasis on the importance of group work, students in a group help each other in learning the content, but achievement is judged individually (Ronsini, 2000).

According to Slavin (1987), the two major theoretical perspectives related to cooperative learning are motivational and cognitive. The motivational theories of cooperative learning emphasize the students‟ incentive to do academic work, while the cognitive theories emphasize the effects of working together. Motivational theories are related to cooperative learning since it focuses on reward and goals structures. One of the elements of cooperative learning is positive interdependence, where students have in mind that their success or failure lies within their working together as a group (Johnson, Johnson & Holubec, 1986). From a motivational perspective, cooperative goal structure creates a situation in which the only way group members can attain their personal goals is when the group is successful (Slavin, 1990). Therefore, in order to attain their personal goals,

students are likely to encourage members within the group to do whatever will help the group to succeed and to help one another with a group task.

According to Johnson and Johnson (1991), unlike traditional classroom learning groups, Cooperative Learning groups are distinguished by five basic elements. These elements include heterogeneous grouping, positive interdependence, individual accountability, social skills, and processing. Each element will be explained in the following paragraphs.

Each cooperative learning group should contain 3 to 6 members; usually 4 members in a group. Each group should reflect the heterogeneous nature of the class. Groups might be mixed heterogeneously, first according to academic abilities and then on ethnic background and gender. Students should not be allowed to form their groups based on friendship or cliques.

Students in the learning groups must recognize that they are positively interdependent upon each other as they work toward a learning goal. This positive interdependence might be achieved through the task (division of labour), an established group goal, interdependent roles, and/or joint rewards.

Although the group has established performance goals, individuals are also measured on their performance. Students may be measured through test scores, task completion, or an assessment of collaborative effort.

The face to face interaction that is required in Cooperative Learning reinforces the need to identify, model, and assess social skills. In addition to the lesson, project, or product that groups are involved with, students are directly taught to listen actively, resolve conflicts, set and revise agendas, keep on task, and monitor individual and group progress.

The final stage in individual and any Cooperative Learning activity requires groups to reflect on and evaluate their group effectiveness. This structured evaluation typically allows group members to identify how well they achieved both the social and academic goals of the experience. Critical to this self/group assessment is the identification of strategies to overcome the identified obstacles or barriers during the next cooperative lesson. There were ten groups formed in this study each constituting 6 members by counting from 1 to 6 where all ones, twos, and so on formed a group.

Aspects of Cooperative Learning

Any collaborative structure that includes the five basic elements identified would be considered thus, Cooperative Learning (Scaglione & Blank, 1997). According to Newman and Thompson as cited in Vermette (1998), there are a number of specific cooperative structures that might be used in any classroom including Student Teams-Achievement Divisions (STAD), Jigsaw, and Group Investigation. Jigsaw and group investigation are among the most commonly used and popular versions of Cooperative Learning structures that extend for days or weeks (Newman & Thompson as cited in Vermette, 1998). Thus, the jigsaw and group investigation were utilized in this study since the study was to last the whole of second term of the schooling period of SHSs.

Like a jigsaw puzzle, each student in a five- to six-member group is given unique information on a topic that the whole group is studying. After reading their material (one section of the chapter or content), students work with members from other teams assigned the same content; each student becomes an "expert" on one topic. Next, students return to their teams to teach it to their teammates so that ultimately, the entire lesson is covered

within the group. Students are all assessed on all aspects of the topic (Kagan, 1989). To ensure that all students have the same information, the teacher may want an expert to explain each topic for the entire class or the teacher can provide an explanatory statement or elaborate on each topic.

With regard to the group investigation, students work in small groups, but each group takes on a different task or project, and within groups, students decide what information to gather, how to organize it, and how to present what they have learned as a group project to classmates. In evaluation, higher level learning is emphasized (Sharan & Sharan, 1992). The teacher may elect to determine the information to be covered in this assignment and develop guiding questions. Additional structures of cooperative learning employed exist as informal structures. According to Kagan (1989), some of the informal Cooperative Learning structures (for example, think-pair-share) are very effective and work well in class.

Effects of cooperative learning on science students

Borich (2004, p. 331) asked, "What good are critical thinking, reasoning, and problem-solving skills if your learners cannot apply them in interaction with others?" Cooperative learning activities instill in learners important behaviours that prepare them to reason and perform in an adult world (Adams & Hamm, 1996; Marzano, Pickering, & Pollock, 2001). Attitudes and values of learners are formed through social interaction. Borich (2004) noted that most of our attitudes and values are formed by discussing what we know or think with others. Continuing, in this manner, we exchange our information and knowledge with that of others who have acquired their knowledge in different ways. This

exchange shapes our views and perspectives. Our attitudes and values are among the most important outcomes of schooling (Borich, 2004). They provide the framework for guiding our actions outside the classroom. Cooperative learning is important in helping learners acquire from the curriculum the basic cooperative attitudes and values they need to think independently inside and outside of the classroom.

Academic achievements of students have been found to be enhanced by the use of cooperative learning (Lampe, Rooze & Tallent-Runnels, 1998; Johnson & Johnson, 1989; Slavin, 1990, 1991; Webb, 1989). Stevens and Slavin (1995) stated that, the fact that it has been linked to increases in the academic achievement of learners at all ability levels is another reason for its use. Bramlett (1994), Megnin (1995), and Webb, Trooper, and Fall (1995) in their contributions noted that cooperative learning activity engages the student in the learning process and seeks to improve the critical thinking, reasoning, and problem-solving skills of the learner.

While research efforts on cooperative-learning indicate that it enhances student achievement (Johnson & Johnson 1989; Slavin 1990; 1991; Webb 1989), Lampe, Rooze and Tallent-Runnels (1998) stated that peer interaction is central to the success of cooperative learning as it relates to cognitive understanding. They further noted that comprehension is facilitated. Lampe et al. (1998) again emphasized that, learners some of who might normally "turn out" or refuse to speak out in a traditional setting, become actively involved in the learning process through group interaction. Stahl and Vansickel (1992) noted that every cooperative-learning strategy, when used appropriately, can enable students to move beyond the text, memorization of basic facts, and learning lower

level skills. This method which results in cognitive restructuring leads to an increase in understanding of all students in a cooperative group.

Apart from academic benefits, cooperative learning has been found to promote self-esteem, interpersonal relationship and improved attitudes toward school and peers (Johnson & Johnson, 1996). Lampe et al. (1998) stated that in a competitively structured classroom, except for the few "Winners" or students who succeed, self-esteem can suffer. When competition is promoted, students may learn to value winning at all costs, and cooperation may be discouraged (Lampe, et al. 1998; Conrad, 1988). Although the advocates of cooperative learning are not opposed to all forms of competition, they do oppose inappropriate competition (Johnson & Johnson, 1996; Johnson & Johnson, 1991). Stahl and Vansickel (1992) stated that inappropriate competition tends to widen the existing differences and abilities, which, in turn, can widen negative perceptions of others on the basis of gender, race, or ethnicity. Studies by Glassman (1989) and Johnson, Johnson and Stanne (1986) and comments by Johnson and Johnson (1996) and Trowbridge and Bybee (1996) on cooperative learning found cooperative-learning groups to equalize the status and respect for all members, regardless of gender. Research by Klein (1985) noted by Lampe et al. (1998) revealed that competitively structured classrooms have the effect of favouring boys or reinforcing sex role stereotypes that may limit opportunities for girls. In cooperative learning this usually is not the case, where interaction among students is intense and prolonged and students gradually take responsibility for each other‟s learning (Borich, 2004).

A synthesis of researches on the influences of ability and gender on cooperative learning outcomes indicated similar findings in all. Studies by Stevens and Slavin (1995), Bramlet

(1994), Megnin (1995), Webb, Trooper and Fall (1995), Glassman (1989), Johnson, Johnson and Stanne (1986), and Crosby and Owens (1993) found that cooperative learning gains are not limited to a particular ability level or sex but to all who engage in it. Stevens and Slavin (1995), for example, linked cooperative learning to increases in academic achievement of learners at all ability levels, while studies by Glassman (1989) and Johnson, Johnson and Stanne (1986) found cooperative learning to equalize the status and respect for all group members, regardless of gender. Again the study by Crosby and Owens (1993) found that different cooperative learning strategies can be employed to help low ability students to improve achievement, who had difficulties making success in the traditional classroom.

In general, cooperative learning can be said to lead to the formation of attitude and values, provision of models of prosocial behaviour, presentation of alternative perspective and viewpoints, building a coherent and integrated identity, and promotion of critical thinking, reasoning, and problem-solving behaviour (Borich, 2004; Stevens & Slavin, 1995; Abruscato, 1994; Zehin & Kottler, 1993). All these result in collaborative skills improvement, better self-esteem and increased achievement. (Johnson & Johnson, 1996).

Biology teaching and learning today is to a great extent focused on activities by which the learner acquires facts, rules and action sequences (Kpangban & Ajaja, 2007). In a student-centered instructional approach like the cooperative teaching and learning, using student ideas means incorporating student experiences, points of view, feelings, and problems into the lesson by making the student the primary point of reference. A completely student oriented lesson is always initiated by asking students questions and

assigning specific roles to them on the content to be taught and their answers and dispositions would become the focus of the lesson. This approach, according to Borich (2004), is intended to heighten students‟ interest and to encourage positive attitude and feeling towards the subject. Research by Johnson and Johnson (1991) on learning together and alone showed that cooperative learning enhanced more positive attitude towards subject members and the teacher.

Most literature related to science education in terms of attitude, has various meanings and it is very important to know and distinguish them from individual writers as used in their work. Science education as defined by eminent scientists such as Dienye and Gbamanja (1990) is the study of interrelationship between science as a discipline and the application of educational principles to its understanding, teaching and learning.

In his book, Heim (op. cit) concluded that the lack of adequate time allotment, scarcity of science teachers, lack of teaching materials, classroom equipment and laboratory equipment hamper the effective teaching and learning of science, thus produce negative attitude toward science education.

Attitudinal studies in science education area are mostly pertinent to elementary, middle and high school students, and in some cases college students. (Turkmen, 2007). As science has become ever more deeply embedded in our everyday life, how ordinary people perceive science has attracted growing attention not only from the scientific community, but also from social scientists (Bak, 2001). A significant amount of research in science education is devoted to understanding ways we can improve the quality of science thus, biology and increase enrolment in biology courses. One of the key factors related to learning science is students‟ attitudes, and the development of positive attitudes

toward science can motivate student interest in science education and science-related careers (George, 2006).However the definition or concept of attitude towards science is vague and ambiguous. Attitude is a concept that defines emotional trends in response to affaires, persons, locations, events or ideas. Therefore, phrases as "I like science" or "I enjoy science courses" enumerate as attitude (Simpson & Oliver, 1990). Ogunleye (1993) in his findings, reports that many students developed negative attitudes to science learning, probably due to the fact that teachers are unable to satisfy their aspiration or goals. Alao (1990) showed that there is positive correlation between attitudes and performance in the science subjects. There are many factors that influence attitudes and achievement among adolescents. Some of the factors are associated with parental background and family environment. Other factors relate to individual characteristics such as self-concept, locus of control, and achievement motivation. Still other variables are associated with schools influences such as class climate, teachers, and administrative styles (Taltont& Simpson, 1985).

Attitudes of non-science and Home Economics students towards biology

The development of a positive attitude toward science is one of the most important goals of the curriculum (Koballa & Crawley, 1985; Laforgia, 1988). Students" attitudes toward science and science education have received much attention (Osborne, Simon & Collins 2003).

Biology is boring for many students (Ebenezer & Zoller, 1993; Delpech, 2002), difficult and not relevant to the people"s lives, more attractive to boys and less interesting to older students

(Ramsden, 1998).

Biology is a unique discipline where experiments with living organisms can take place both in the laboratory and in the field. However, increasing use of virtual environments instead of practical investigations in biology has recently been documented (Partridge, 2003; Tranter, 2004). This practice invariably affects students‟ achievement negatively. How do students regard biology compared with other subjects? Several studies have been concerned with attitudes toward particular disciplines like physics (Angell, Guttersrud & Isnes, 2004) or chemistry (Salta & Tzougraki, 2004) but few studies have focused on students‟ attitudes toward biology (Spall, Stanisstreet, Dickson & Boyes, 2004). Though many of researches on attitude towards science have dealt with science in general, there are some researchers who examine this construct in specific science courses as physics, biology or chemistry and so on. For example Krogh (2005) assessed secondary students‟ attitude towards physics and also Bennett (2001) did similar research on chemistry. Weinburgh‟s (1995) meta-analysis research suggests that there is only a moderate correlation between attitude towards biology and achievement. Longitudinal study of Oliver and Simpson (1988) shows a strong relationship between the three affective variables - attitude towards biology, motivation to achieve and the self-concept that the individual has of their own ability - and their achievement in biology. Regarding the importance of attitude towards biology among adolescents in this study, attitudes of SHS Home Economics students towards biology and its effects on their achievements in biology is examined. The gap in Home Economics students‟ studying biology literature calls for this study to improve the attitudes and achievement of Home Economics students in biology. It is also of great concern due to the fact that girls are mostly the

majority who offer the Home Economics programme and have preference for biological sciences while boys prefer the physical sciences.

Summary

Cooperative Learning is the instructional use of small groups so that students work together to maximize their own and each other‟s learning (Johnson, Johnson, & Holubec, 1993). Cooperative learning technique has two major theoretical perspectives thus, motivational and cognitive. The motivational theories of cooperative learning emphasize the students‟ incentive to do academic work, while the cognitive theories emphasize the effects of working together. Cooperative learning experiences promote more positive attitudes toward the instructional experience than competitive or individualistic methodologies. The approach has numerous benefits such as instilling in learners important behaviours that prepare them to reason and perform in an adult world (Adams & Hamm, 1996; Marzano, Pickering, & Pollock, 2001). Research efforts on cooperative teaching andlearning indicate that it enhances student achievement (Johnson & Johnson 1989; Slavin 1990; 1991; Webb 1989). Lampe, Rooze and Tallent-Runnels (1998) stated that peer interaction is central to the success of cooperative learning as it relates to cognitive understanding.

Cooperative learning is a component of the Contextual teaching and learning approach. Although Contextual Teaching and Learning approach is a relatively new concept in the field of education, its principles and practices have been around for centuries (Dijkstra, 1998).

The attitudes of students toward biology and academic achievement have been of great interest in most researches. Attitudinal studies in the area of science education are mostly pertinent to elementary, middle and high school students‟, and in some cases college students. (Turkmen, 2007). Regarding the importance of attitude towards biology between adolescents in this study, attitude of SHS Home Economics students towards biology and its effects on students‟ achievements in biology courses are examined.

Studies on Home Economics and other non- science students‟ attitudes toward biology have revealed several claims about its educational purpose. One claim which has persisted is that Home Economics is an applied science, applying the principles of science to everyday living, encouraging reasoning about the tasks of daily living, contributing to an appreciation of right living, and in general, improving the quality of life. Isabel Bevier during her time at the University of Illinois (1921) fervently believed that Home Economics would gain intellectual recognition and social value as an applied science. However, the continual abysmal performance of this category of students needs to be looked at.

CHAPTER THREE

METHODOLOGY

Overview

This chapter describes the method and procedures employed to collect data for the study. The chapter comprises the research design, population, sample and method of sampling, instruments for data collection made up of questionnaire and tests, the validation of the instruments, pre-intervention, intervention and data collection. It ends with data analysis.

Research Design

This study is an action research aimed at improving Home Economics students‟ attitude towards biology and their academic achievement. Action research is a form of investigation designed for use by teachers to attempt to solve problems and improve professional practices in their own classrooms. It involves systematic observations and data collection which can then be used by the practitioner -researcher in reflection, decision- making and the development of more effective classroom strategies (Parsons &Brown, 2002). Again, Creswell (2008) states that action research is the most commonly applied practical research design in education today, since according to Altrichter (1993, p.48), “unlike many other research and development approaches, action research does not want to replace the practitioners‟ thinking by expert knowledge but rather aims to build on it and to support it”. Creswell (2008) continued by saying that teachers reflect on what

worked well and what did not, what needs adjustment, and what should be discarded altogether. He concluded that teachers also consider what new practices hold promise for the academic attainment of their students.

Mills (2000) believes that the purpose for choosing action research is to affect positive educational change. The basis for the choice of action research was because of its flexibility in implementing an intervention step by step within the context of the problems. Action research improves teacher‟s classroom practice and enhances students‟ learning, and also promotes personal and professional growth of the teacher (Johnson, 1995).

This study was carried out in three phases. The 1st phase consisted of pre-intervention activities thus collection of data on respondents‟ attitudes towards biology and academic achievement, the 2nd phase consisted of intervention activities whiles the 3rd phase was the post-intervention activities.

Population

The target population for this study comprised all Senior High School Home Economics studentsin Tamale Metropolis in the Northern Region of Ghana. At the time of the study, the school had a total population of 1,850 students that is, the 2013/2014 academic year. The school runs four different programmes Business, General Arts, Home Economics and General Science. The accessible population for this study consisted of 430 Home Economics students distributed among three grade levels, form three (150), form two (120) and form one (160). The large enrolment is due to the fact that the school was established purposely for business and Home Economics programmes. There are nine

classes for Home Economics students in the school all offering biology alongside Food and Nutrition, Management in living and Economics as the four elective subjects. Biology was included in Home Economics programme in 2001to meet the entry requirements into the Universities for further studies.

There was only one trained biology teacher and one integrated science teacher for biology instructional lessons. The school lacks well-established science laboratory, science equipment and materials even though there was a science laboratory which was established over 60 years ago. It had been abandoned for lack of science facilities.

Sampling Procedure

A sample of 66 (32 males, 34 females) form two S H S Home Economics students taking biology as an elective subject was purposely selected for the study. Other electives offered by these students included Food and Nutrition, Management in-Living and Economics. The students‟ ages ranged between 14 and 24 years with a mean age of 19 years. Purposive sampling was adapted because it deals with a conscious selection of people of a particular set of attributes that have an effect on the problem or issue of interest and ensures comprehensive representativeness (Stringer, 1996; O‟ Lery, 1990). It implies that, a particular sampling unit to be selected for the sample depends on the subjective judgment of the researcher. Notwithstanding the subjectivity of this sampling procedure in nature, the advantage of its ability of releasing good and adequate information cannot be overlooked. As noted by Patton (2002), “The logic and power of purposeful sampling lie in selecting information-rich cases for the study. Information rich

cases are those from which one can learn a great deal about issues of central importance to the purpose of the inquiry..." (p. 230).

Three reasons accounted for the use of SHS 2 students for this study. Firstly, the SHS 3 students could have been the appropriate group since they had almost covered the biology syllabus. However, they were being prepared towards the final WASSCE and as such; the school authorities would not endorse such students for the study. Secondly, the SHS 1 students were not the appropriate group due to the fact that, they were just admitted at the time of the study and were yet to settle down. Thirdly, it was expected that by the end of the second year of Senior High School (i.e. SHS 2), students would have covered a greater part of the content of SHS biology syllabus. Since the attitude instrument was to determine students‟ attitudes towards biology, it was considered that the SHS 2 students were the cohort of students more likely to be able to give appropriate responses on the attitude instrument. Finally, the researcher was teaching form two students biology thus, she will not have much difficulty in identifying students‟ learning abilities and other factors. The sample was then obtained through a ballot involving three representatives from three classes where the individual that picks a yes is selected thus, the class leaving the rest.

Instruments

Two instruments, a questionnaire on students‟ attitude towards Biology and an achievement test were used to collect data for the study.

Questionnaire

A questionnaire, Home Economic Students‟ Attitudes towards Biology **[**HESAB] (Appendix A) was developed by the researcher based on extensive literature review on areas related to students‟ attitudes towards biology. These areas include students‟ attitudes towards science, non-science students‟ attitudes towards biology and Home Economics students‟ attitudes towards biology. At this stage, a pool of 15 items was created using the content of the areas reviewed as a guide. The items consisted of both positive and negative statements to avoid students‟ answers being skewed toward the positive response options. The questionnaire was based on a five point Likert type scale (1= strongly disagree and 5= strongly agree). Each option was weighted. Positive items were scored „Strongly agree‟ =5; „Agree‟ =4;‟ Neutral‟ = 3;‟ Disagree‟ =2 and „Strongly disagree‟ =1. For the analysis of the data, the scoring of all negative statements was done in the reverse order, that is: „strongly agree‟ =1; „Agree‟ =2; „Neutral‟ =3;‟ Disagree‟ =4 and „Strongly disagree‟ =5. This is to ensure that a numbered response on the Likert scale would represent positive attitude.

Reviewers were informed about the goal of the study and the purpose of the instrument, and were asked to individually check each item‟s relationship with the goal of the instrument, content, clarity, redundancy and any other related issue that might result in improving the items or the instrument as a whole. All reviewers‟ comments and suggestions were collected, analyzed and considered. This resulted in changing, deleting, or adding few items to the existing instrument. A greater number of the items were considered clear and appropriate. Two items were revised slightly and two others were dropped either the experts considered them unclear, or the item content was redundant

with another item. By the end of this step, an improved draft of the instrument was developed with a total of 13 items. Examples of these items are: “Biology is a boring subject” (Item 1), “knowing biology will earn me a living” (Item 7) and “getting a teacher to take me seriously in biology is a problem” (Item 10).

The final draft instrument contained two parts with the first seeking information on students‟ demographic characteristics such as, gender and age. The second part, Home Economics Students‟ Attitudes towards Biology (HESAB) scale assessed SHS Home Economics students‟ attitude towards biology. The instrument consisted of 11 Likert-type items related to students‟ interest in biology, relevance of biology to students and the teacher and instructional methods. This was because of the deletion of two items during the reliability.

A Likert scale is commonly used to measure attitudes, knowledge, perceptions, values, and behavioural changes. A Likert-type scale involves a series of statements that respondents may choose from in order to rate their responses to evaluative questions (Vogt, 1999). Also, likert-type scales are easy to construct and as much provide the researcher with opportunity to compute frequencies and percentages, as well as statistics such as means and standard deviation of scores. This invariably, allows for more sophisticated statistical analyses such as analyses of variance and factor analysis to be performed on the data (Page-Bucci, 2003). Again, Likert scales are often found to provide data with relatively high reliability (Gable & Wolf, 1993). Notwithstanding, there seems to be some concerns as to whether Likert-type scales are a good instrument for measuring attitude (Gal & Ginsburg, 1994). However, other researchers (Robson, 2002;

Neuman, 2000) favour the use of Likert-type scales. Robson (2002) indicated that Likert scales look interesting to respondents and people enjoy completing a scale of this kind.

Tests

Two teacher-made tests were developed and administered before and after the intervention (Appendix B). The tests consisted of both multiple choice and essay type items. These were constructed by the researcher and the questions drawn from the topics taught on interactions in nature thus, ecological concept, ecological terminologies and factors of the ecosystem for pre-test whiles the post-test was constructed from the following topics; the Soil, study of specific habitats, food chains and webs, biological associations, pyramids and concept of symbiosis. Each test had two sections A and B with A made up of 10 compulsory multiple choice whiles B had two essay type questions all to be answered. The content of the items were validated based on the existing instructional objectives stipulated in the biology syllabus for Senior High Schools in Ghana (CRDD, 2008).

The pre- and post-tests scripts were scored out of 30 marks each. The scores were used to categorise the students into three ability groups, low, average and high achievers.The low achievers were those who scored less than 15 marks out of 30 on the pre-test, while the average and the high average were those who scored between 15 and 25; and above 25 out of the 30 marks respectively.

The post-test was administered to the students after the intervention. Time allotted for students for both tests was 40 minutes. Each correct response in section A attracted a maximum of one mark whereas a question in section B attracted 10 marks (Appendix C).

Pilot test

Pilot test, according to Polit and Hungler (1995), is a small-scale version or trial done by the investigator in preparation for the major study. In this study, the student attitude instrument was piloted on 37 SHS 2 Home Economics students in Northern School of Business to establish the internal consistency and reliability of the questionnaire. Northern School of Business was chosen for the pilot test because it runs similar courses. Also, students‟ demographic characteristics were similar because they were of the same year group. The Home Economics students in this school had been taught the similar topics in biology from the syllabus for the past year. Participants were assured of confidentiality, and the instrument was responded to anonymously with no identification information. They were given sometime within the instructional hours to provide their responses after which all questionnaires were received.

Validity of Instruments

Validity of HESAB

According to Joppe (2000), validity in quantitative research determines whether the research truly measures that which it was intended to measure or how truthful the

research results are. Face validity of the questionnaire items for this study was determined by both lecturers and colleague students to ensure there were no redundant and ambiguous items.

The construct validity of the questionnaire was established by employing the confirmatory factor analysis (Appendix D). The first step involved extraction of factors through principal component analysis with varimax rotation. This resulted in the generation of three (3) components with Eigen values exceeding one. According to Osman, Lilia & Subahan (2006), the Eigen value represents a measure that attaches to the factors and indicates the amount of variance in the pool of original variables that the factors explain. Each construct (factor) is retained if its Eigen value was more than 1.

The next step involved factor rotation. In this study the varimax rotation method was used because of its advantage in producing factors (constructs) that are free and independent of one another (Blakenship & Moore, 1977). In the extraction of factors, a scree plot was used to determine the number of components to be extracted. The *scree test* (Cattell, 1966) is also based on eigenvalues but uses their relative rather than absolute values as a criterion. Cattell suggested that the "right" number of factors can be determined by looking at the drop in amount of information (and, thus, in eigenvalue magnitude) across successive factors. Ideally, the progression of factors will have a point at which the information drops off suddenly, with an abrupt transition from vertical to horizontal and a clear "elbow" (Figure 1). In the plot, the drop was indicated on the second component.

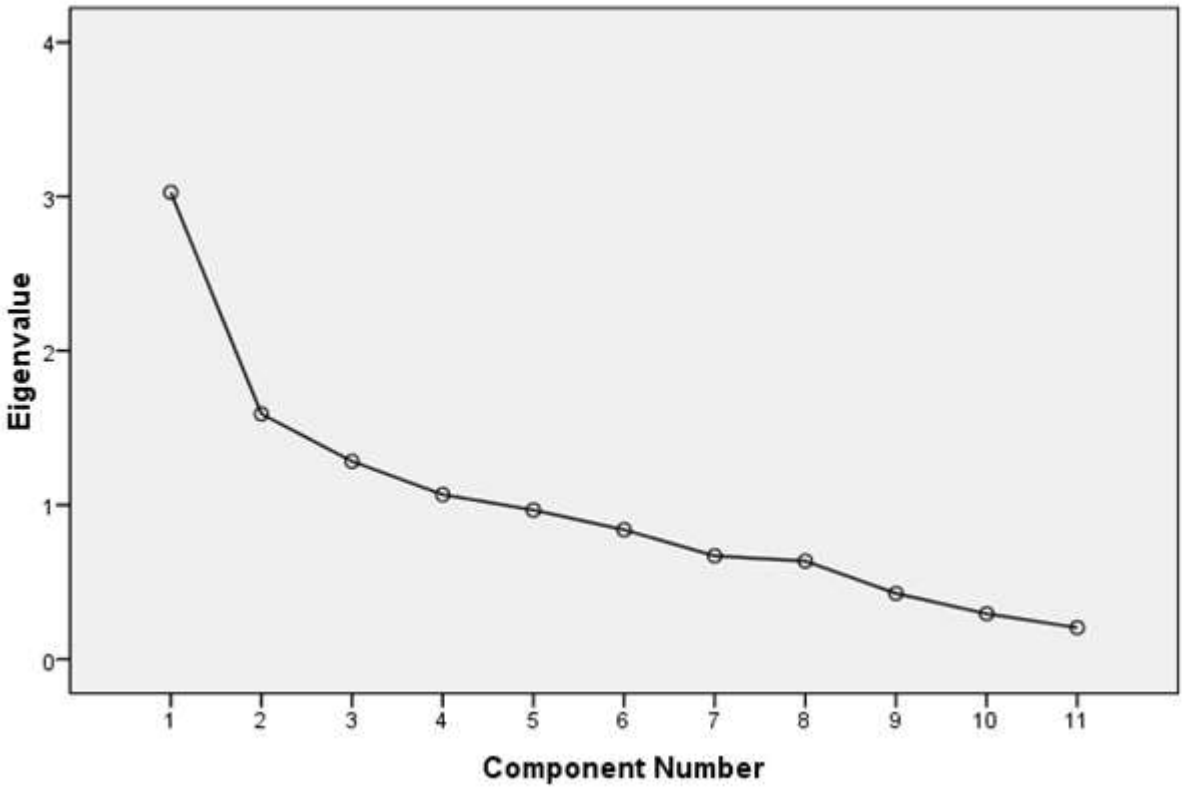

Fig 1: Screeplot

The plot confirms that only three factors were extracted. The curve of the plot is the point at which a component is extracted. A systematic conduction of these procedures stated, led to the extraction of three factors which all contribute to 53.6 percent of the overall variance. Factor one loaded 2 items (items 10 and 11), 5 items loaded onto factor two (items 3, 2, 8, 4 and 7) and 4 items onto factor three (items 1, 9, 5 and 13).

A factor is considered interpretable to the extent that the items associated with it appear similar to one another and make theoretical and logical sense as indicators of a coherent construct. Factor two had high loadings with 5 items representing the relevance of biology followed by factor three with items representing students‟ interest to study

biology and finally factor one had 2 items interpreted as the teacher in motivating students to study biology.

Table 2:

Descriptive statistics, Factor Loading and Item-Total Correlations of HESAB Scale

Factors	Item	MS	SD	Item-total correlation	Alpha if item-deleted	Factor Loadings
F1	10	2.14	1.06	.41	.55	.85
	11	4.19	.94	.44	.54	.57
F2	8	4.27	.96	.29	.56	.83
	3	2.03	.89	.44	.66	.80
	4	2.08	.86	.35	.65	.58
	2	2.57	1.04	.56	.64	.56
	7	4.38	.86	.23	.59	.48
F3	5	4.34	.93	.21	.59	.69
	13	1.73	.90	.12	.63	.66
	1	3.00	1.08	.66	.62	.64
	9	4.16	1.04	.36	.55	.62

Factor 1= the teacher (T), Factor 2= relevance of biology (R) and Factor 3= interest or confidence of students (C)

Table 3:

Percentage of overall variance of the three factors

Factor	Percentage (%) of total variance
1	27.51
2	14.45
3	11.66
Percentage of overall variance	**53.62**

The percentage of overall variance was high at 53.6. The percentage of the total variance at 53.6 was good according to Fraser, McRobbie and Giddings (1993). Given that individual means were used as the unit of analysis.

Table 2 shows that the factor loadings on the first component, factor 1, ranged from .57 to .85 and this component was interpreted as the extent to which Home Economics students learn biology effectively through the teacher as an instructor.

The second principal component, Factor 2, had factor loadings ranged between .48 to .83 This was interpreted as the extent to which biology is relevant to Home Economics students.

The third principal component, Factor 3 had factor loadings which ranged from .62 to .69. It was interpreted as the extent to which Home Economics students have interests or confidence to study the Biology.

The total average mean of all scales was 3.17 whiles the average means of factor one; two and three were at 3.17, 3.07 and 3.31 respectively. Each of the three sub-scales

consisted of 2, 5 and 4 items respectively. Hence, factor three is highly correlated indicating positive attitudes of respondents followed by factor one and finally factor two. The item means for teacher ranged from 2.14 to 4.19 with average sub-scale mean of 3.17. Item means for relevance also ranged from 2.03 to 4.38 with sub-scale mean of 3.07 whereas item means for confidence ranged from 1.73 to 4.34 with a sub-scale mean of 3.31.

Validity of the test

Validity refers to whether a test truthfully does what it is constructed to do (Taale & Ngman-Wara, 2003). In addition the validity of a test is dependent upon the use of the test. A test is valid if its results are appropriate and useful for making decisions and judgment about an aspect of students" achievement (Gronlund & Linn, 1990). For face validity, the test items used were validated by two experienced teachers who had taught biology for five years in the school for the study. They checked the test items to ensure they are within the content of the topics taught.

The content validity of the test items were examined by the researcher based on the cognitive level of the students and the instructional objectives stipulated in the biology syllabus for Senior High Schools in Ghana (CRDD, 2008) and the course content used in the intervention.

According to Taale and Ngman-Wara (2003), content validity is most appropriately considered in connection with achievement testing. An achievement test has content validity if it represents faithfully the objectives of a given instructional sequence and

reflects the emphasis accorded those objectives as the instruction was carried out. In other words, it is the degree or the extent to which the test items adequately cover the subject matter or the part of the curriculum covered during instruction

Reliability of Instruments

Reliability of HESAB instrument

Joppe (2000) defines reliability as the extent to which results are consistent over time and if the results of a study can be reproduced under the same methodology, then the research instrument is considered to be reliable. Data from the pilot test was used to determine the reliability of the research questionnaire. Item analysis was at this point carried out to identify items whose removal would enhance the internal consistency of the instrument. In particular, an attempt was made to improve the internal consistency by removing items with low item correlations (i.e. correlations between a certain item and the rest of the items excluding that item) (Appendix E). Items meeting any of the following criteria were deleted: correlation coefficient between an item and the total score less than 0.30 and if internal consistency (Cronbach α) of the whole scale was high after deleting the item. This led to the deletion of two items (6 and 12) of the 13 items. The remaining 11 items resulted in a Cronbach alpha reliability coefficient of .69 (Appendix F) as shown in (Table 4).

Table 4:

Reliability Coefficient of the HESAB Instrument

No. Of Items	Alpha Coefficient	KMO	Bartlett's Test
11	.692	.585	.002

The Bartlett"s Test was significant at P<0.05. According to Leach, Barrette and Morgan (2005) alpha value of 0.70 and above shows a reasonable internal consistency and that the alpha values between 0.60 and 0.69 indicate minimally adequate reliability. They however added that a lower alpha value may be due to a handful of items in a scale. According to Ary, Jacobs, and Razavieh (2002), if results are used to make decisions about a group or for research purposes, reliability coefficients of 0.50 to 0.60 are accepted. The instrument was therefore accepted as reliable by the researcher based on the purpose and objectives of this study. Thus, the final HESAB instrument had 11 items.

Test reliability

The reliability of a test refers to how well it provides a consistent set of results across similar test situations, time periods and examiners (Taale & Ngman-Wara, 2003). In other words, it is the consistency with which a test measures whatever it measures from one measurement to another, over and over again, over times. Also, Reliability concerns the degree to which an experiment, test, or any measuring procedure yields the same results on repeated trials (Patton, 2002). The researcher administered an initial test followed by a second one within the intervening time to the participants. The test-retest

with alternate forms method was used to determine the reliability. In this method, the correlation coefficient between the two sets of observed scores is an estimate of the reliability of either one of the alternate forms and this is known as the coefficient of stability and equivalence. Hence, a strong correlation coefficient between the two tests was at 0.91(Appendix L).

Pre-intervention

This stage involved the administration of the HESAB questionnaire and conduct of a pre-test. The questionnaire sought response on Home Economics Students‟ attitude towards Biology. Students were assured of their confidentiality and the items explained to them. The questionnaire was administered in the first week on commencement of the study to determine the attitudes students have towards the Biology. The questionnaire was administered during biology lessons for prompt retrieval and analysis.The pre-test was also conducted the same week in the respondents own classroom under the researcher‟s supervision within a period of 40 minutes. The test was meant to assess students‟ achievement in Biology. The test was scored out of 30 marks and the data analysed.

From the data analysed, it was revealed that Home Economics students have negative attitude towards Biologyand the responsible factor was the teacher. Also, the pre-test results showed poor achievements of students.

Intervention

The intervention process involved the use of the Contextual teaching and learning model **(**Fig 2) to teach a major biological topic, Interactions in nature with units as ecological habitats, factors of the ecosystem, the soil, biological associations, food chains and webs, pyramids and concept of symbiosis.

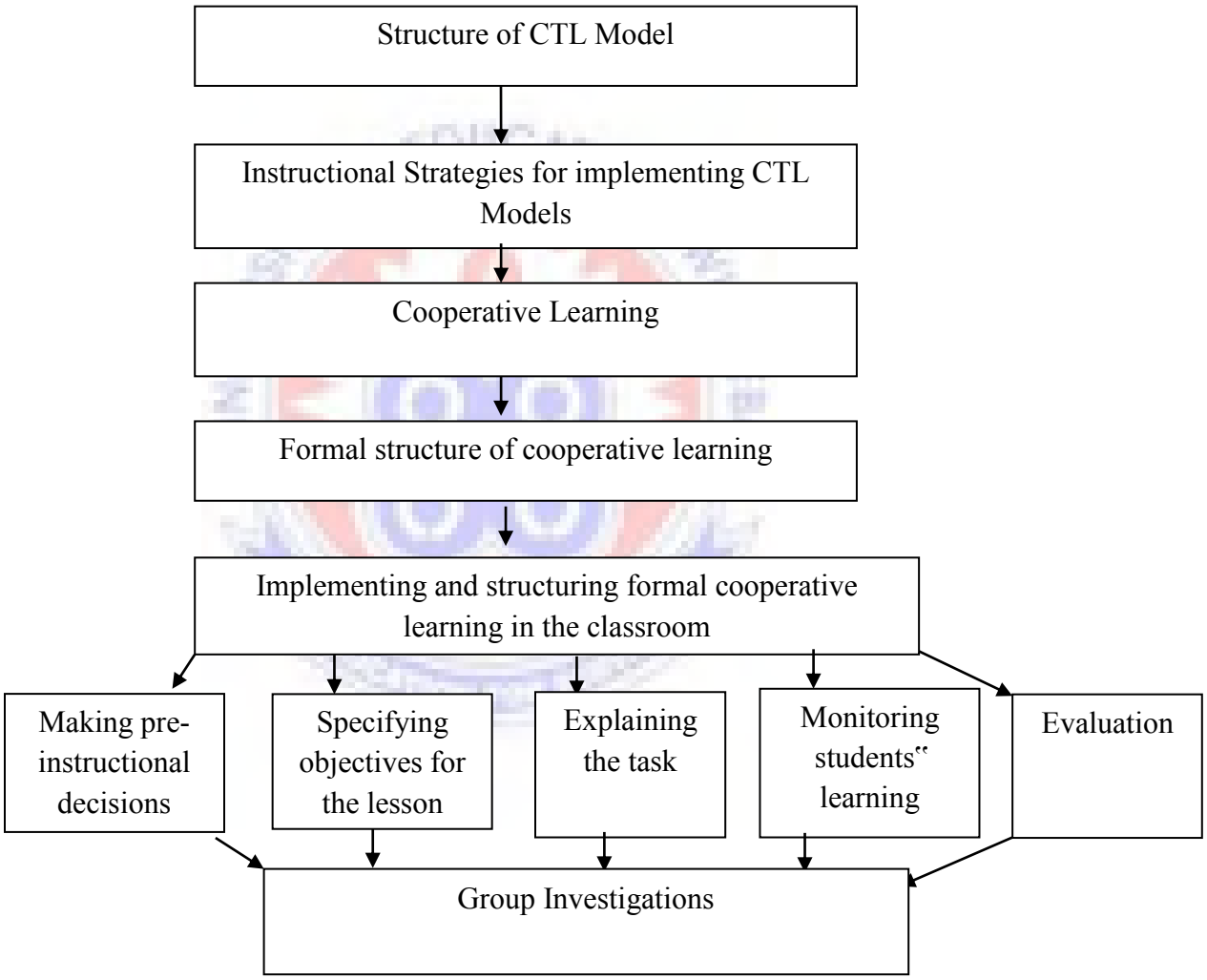

Fig 2: CTL (cooperative learning strategy) model

Cooperative Learning, a CTL approach, is the instructional use of small groups so that students work together to maximize their own and each other‟s learning (Johnson, Johnson, & Holubec, 1993). It is a successful teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject. Each member of the team is responsible not only for learning, but also for helping teammates learn. Table 5 shows the attitudes of Home Economics students before the intervention.

Table 5:

Subscales, Items and Means of HESAB instrument before intervention

Subscales	Item no.	Statement	Mean
The teacher	10	Getting a teacher to take me seriously in biology is a problem	2.98
	11	My teachers have encouraged me in my progress in biology	4.21
		Average sub-scale mean	**3.61**
Relevance of biology	**8**	Attending biology courses made me understand better the surrounding world	4.41
	3	Doing well in biology is not important for my future	4.18
	4	I don‟t expect to use biology much when I get out of school	4.11
	2	Biology will not be important to me in my life‟s work	4.58
	7	Knowing biology will earn me a living	4.52
		Average sub-scale mean	**4.36**
Interest or confidence of students	**5**	I would like to attend biology classes in all school grades	4.32
	13	I‟m not the type to do well in biology	3.92
	1	Biology is a boring subject	4.39
	9	I discuss with my friends things I learn in biology courses	3.85
		Total mean	**4.12**

As shown in Table 5, students indicated positive attitude about the relevance of biology to them (MS=4.36) followed by their interest in biology (4.12). However, the teacher and his/her instructional methods were observed to be rather neutral (3.61).

In agreement with these results, best mean scores were found for items focused on the relevance of biology and interest of students. Especially items such as "knowing biology will earn me a living", "I will like to attend biology classes in all school grades", "attending biology courses made me understand the surrounding world", "biology will not be important in my life‟s work [scored in the reverse order thus, all negative items scored as 1 for strongly agreement and 5 for strongly disagreement]" and "biology is a boring subject [scored in the reverse order]" had mean scores above 4 (i.e, high agreement of respondents). In contrast, mean score of item 10 was below 3.0 which suggested that a significant part of the students showed some learning difficulties when learning biology whiles two items such as "I discuss with my friends things I learn in biology courses "and "I‟m not the type to do well in biology" [scored in the reverse order] were below 4.0 (i.e, negative attitude of participants). The neutral responses show that respondents neither disagreed nor agreed on the statements hence, students still showed negative attitude towards Biology.

The cooperative learning strategy was employed by the researcher for this study because of the identified factors from the questionnaire thus, the teacher factor that contribute to the students‟ poor attitudes towards biology. The model consists of five steps as making pre-instructional decisions, specifying objectives for the lesson, explaining the task, monitoring students‟ learning and evaluation. Jigsaw and group investigation are among

the most commonly used and popular versions of Cooperative Learning structures that extend for days or weeks (Newman & Thompson as cited in Vermette, 1998).

The researcher implemented this model through the group investigation during the intervention stage. A plan of activities for six weeks instructional lessons during the intervention stage are outlined in Table 6.

Table 6:

Activities during the intervention stage for a period of six weeks

Weeks	Group	Content/Topic	Objectives	TLMs/Activities	Presentations/Evaluation
1	All	Terrestrial habitats, Aquatic habitats	outline the general characteristics of aquatic and terrestrial habitats	Biology Text books. Observation of Habitats by students, groups" discussions.	Group presentations in class; organisms are on land, aquatics in water. questions and answers
2	All	Biotic & Abiotic factors, effects	explain the effects of abiotic, biotic factors on the environment	Texts books/ observe and discuss interactions of the two different f actors.	Presentations: Photosynthetic organisms, chemical, Physical environment. Individual questions: e.g. what is the effect of light on plants, animals? etc.
3	All	Soil components and properties, experimental determination methods	list and explain soil components, determination of Air and water in soil	Text books/discussion on findings, Illustrations on determination of water and air in soil samples	Presentations/properties: Air, water, organic and inorganic substances. Sandy retains less water while loamy holds moderate, clay retains high. Questions
4	All	Food chains & webs, methods of determining food chains & webs	explain food chains, webs. how to determine them	Videos/Observations in surroundings/ discussions.	Presentations: food chains, webs by means of diagrams. Explanations: direct method observation of organisms as they feed. Eg. Goat,fowl
5	All	explain the components of pyramids, concept of symbiosis	explain the components of pyramids, concept of symbiosis	Presentations: Charts of pyraminds. Explanation of concept of symbiosis.	Presentations: Charts of pyraminds. Explanation, symbiosis is feeding relationship involving two orgs. Questions: parasitism; affects one
6	All	Post test	All questions	Written test for 40 minutes	Section A;10 questions, B; 2

In implementing the cooperative model in the classroom, the researcher employed theGroup Investigationwhich is one of the major formal structures of cooperative learning for the intervention. In this method, six groups of seven and four of six students were formed.

Students were made to form a line at the front of the room. They lined up alphabetically by last name. Then, count off in groups 1, 2, 3, 4, 5 and 6. All the ones formed a group, all the twos formed a group, and continue until all groups are formed. Based on previous instructions and evaluation the researcher reassigned some students to different groups based on gender, below average, average and high average. Students were assigned roles such as facilitator, recorder, and spokesperson in each group. They were provided with textbooks and other resources (internet) by the researcher. At this point, objectives for the various groups‟ topics (Table 6) were clearly stated to them by the researcher to guide participants in their investigations. All groups were assigned the same task or project, and within groups, students decided what information to gather, how to organize it, and how to present what they have learned as a group project to classmates. Students worked together in assigned groups. The researcher estimated the period and time allotted to the various groups‟ presentation as 15 minutes each.

The next stage was the explanation of the tasks. The researcher clearly defined the assignments, explained the required concepts and instructional guidelines. The researcher then introduced the unit on Interactions in Nature and students were guided on the task to be completed (that is, what should be included, what they needed to complete the task, the source, and how long they had to complete the assignment). Since this was a graded activity, students were informed about the criteria for evaluation. For the first week, all

groups were tasked on the topic; general characteristics of aquatic and terrestrial habitats. These are based on the physical environment, chemical and the photosynthetic plants and animals. The researcher moderated various groups‟ presentations by their leaders. Since groups‟ topics were to be taught the same week, a preliminary tuition was made by the researcher before students carried out their investigations.

The second week of instruction for the groups was on the topic; effects of biotic/biological and abiotic/physical factors of the ecosystem. Again, the various concepts of ecological components such humidity, light, wind, herbivorous organisms, microorganisms e.t.c were discussed with students to enable them in their observations in the environment and in turn identify effects of such factors.

Week three‟s topic was; the soil. The concept of soil as the finest substances covering the earth crust and how it supports life was explained to students during the last instructional lesson in week two to enable learners prepare adequately for the lesson. Some equipment such as measuring cylinders, beakers, stirring rods and so on were provided for groups‟ experiments.

The fourth week topic was; components of food chains and food webs. Content of these concepts were briefly discussed with students in class in the third week during the intervention. The researcher also projected a screen to show pictures of food chains, food webs (Appendix H).

Week five‟s activities were on the topics; ecological pyramids and concept of symbiosis. Explanation of symbiosis was discussed in class with students as well as the use of charts (Appendix I) showing the various pyramids to be taught.

All groups usually presented on the same topic during lessons and evaluated by the researcher. The researcher monitored students‟ learning within the groups. When necessary, the researcher intervened to assist students in working together effectively. During the groups‟ presentations, the researcher moderated the activities through questions and answers, clarified statements and assessed individual groups. At the end of all presentations weekly, individual members within the groups were evaluated through oral questions and answers for scores.

Data Collection Procedure

An introduction letter (Appendix M) obtained from the Head of Science Department in the University of Education, Winneba was used to obtain permission from the Headmaster of the school to carry out the study.The researcher sought the help of the biology teacher during the administration of the instruments and retrieval. The respondents were briefed on the intended research and the date of questionnaire administration was communicated to them. Before the pre-intervention questionnaire administration, respondents were assured that the exercise was meant to identify their weaknesses and determine the appropriate pedagogical approaches which would benefit them. The questionnaires were administered within the period of biology lessons to facilitate prompt retrieval since some of the respondents were day-students. Finally, respondents‟ confidentiality was assured as their names were not required. The completed questionnaires were collected after the respondents indicated that they had responded to all the items.

A post intervention questionnaire administration was conducted using the same questionnaire items. The same procedure of the pre-intervention administration was followed and the completed questionnaires were collected from respondents.

Test

A post-test, after the intervention was conducted on the same students thus, second year (SHS 2). To ensure reliability, both forms of the tests were administered in the respondents own classroom under the researcher‟s supervision. An equivalent form of the pre-test was used for the post-test to avoid the effect of pre-test sensitization. According to Ary et al. (2002), pre-test sensitization is the effect of pre-test on the respondents that causes them to respond differently regardless of the treatment, from the way they would without the pre-test. Pre-test sensitization is a major threat to the validity of a test when very same test is repeated rather than parallel forms. Students were assured that the exercise would not influence their Continuous Assessment or course grades, and that they were not obliged to write their names or any identification number. The received answer sheets (Appendix K) were marked and scores recorded for analysis.

Post-intervention

The procedure for the administration of the HESAB questionnaire was repeated using the same set of items to determine whether changes had occurred with regard to the students‟ attitudes towards biology after the intervention. A post test was also conducted using

equivalent form of the pretest to determine the impact of the Cooperative teaching and learning approach on students‟ achievement after the intervention.

Data Analysis

Table 7:

Data analysis plan for the HESAB:

General negative attitudesN General positive attitudes

1	2	3	4	5
Strongly disagree	Disagree		Agree	Strongly agree

From Table 7, mean values <3represent negative attitudes, mean values at 3 represent neutral and mean values >4 represent positive attitudes toward biology.

As already mentioned, this study collected data on senior high school Home Economics students‟

attitude and their academic achievement in biology. The HESAB data from both pre and posttest intervention was analysed using Statistical Package for the Social Science (SPSS) version 16 for Windows. The data of the HESAB instrument were coded and keyed into the SPSS for the statistical analysis. The descriptive statistics function of the software was used to determine mean scores, standard deviations and responses also converted into percentages on Home Economics students‟ scores from the HESAB to answer Research Question 1. This was followed by descriptive statistics analyses based on the subscales; the teacher, relevance of biology and interest or confidence of students to answer Research Question 2. The descriptive statistics function of the software was again used to determine mean scores, standard deviations and percentages on Home

Economics students‟ scores from post administered HESAB to answer Research Question 3. The paired t-test statistical method at p-value = 0.05 level of significance using scores of the pre- and pos-ttest was employed to answer Research Question 4.

CHAPTER FOUR

RESULTS

Overview

The purpose of the study was to improve Home Economics students‟ attitude towards Biology and their academic achievement in Biology through cooperative teaching learning approach.

The chapter presents the results in five sections. The first section dealt with the respondents‟ demographic data while the second and third sections presented results of the pre-intervention HESAB data to answer Research Questions 1and 2 respectively. The fourth section dealt with Research Question 3 and finally, the fifth section presented results of the tests to answer Research Question 4.

Demographic Characteristics of Respondents

The data on background variables as presented in Table 8 and Figure 3 show that the sample had more females (51.5%, 34) than males (48.5%, 32). This is due to the fact that the sample is from a Home Economics class just as has been found that females prefer Biology more than males (keeves & Kotte, 1992; Hong, Shim, & Chang, 1998; Prokop et al.2007b, c).

Table 8:

Background information on the respondents

Variable	Frequency count	Percentage frequency
Gender		
Male	32	48.48
Female	34	51.51
Total	**66**	**100.0**
Age range		
10-15	18	27.3
15-20	47	71.2
20-25	1	1.5
Total	**66**	**100.0**

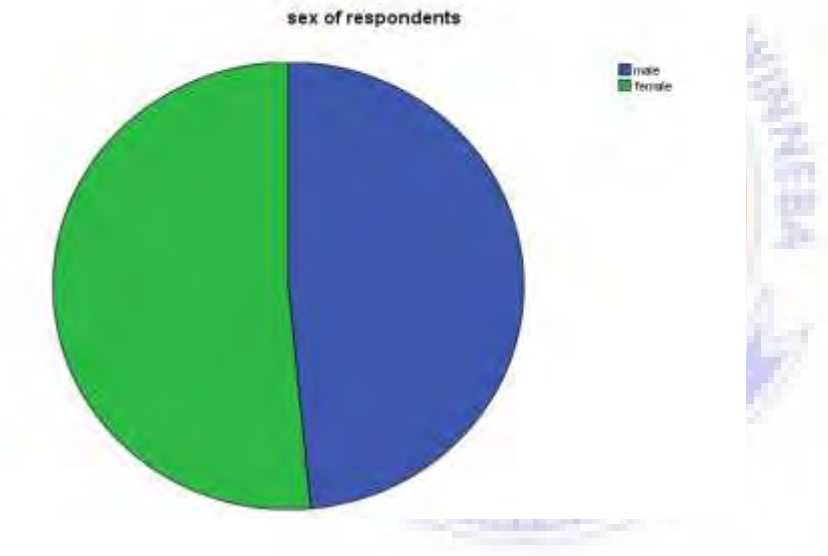

Fig 3: Pie Chart Showing Respondents‟ sex

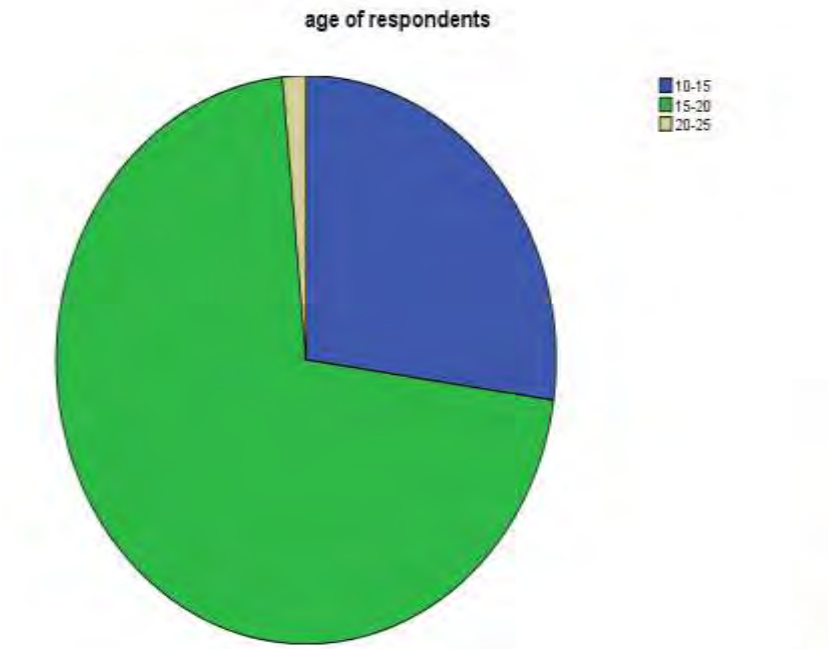

Fig 4: Pie Chart showing Respondents" age ranges

From Table 8 and Fig 4 respectively, the dominant age group was within the range of 15-20 years with (71.2%, 47) of the sample. This was followed by the age range of 10-15 (27.3%, 18). Only one of the respondents had age within the range of 20-25 (1.5%, 1).

Research Question 1

How are the attitudes of Home Economics students of Tamale Business SHS towards biology before the intervention?

The research question sought to determine the attitude of Home Economics students towards biology. Data was collected using the HESAB instrument before the intervention stage to find out the prior attitude of the respondents towards biology. The descriptive statistics function of the SPSS software was used to analyse the data into mean scores and

standard deviations. The responses were also organized into frequency counts and converted into percentages. The results of the analysis are presented in Table 9. The respondents‟ mean scores ranged between 2.98 and 4.58 and the standard deviations ranged between 0.71 and 1.60.

Table 9:

Means and Standard Deviations of Responses before intervention

Sub-scales	S/NO	Items	Mean	SD
	10	Getting a teacher to take me seriously in biology is a problem	2.98	1.51
The teacher	11	My teachers have been encouraged in my progress in biology	4.21	0.71
Average mean			**3.61**	**1.11**
	8	Attending biology courses help understand better the surrounding world	4.41	1.12
Relevance of biology	3	Doing well in biology is not important for my future	4.18	1.51
	4	I don‟t expect to use biology much when I get out of school	4.11	1.09
	2	Biology will not be important in my life‟s work	4.58	1.02
	7	Knowing biology will earn me a living	4.52	0.96
Average mean			**4.36**	**1.14**
	5	I would like to attend biology classes in all school grades	4.32	1.18
Interest or Confidence	13	I‟m not the type to do well in biology	3.92	1.60
	1	Biology is a boring subject	4.39	1.25
	9	I discuss with my friends things I learn in biology courses	3.85	1.21
Average mean			**4.12**	**1.31**
Over all mean average			**4.03**	**1.19**

As presented in Table 9, students showed positive attitude towards the relevance of biology as important accordingly (MS=4.36, SD=1.14) and they also had positive attitude

towards their interest to study biology (MS=4.12, SD=1.31). However, the assistance of the teacher was observed to be rather negative (MS=3.61, SD=1.11).

From the results, the highest mean scores were found for items focused on the relevance and interest in biology. Especially items such as “knowing biology will earn me a living”, “Attending biology courses made me understand better the surrounding world” and “Biology is a boring subject[scored in reverse order, thus 1 for strongly agree and 5 for strongly disagree]” had mean scores above 3 thus, indicating positive attitudes. In contrast, mean scores of two items “I discuss with my friends things I learn in biology courses” and “I‟m not the type to do well in biology [scored in reverse order]” were below 3 hence, revealed negative attitudes. This indicates that a significant number of the students do not clearly realize the relevance of biology to them. Also, mean scores of item 10 “Getting a teacher to take me seriously in biology is a problem [scored in reverse order]” was below 3.This suggested that a significant part of the students showed negative attitude towards biology.

Table 10:

Frequencies and Percent of responses of students on the three subscales before intervention

Item	Frequency & percent of responeses					DISAGREE SUM	AGREE SUM	MS	SD
	SD	D	N	A	SA				
10	15(23%)	15(23%)	7(11%)	14(21%)	15(23%)	30(46%)	29(44%)	2.98	1.51
11	0(0%)	0(0%)	11(17%)	30(45%)	25(38%)	0(0%)	55(83%)	4.21	0.71
TOTAL								**3.61**	**1.11**
8	4(6%)	4(6%)	3(5%)	11(17%)	44(67%)	8(12%)	55(84%)	4.41	1.12
3	11(17%)	0(0%)	3(5%)	4(6%)	48(73%)	11(17%)	52(79%)	4.18	1.51
4	2(3%)	5(8%)	9(14%)	18(27%)	32(48%)	7(11%)	50(75%)	4.11	1.09
2	4(6%)	0(0%)	2(3%)	8(12%)	52(79%)	4(6%)	60(91%)	4.58	1.02
7	1(2%)	4(6%)	4(6%)	8(12%)	49(74%)	5(8%)	57(86%)	4.52	0.96
TOTAL								**4.36**	**1.14**
5	5(8%)	2(3%)	2(3%)	15(23%)	42(64%)	7(11%)	57(87%)	4.32	1.18
13	12(18%)	2(3%)	2(3%)	9(14%)	41(62%)	14(21%)	50(76%)	3.92	1.60
1	5(8%)	4(6%)	1(2%)	6(9%)	50(76%)	9(14%)	56(85%)	4.39	1.25
9	5(8%)	5(8%)	8(12%)	25(38%)	23(35%)	10(16%)	48(73%)	3.85	1.21
TOTAL								**4.12**	**1.31**

Table 10 shows that 46 %(30) of the students agreed that getting a teacher to teach them seriously in biology is a problem whilst 44 %(29) did not agree. However, 11 %(7) remained neutral. 83 %(55) agreed that teachers encouraged them whiles the remaining 17(17%) were neutral. This gives an indication that biology teachers do not present lessons in a manner that will motivate students to learn effectivelysince the main strategy for instruction was the traditional method in the school.

Most of the students, 84 %(55) indicated that biology helped in understanding the world and 12 %(8) did not agree. A total of 79 %(52) agreed to the importance of biology whiles 17 %(11) did not. Also, 75 %(50) agreed on use of biology after school and 14 %(9) were neutral whereas 11 %(7) disagreed. A total of 91 %(60) students agreed on the benefit of biology in life‟s work and only 6 %(4) did not. Also, 86 %(57) students agreed that biology will earn them a living and only 8 %(5) disagreed. This suggested that though some of the students responded positively to the relevance of biology to them, there are some who showed negative attitudes.

A total of 87 %(57) students indicated positive attitude towards biology lessons at all school grades whiles11 %(7) showed negative attitude. Also, 76 %(50) of students showed positive attitude in their ability to perform well in biology whereas 21 %(14) showed negative attitude. A total of 85 %(56) responded positively to the fact that biology is not a boring subject whiles 14 %(9) responded negatively. Also, 73 %(48) students indicated positively that they discuss biology with friends and 16 %(10) indicated negative attitude whiles 12 %(8) remained neutral. Thus, though some of the students showed positive attitude in their interest to study biology, there were some who did not.

Research Question 2

What factors account for the Home Economics students' poor attitudes towards biology?

This research question sought to identify the factors responsible for students‟ poor attitudes towards biology.

Table 11:

Factors accounting for students' poor attitudes towards biology

Factor	Statement	Frequencies and (% frequencies)					Mean	SD
		SD	D	N	A	SA	Mean	SD
	Getting a teacher to take me seriously in biology is a problem	15 (23%)	15 (23%)	7 (11%)	14 (21%)	15 (23%)	2.98	1.51
F1	My teachers encouraged me in biology	0 (0%)	0 (0%)	11 (17%)	30 (45%)	25 (38%)	4.21	0.71
	Av. Sub-scale MS						3.61	1.11
	Attending biology courses help understand better the surrounding world	4 (6%)	4 (6%)	3 (5%)	11 (17%)	44 (67%)	4.41	1.12
F2	Doing well in biology is not important for my future	11 (17%	0 (0%)	3 (5%)	4 (6%)	48 (73%)	4.18	1.51
	I don‟t expect to use biology out of school	2 (3%)	5 (8%)	9 (14%)	18 (27%)	32 (48%)	4.11	1.09
	Biology will not be important in my life‟s work	4 (6%)	0 (0%)	2 (3%)	8 (12%)	52 (79%)	4.11	1.09
	Knowing biology will earn me a living	1 (2%)	4 (6%)	4 (6%)	8 (12%)	49 (74%)	4.52	0.96
	Av. Sub-scale MS						4.36	1.14
	I would like to attend biology classes in all school grades	5 (8%)	2 (3%)	2 (3%)	15 (23%)	42 (64%)	4.32	1.18
F3	I‟m not the type to do well in biology	12 (18%)	2 (3%)	2 (3%)	9 (14%)	41 (62%)	3.92	1.60
	Biology is a boring subject	5(8%)	4(6%)	1(2%)	6(9%)	50(76%)	4.39	1.25
	I discuss biology with my friends	5 (8%)	5 (8%)	8 (12%)	25 (38%)	23 (35%)	3.85	1.21
	Av. Sub-scale MS						4.12	1.31
	OVERALL AV. MS						4.03	1.25

Factor 1= the teacher (T), Factor 2= relevance of biology (R) and Factor 3= students' interest or confidence (IN)

As clearly observed from Table 11, the overall average mean for the three factors was 4.03(1.25) indicating a significant positive attitude towards biology. The average mean for factor 1 was 3.61, indicated negative attitude of the students about the teacher"s role as an instructor. The first item under factor 1 revealed that 46% of respondents agreed that the biology teacher as an instructor is a problem whilst 44% disagreed and 11% were neutral. Factor 2 had an average mean score of 4.36(1.14) which indicates a significant positive attitude towards biology and 79% indicated the relevance of biology whilst 11% did not agree. However, item 2; "I discuss with my friends things I learn in biology courses" had a mean score below 4 indicating a negative attitude towards biology. Factor 3 had an average mean score of 4.12 (1.31) and 83% in agreement indicating that students had interest in biology whilst 16% did not have interest in biology. However, item 2 under this sub-scale; "I"m not the type to do well in biology had a mean score below 4 indicating negative attitude of students" interest in studying biology. As the findings indicate, students seem to have interest in studying biology and know the relevance of biology. In contrast, students feel the biology teacher and his/her instructional strategies are creating a problem in the learning of biology.

Research Question 3

What is the impact of the Cooperative teaching and learning approach on students' attitude towards biology in Tamale Business S H S?

This research question aimed at finding out whether the Cooperative teaching andlearning approach could develop positive attitudes in Home Economics students towards biology in Tamale Business S H S. Table12 presents means, standard deviation and percent frequencies on students" attitude to the Home Economics students" attitude scale. The results are presented according to the sub-scales. The responses of the sample were categorised into disagreement with a mean value<3 whiles a mean value>4 represented agreement. (Appendix G)

Table 12:

Means, Standard Deviations and percent of Responses before and after intervention

Sub-scales	Statement	Frequencies and (% frequencies)					Pre-mean	SD	Post-mean	SD
		SD	D	N	A	SA				
The teacher	A teacher to take me seriously in biology is a problem	0 (0%)	2 (3%)	0 (0%)	24 (36%)	40 (61%)	2.98	1.51	4.54	.66
	Teachers encouraged me in biology	0 (0%)	2 (3%)	2 (3%)	24 (36%)	38 (58%)	4.21	.71	4.48	.71
Av. Scale MS							**3.61**	**1.11**	**4.51**	**.69**
Relevance	Biology help understand better the world	0 (0%)	1 (2%)	0 (0%)	22 (33%)	43 (65%)	4.41	1.12	4.62	.58
	Doing well in biology is not important	1 (2%)	4 (6%)	4 (6%)	27 (41%)	30 (45%)	4.18	1.51	4.22	.93
	I don"t expect to use biology after school	0 (0%)	3 (5%)	3 (5%)	43 (65%)	17 (26%)	4.11	1.09	4.11	.69
	Biology will not be important in my life"s work	0 (0%)	1 (2%)	2 (3%)	31 (47%)	32 (48%)	4.58	1.02	4.42	.64
	Biology will earn me a living	0 (0%)	2 (3%)	2 (3%)	27 (41%)	35 (53%)	4.52	.96	4.43	.71
Av. Scale MS							**4.36**	**1.14**	**4.36**	**.71**
Students' interest or confidence	I would attend biology classes in all school grades	0 (0%)	2 (3%)	2 (3%)	28 (42%)	34 (52%)	4.32	1.18	4.51	.56
	I"m not the type to do biology	0 (0%)	1 (2%)	0 (0%)	29 (44%)	36 (55%)	3.92	1.60	4.51	.59
	Biology is a boring subject	0 (0%)	1 (2%)	2 (3%)	34 (52%)	29 (44%)	4.39	1.25	4.37	.63
	I discuss biology with friends	0 (0%)	1 (2%)	1 (2%)	20 (30%)	44 (67%)	3.85	1.21	4.57	.68
Av. Scale MS							**4.12**	**1.31**	**4.49**	**.62**
Overall Av.							**4.03**	**1.19**	**4.45**	**.67**

Table 12 revealed that respondents"" mean scores after intervention ranged between 4.11 and 4.62 while standard deviations ranged between .56 to .93. These indicated the development of positive attitudes toward biology. All items mean scores were above 4

(i.e., high agreement of participants) such as; "I discuss with my friends things I learn in biology courses", "getting a teacher to take me seriously in biology is a problem [scored in reverse order]" "I'm not the type to do well in biology [scored in reverse order]" and "Biology is a boring subject [scored in reverse order]". The overall average means score for the sample after the intervention was 4.45 (strong agreement) as compared to the pre average mean score at 4.03. This suggested the development of positive attitudes by students after the intervention. The teacher sub-scale had a high mean score as against the pre which suggested a significant development of positive attitudes towards biology. The relevance and confidence both indicated strong agreement thus, positive attitude of respondents towards biology. Percentages of all items were also very high in agreement.

Research Question 4

Is there any improvement in the academic achievement of Tamale Business S H S Home Economics students in Biology through the cooperative approach?

Hypothesis Testing

To determine whether there was statistically significant difference in the academic achievement of Home Economics students in Biology when they were taught with the cooperative teaching learning strategy, Research Question 4 was formulated into a null hypothesis as:

Ho: There is no significant difference in the use of the Cooperative approach on Home Economics students' academic achievement in biology in the Tamale Metropolis.

The Independent sample for 2-tailed t-test analysis was employed and the mean scores for the tests (Table 13) showed significant difference ($t(62) = -20.39$; $p<0.05$).

Table 13**:**

Results of t-test analysis on the Home Economics students' Pre and Post-tests mean scores

Test	**No.**	**Mean**	**SD**	**t**	**df**	**P-value**
Pretest	63	48.06	16.49			
				-20.39	62	0.00
Posttest	63	65.71	13.92			

Both the pretest and posttest were scored over 30 marks with 15 marks as the pass mark. The average mean score of the pre test was 48.06 (SD=16.49) whilst that of the post test was 65.71 (SD=13.92), yielding a mean difference of 17.65. The t-test analysis was found to be statistically significant at 0.05 significance level (t (62) = -20.39; p = 0.00), meaning that the difference between the pre-test average score and the post-test average score was statistically significant.The difference was in favour of the posttest. Hence the Cooperative teaching learning strategy could significantly improved students performance in biology. It was therefore concluded that the use of the Cooperative strategy to teach topics in biology showed a significant difference in Home Economics students" achievement in biology in the Tamale Business S H S. Hence the hypothesis was rejected since there was a significant difference between the pre and post-tests.

CHAPTER FIVE

DISCUSSION

Overview

The study aimed at improving Home Economics students‟ attitudes and their academic achievement in biology through Cooperative teaching and learning strategy in Business S H S in Tamale Metropolis. The study also sought to identify the possible factors for students‟ poor attitude towards the subject.Data was collected from 66 Home Economics students through a questionnaire and tests. An intervention employed the Cooperative teaching and learning approach during instructional periods for six weeks during which scores were obtained for analysis. The questionnaire sought feedback on students‟ attitudes towards biology: the teacher, relevance of biology and students‟ interest or confidence. Descriptive statistics was used to organize the data into means and standard deviations, percentages and a T-test statistic was used to establish the impact of the Cooperative method on students‟ academic achievement.

This chapter specifically presents a discussion of the results in line with the research questions under the following headings:

Home Economics Students‟ Attitude towards Biology

Factors accounting for Home Economics students‟ poor attitudes towards Biology

Impact of the cooperative approach on students‟ attitude towards Biology

Home Economics Students' Attitude towards Biology

The findings of research question one showed that students had poor attitude towards biology. The respondents‟ poor attitudes ran through all the three sub-scales thus; the teacher, relevance of biology and interest. The results indicated that students had limited positive attitudes toward biology and therefore possessed some negative attitudes toward the subject.

According to Muellerleile (2005), attitude is a way of looking at things. In the work of Uitto, Juuti, Lavonen & Meisalo, (2006).They found out that information about students‟ interests may help teachers to devise strategies to enhance students‟ interest in biology.

Several studies have been concerned with attitudes toward particular disciplines like physics (e.g. Angell *et al*, 2004) or chemistry (e.g. Salta and Tzougraki, 2004) but few studies have focused on students‟ attitudes toward biology (Spall, Stanisstreet, Dickson & Boyes. 2004). It is in this direction that the study sought to find out the attitude of Home Economics students and improve them in the Tamale Metropolis.

Factors accounting for Home Economics students' poor attitudes towards biology

The findings of the study indicated that the teacher factor accounted for the students‟ poor attitude toward biology. This is so because, this factor had a mean score value indicating disagreement thus, negative attitude toward biology. The teacher factor

consists of the teaching approaches and professional qualification. The results supported the responses for the students‟ poor attitude toward biology. Of course, teachers play vital roles in the teaching and learning process. Unexpectedly, in this study this factor revealed negative attitude toward biology by the students.

Biology teachers usually prefer to employ mainly traditional teaching approaches and techniques (Cimer, 2004). Therefore, biology lessons are mainly run in a teacher-centered manner: teachers transfer the knowledge that they have and what is written in the textbook without conducting student-centered teaching activities. This, of course, has negative effects on students‟ attitudes towards biology and their motivation to learn. Indeed, Zoller (2000) asserts that teacher-centered or traditional lessons can be non-productive and, in some cases, detrimental to student learning. In addition, Lanier and Little (1986) claim that traditional lessons are less likely to promote conceptual understanding or to facilitate conceptual change and thus are less likely to promote the development of technical skills. Therefore, teachers‟ competencies and knowledge in both biology as a discipline and its teaching are crucial for enhancing students‟ learning. If teachers show weaknesses in their knowledge of the subject, this might create distrust in students of the teachers‟ abilities and knowledge (Çimer, 2004). Students may then not listen to teachers in the lessons and might develop negative attitudes towards both biology and its teachers.

According to Maundu (1986), a teacher‟s level of education (qualification) is a very important and determinant in effective teaching and learning, and that the level of educationinfluences performance in Biology.This is because trained teachers have know-

how in the subject to teach iteffectively as they are equipped with the skills and knowledge to teach with confidence.

The factors identified in this study that strongly affect Home Economics students‟ attitudes toward biology are common and similar to what is in the related literature. In his book, Heim (op. cit) concluded that the lack of adequate time allotment, scarcity of science teachers, lack of teaching materials, classroom equipment and laboratory equipment hamper the effective teaching and learning of sciences, thus produce negative attitude toward science education.

However, the order of the influence or importance of these factors is different. How teachers teach and lack of motivation on students‟ part has been found to extremely affect attitudes toward biology. The findings has been found to be are similar to that of (Taltont & Simpson, 1985), thatthere are many factors that influence attitudes and achievement among adolescents. Some of the factors are associated with parental background and family environment. Other factors relate to individual characteristics such as self-concept, locus of control, and achievement motivation. Still other variables are associated with schools influences such as class climate, teachers, and administrative styles. Furthermore, these categories of students are not selected for the study of biology based on good grades obtained in science after graduation at the J H S level. One implication of this result is to continually work on improving attitudes of students. All appropriate conditions should be offered for these students to learn biology at all school grade levels and continue to have greater achievements in the subject. Indeed, a growing body of research suggests that good teaching and an overall teacher quality are the critical

determinants of students‟ attitudes to science and science achievement (e.g. Woolnough, 1994).

The impact of the Cooperative approach on students' attitude towards biology

The post intervention results from the questionnaire and test indicated an improvement in students‟ attitude towards biology. The overall mean score for each sub-scale was above 4 indicating positive attitudes. The implication is that students were able to acquire some positive attitudes toward the subject after the implementation of the Cooperative strategy during instructions within the intervention period of this research. This is not surprising since there have been a conscious effort by the researcher to improve students‟ attitudes and performance, by introducing the cooperative technique of teaching the selected biology topics. The findings are in line with Glasman & Albarrcin, 2006; Kraus, (1995) that attitudes predict individuals‟ decision making and action taking thus; effect of the cooperative approach.

Again, Johnson and Johnson (1989) also reported that cooperative learning experiences promote more positive attitudes toward the instructional experience than competitive or individualistic methodologies. Also, Johnson and Ahlgren (1976) examined the relationships between student‟s attitudes toward cooperation, competition, and their attitudes toward education. Results of the study indicated that student cooperativeness, and not competitiveness, was positively related to motivation to learn. Apart from academic benefits, cooperative learning has been found to promote self-esteem,

interpersonal relationship and improved attitudes toward school and peers (Johnson & Johnson, 1996).

The finding is in harmony with Adesins and Akinbobola (2005) that, although attitude changes gradually, people constantly form new attitudes and modify old ones when they are exposed to new information and new experiences. The finding is connected with Schunk and Hanson (1985) who suggests that the attitude of pupils is likely to play a significant part in any satisfactory explanation of variable level of performance shown by students in their school science subject. According to Ogunleye (1993), he reports that many students developed negative attitudes to science learning, probably due to the fact that teachers are unable to satisfy their aspiration or goals. Thus, the adoption of the cooperative teaching learning strategy significantly improved the attitudes and academic achievement of Home Economics students in Tamale Business S H S.

The impact of the Cooperative teaching learning approach on students' academic achievement

With respect to research question four, findings revealed that there was a significant difference between pretest and posttest thus; (t (62) = -20.39. The implication is that, the Cooperative teaching and learning approach improved students" achievement since the post-test mean score was very high (65.71) as against the pre-test (48.06). The average score difference between the two tests is highly significant (0.00) at an alpha level of 0.05. This is not surprising since the cooperative teaching learning technique employed by the researcher enabled students to learn through groups, being encouraged to compete

within groups for scores and became motivated as they worked in the groups. Cooperative Learning is the instructional use of small groups so that students work together to maximize their own and each other‟s learning (Johnson, Johnson, & Holubec, 1993).The finding is connected with the report of Weinburgh (1995), that the relationship between learners‟ attitude and achievement is fundamental in science education. In general, attitudes, goals and interest have been identified as important for student‟s understanding, learning and their academic success. Furthermore, Shimazoe and Aldrich (2010) provide several benefits on the use of cooperative learning approach for students. First, cooperative learning promotes deep learning of materials. Second, students achieve better grades in cooperative learning compared to competitive or individual learning. Academic achievements of students have been found to be enhanced by the use of cooperative learning (Lampe, Rooze & Tallent-Runnels, 1998; Johnson & Johnson, 1989; Slavin, 1990, 1991; Webb, 1989). In addition,Alao (1990) showed that there is positive correlation between attitudes and performance in the science subjects. Also, interest, goals and motivation have been identified as important for learning and academic performance (Hidi & Harackiewicz, 2000).

In conclusion, the cooperative teaching and learning technique was able to improve students‟ attitude and performance.

CHAPTER SIX

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS

Overview

With respect to this chapter, a summary of the major findings of the research, the implications and conclusions are presented as well as recommendations and suggestions for further research on the study. The study was to improve the attitudes and academic achievements of Home Economics students in biology through Cooperative teaching and learning approach in Ghanaian schools to promote good academic achievement in the sciences.

Summary of Findings of the Study

This part focuses on the summary of the major findings of the study. It looks at the summary ofHome Economics students‟ attitudes towards biology in Tamale Business S H S before and after intervention based on three factors; the teacher, relevance of biology and students‟ interest or confidence. Finally, the significance of the Cooperative approach on students‟ academic achievement is also treated in this section.

The following findings were arrived at:

The findings indicated poor attitudes of Home Economics students toward biology in Tamale Business S H S.

1. The poor attitudes of students towards biology before intervention occurred in all the three sub-scales thus; the teacher, relevance and interest sub-scales. This is due to the fact that some items in all the three sub-scales showed mean scores below 4 hence, negative attitudes.The factors responsible for students‟ poor attitude toward biology was factor 1; the teacher. This is so because the teacher sub-scale indicated a mean score below 4 thus; negative attitude while the other two sub-scales had mean scores above 4 thus; positive attitude.
2. Positive attitudes were developed after the intervention. In all three sub-scales, all items indicated mean score above 4 (agreement)
3. The t-test was significant (0.00) at 0.05 alpha levels. Also, the correlation coefficient of the tests was at 0.912. Since there is a significant difference in the two tests, it means that the cooperative method was good.

Conclusion

Based on the findings of the study, the following conclusions were made:

The study established the fact that Home Economics students in TamaleBusiness Senior High School had poor attitudes toward biology since mean scores below 4 were shown which required immediate attention by the authorities and other stakeholders including the Ghana Education Service.The development of students‟ positive attitude is necessary because attitude is linked with academic achievement (Cheung, 2009).

Students‟ developed positive attitudes toward biology in the school during the study after the intervention due to the implementation of the cooperative teaching and learning

approach which invariably improved their achievement in the posttest administered. This is so because, results of the post-intervention indicated positive attitudes of respondents.The achievement of the Home Economics students in Tamale Business S H S in the post-test attests to the impact of the Cooperative teaching and learning approach. Students who do not improve upon their performance require more assistance than their counterparts with higher scores.

Recommendations

Based on the findings of the study, the following recommendations are made:

It is recommended that Home Economics students should be taught Biology through the cooperative teaching and learning approach as a result of its impact on the students‟ attitudes and academic achievement in Tamale Business S H S. Teachers should be assisted through in-service training by stakeholders to use it for instruction to improve students‟ attitudes and achievement.

Suggestions for Further studies

It is suggested that, further studies be conducted on Home Economics students‟ poor attitudes and academic achievement in biology to further unearth the causes.

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APPENDICES:

APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF SCIENCE EDUCATION

HOME ECONOMICS STUDENTS' ATTITUDES TOWARD BIOLOGY (HESAB) INSTRUMENT

The following questionnaire is part of a study being conducted as an M.PHIL Thesis research.

Please do not write your name on the questionnaire to ensure the confidentiality of your responses.

Thank you for your cooperation.

Please select the option below that best represents how you feel about Biology as an elective subject to you by ticking your choice.

Gender: I am:

Male:…… [1]
Female:…… [2]

Age:0-10……..[1], 10-15……[2], 15-20……[3], 20-25……[4], 25-30……[5]

S/N	STATEMENT	OPTIONS				
		Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
1.	Biology is a boring subject					
2.	I don‟t expect to use biology much when I get out of school					
3.	I would like to attend biology classes in all school grades					
4.	Knowing biology will earn me a living					
5.	Biology will not be important to me in my life‟s work					
6.	Doing well in biology is not important for my future					
7.	M y teachers have encouraged me to learn biology					
8.	Attending biology courses made me understand better the surrounding world					
9.	I discuss with my friends things I learn in biology courses					
10.	Getting a teacher to take me seriously in biology is a problem					
11	I‟m not the type to do well in biology					

"THANK YOU"

APPENDIX B

TAMALE BUSINESS SENIOR HIGH SCHOOL

SECODTERM FORM 2E

SUBJECT: BIOLOGY

TEST 1 TIME: 40MUNITES

Answer ***all*** questions in sections A and B.

SECTION A

1. The activities of an organism which affect the survival of another organism in a habitat can be described as
   A. Biotic
   B. Abiotic
   C. Climatic factors
   D. Edaphic factors
2. Which of the following groups of organisms feeds directly on green plants?
   A. Producers
   B. Decomposers
   C. Primary consumer
   D. Tertiary consumer
3. The term used in describing the effective management of natural resources by man is
   A. Utilization
   B. Conservation
   C. Development
   D. Economics
4. Which of the following is used in measuring the amount of moisture in the air?
   A. Hygrometer
   B. Photometer
   C. Anemometer
   D. Barometer

5. Clayey soil can be made more useful for farming by
   A. Adding lime and humus
   B. Adding sandy soil
   C. Introducing earthworms to the soil
   D. Adding loamy soil
6. The burning of farmlands should be discouraged because it
   A. Destroys some plant pests
   B. Makes bush clearing more difficult
   C. Destroys the organic part of the soil
   D. Reduces the dormancy period of some weeds
7. Which of the following soil types retains the least amount of water?
   A. Sand
   B. Clay
   C. Humus
   D. Loam
8. Ecology simply means the study of
   A. The properties of a habitat
   B. Several species of plants and animals
   C. Interrelationship between organisms and their environment
   D. The environment
9. The abiotic factor which determines the depth to which light penetrates in a pond is
   A. Turbidity
   B. Wind
   C. Salinity
   D. Current
10. Which of the following is not a biotic factor?
   A. Pressure
   B. Parasites
   C. Predator
   D. Grazers

SECTION B

1a. List **five** methods of conserving soil fertility

b. Distinguish between biotic and abiotic factors

2. Define the following giving an example each:

(i) A habitat

(ii) The population

(iii) The environment

(iv) An ecological niche

TAMALE BUSINESS SENIOR HIGH SCHOOL

TEST 2 FORM 2E SECOND TERM

SUBJECT: BIOLOGY TIME: 40MUNITES

Answer ***all*** questions in sections A and B.

SECTION A

1. The relationship between a herbivore and the bacteria which live in its caecum is known as

A. Parasitism B. symbiosis C. predation D. saprophytism

2. Autotrophic nutrition may be defined in terms of food obtained

A. By synthesizing simple substances using energy from an external source
B. By breakdown of complex substances
C. By an organism utilizing its own store of energy
D. From other organisms in exchange for some products

3. Which of the following does not contribute to the biomass in an ecosystem?

A. producers B. consumers C. saprophytes D. food chains

4. Which of the following is not classified as a terrestrial habitat?

A. Desert B. littoral zone C. Forest D. Afro Alpine

5. Which of the following statements is not true of climax vegetation? It

A. results from succession B. involves the colonization of a habitat

C. is an ecological phenomenon D. is a stable community

6. An association between living organisms in which one lives on and feeds at the expense of the other organism is known as

A. predation B. commensalism C. mutualism D. parasitism

7. Which of the following statements is not correct about food chains?

A. There is no energy loss in a food chain

B. All food chains have primary consumers C. All food chains start with a green plant

D. Food chains involve feeding relationships among organisms

8. Which of the following groups of organisms feeds directly on green plants?

A. producer B. primary consumer C. decomposer D. secondary consumer

9. To which trophic level would the carnivore belong in a food chain consisting of king fisher, mosquito larva, microscopic algae and Tilapia fish?

A. First and third B. third and fourth C. second and third D. fourth and first

10. Which of the following best describes a food web?

A. A linear feeding relationship among organisms in the same community

B. A feeding comprising carbohydrates, fats, oil and protein

C. A complex feeding relationship consisting of interrelated food chains

D. A community comprising producers, consumers and decomposers

SECTION B

1 a. state two distinguishing features each of

(i) Epiphytes (ii) parasites

b. give two examples of parasitic plants

2 (a) List four components of soil

(b) With the aid of a diagram, explain a pyramid of biomass involving plants and animals in an ecosystem.

APPENDIX C

TAMALE BUSINESSS SENIOR HIGH SCHOOL

MARKING SCHEME FOR TEST 1

SUBJECT: **BIOLOGY**

FORM: **2E**

SECTION A: (10 MARKS)

1. A
2. C
3. B
4. A
5. A
6. C
7. A
8. C
9. A
10. A

SECTION B: (20MARKS)

1 a. The five methods of conserving soil fertility are:

Cover cropping

Avoid overgrazing

Terracing

Strip cropping

Avoid bush burning

Bush fallowing **any 5*1 =5marks**

b. The difference is that, biotic factors are the biological or living components of the ecosystem whiles abiotic constitute the physical or non-living part of the ecosystem.

Examples of biotic include; herbivores, epiphytes, man, insects, reptiles etc. and abiotic include; temperature, light, rainfall, humidity, wind etc.

5 marks

2

i. A habitat is referred to as the region or location in which an organism can live successfully. Examples; water/aquatic and land/ terrestrial.

3marks

ii. A population refers to the total number of members of a single unit in a habitat. Examples; tilapia fish in a pond, total number of students in 2E, termites in a termitarium.

2marks

iii. The environment is defined as everything that surrounds an organism. It consist of both the living and non-living components.

3marks

iv. An ecological niche refers to the specific role or function of an organism. Example; the various activities in a termitarium, roles of caste of bees in a hive etc.

2marks

TAMALE BUSINESSS SENIOR HIGH SCHOOL

MARKING SCHEME FOR TEST 2

SUBJECT: **BIOLOGY**

FORM: **2E**

SECTION A: (10 MARKS)

1. B
2. A
3. D
4. B
5. A
6. D
7. A
8. B
9. C
10. A

SECTION B (20 MARKS)

Q 1

(i) The two distinguishing features of epiphytes include:
1 They are plants
2 They do not depend on the host for nutrients
3 They do not cause harm or damage to their host.
Any 2*2 (4 marks)

(ii) The distinguishing features of parasites include:
1 They could be plants or animals
2 They depend on their hosts for nutrients
3 They cause harm or damage to their host.
Any 2*2 (4 marks)

1 b. Examples of parasitic plants are:
(a) Mistle toe
(b) Dodder (Cassytha Sp)
(c) Loranthus Sp
Any 2*1 (2 marks)

Q 2

(a) The components of soil include:

1 Organic matter (Humus)

2 Water

3 Air

4 Microorganisms

5 Inorganic particles

Any 4*1 (4 marks)

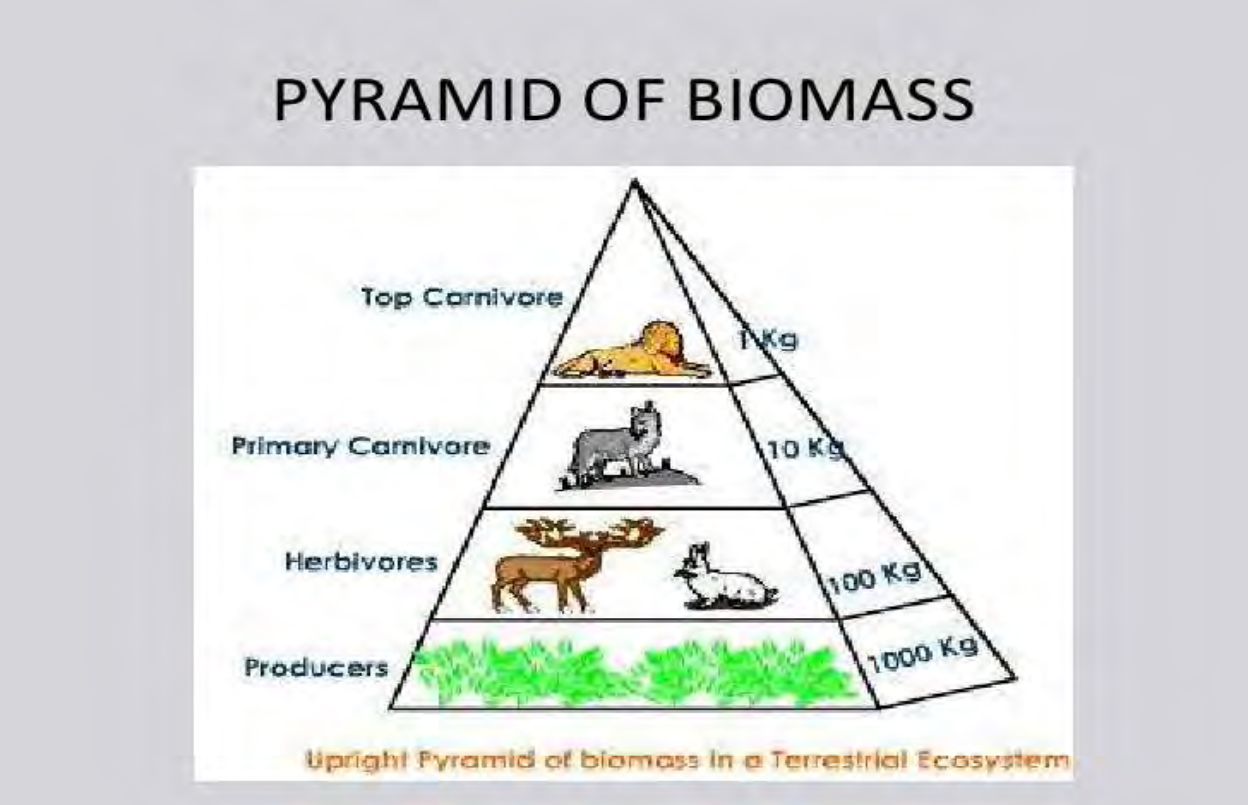
(b) A pyramid of biomass is the type that shows the total weight of organisms supported at each trophic of feeding level. It is measured in grammes per square (gm^{-2}).

It has the following characteristics:

- It shows graphical representation of the relative amount of biomass at each trophic level.
- It expresses the total dry weight of the organisms existing in the trophic level.
- There can be an inverted biomass pyramid.
- The organisms can be easily assigned to a particular trophic level in this pyramid.

2 marks

(II). A diagram showing pyramid of biomass involving plants and animals:



NOTE: An inverted diagram is accepted.

Title=1/2 mark

Labels=2 marks

Guideline=1 mark

Clarity=1/2 mark

TOTAL=4 marks

APPENDIX D

Extraction of factors

ITEMS	Scale Mean if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
biology is a boring subject	41.3243	.655	.622
biology will not be important to me in my life's work	41.7568	.562	.638
doing well in biology is not important for me	42.2973	.443	.660
i don't expect to use biology much when i get out of school	42.2432	-.348	.747
i would like to attend biology classes in all schoolgrades	40.0811	.210	.689
knowing biology will earn me a living	39.9459	.228	.686
attending biology courses made me understand better the surrounding world	40.0541	.289	.679
i discuss with my friends things i learn in biology courses	40.1622	.361	.669
getting a teacher to take me seriously in biology is a problem	42.1892	.413	.661
my teachers have encouraged me to study more biology	40.1351	.443	.659
i'm not the type to do well in biology	42.5946	-.107	.725
sample total score	34.7838	.736	.573

Factor loadings

Item	Component		
	1	2	3
getting a teacher to take me seriously in biology is a problem	.848		
my teachers have encouraged me to study more biology	.568		-.356
Attending biology courses made me understand better the surrounding world	-.118	.833	
Doing well in biology is not important for me	-.118	.803	.206
I don‟t expect to use biology much when I get out of school		-.578	-.24
Biology will not be important to me in my life„s work		.556	.254
Knowing biology will earn me a living		.478	.153
I would like to attend biology classes in all school grades	.263		.685
I„m not the type to do well in biology	-.291		.657
Biology is a boring subject	.389		.636
I discuss with my friends things I learn in biology courses	.129	.135	.619

APPENDIX E

Results of pilot test reliability statistics on 13 items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.427	.377	13

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.522
Bartlett's Test of Sphericity	Approx. Chi-Square	119.582
	Df	78
	Sig.	.002

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
biology is a boring subject	38.08	14.410	.495	.520	.279
biology will not be important to me in my life's work	38.51	15.201	.412	.311	.315
doing well in biology is not important for me	39.05	15.830	.420	.618	.327
i don't expect to use biology much when i get out of school	39.00	21.056	-.274	.265	.513
i would like to attend biology classes in all schoolgrades	36.84	18.195	.074	.394	.429
if biology was not one of the subjects that we have to be tested on order to have access to University, i would not be interested at all	39.05	20.386	-.196	.304	.515
knowing biology will earn me a living	36.70	18.492	.054	.416	.433

attending biology courses made me understand better the surrounding world	36.81	16.547	.276	.549	.368
i discuss with my friends things i learn in biology courses	36.92	15.854	.325	.302	.347
getting a teacher to take me seriously in biology is a problem	38.95	15.608	.347	.593	.338
my teachers have encouraged me to study more biology	36.89	16.044	.360	.630	.342
biology is hard for me	36.81	20.269	-.178	.489	.480
i'm not the type to do well in biology	39.35	19.956	-.141	.194	.485

APPENDIX F1

Results of pilot test reliability statistics on 11 items

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.692	.648	12

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.585
Bartlett's Test of Sphericity	Approx. Chi-Square	89.640
	Df	55

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.585
Bartlett's Test of Sphericity	Approx. Chi-Square	89.640
	Df	55
	Sig.	.002

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
biology is a boring subject	41.3243	30.614	.655	.800	.622
biology will not be important to me in my life's work	41.7568	31.911	.562	.708	.638
doing well in biology is not important for me	42.2973	34.159	.443	.592	.660
i don't expect to use biology much when i get out of school	42.2432	42.800	-.348	.235	.747
i would like to attend biology classes in all schoolgrades	40.0811	36.410	.210	.421	.689

knowing biology will earn me a living	39.9459	36.497	.228	.192	.686
attending biology courses made me understand better the surrounding world	40.0541	35.386	.289	.472	.679
i discuss with my friends things i learn in biology courses	40.1622	34.140	.361	.307	.669
getting a teacher to take me seriously in biology is a problem	42.1892	33.435	.413	.579	.661
my teachers have encouraged me to study more biology	40.1351	33.898	.443	.545	.659
i'm not the type to do well in biology	42.5946	40.026	-.107	.185	.725
sample total score	34.7838	21.341	.736	.873	.573

APPENDIX G

Means and standard deviations of responses before intervention

Item	N	Mean	Std. Deviation
biology is a boring subject	66	4.39	1.25
biology will not be important to me in my life's work	66	4.58	1.02
doing well in biology is not important for me	66	4.18	1.51
i don't expect to use biology much when i get out of school	66	4.11	1.09
i would like to attend biology classes in all school grades	66	4.32	1.18
knowing biology will earn me a living	66	4.52	.97
attending biology courses made me understand better the surrounding world	66	4.41	1.12

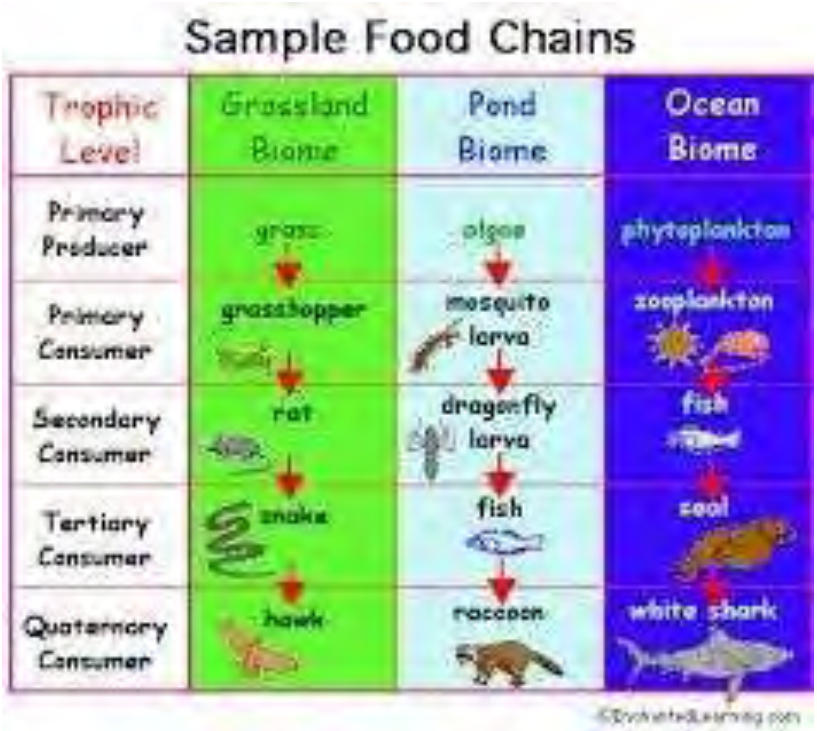
i discuss with my friends things i learn in biology courses	66	3.85	1.21
getting a teacher to take me seriously in biology is a problem	66	2.98	1.51
my teachers have encouraged me	66	4.21	.71
i'm not the type to do well in biology	66	3.92	1.60
Sumtotal	0		
Valid N (listwise)	0		

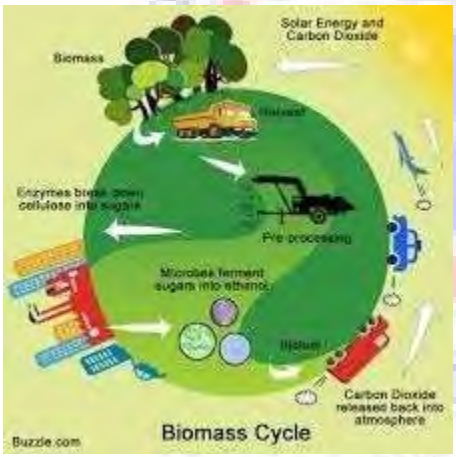
Means and standard deviations of responses after intervention

Item	N	Mean	SD
biology is a boring subject	65	4.37	.63
biology will not be important to me in my life's work	65	4.42	.64
doing well in biology is not important for me	65	4.22	.93
i don't expect to use biology much when i get out of school	65	4.119	.69
i would like to attend biology classes in all school grades	65	4.51	.56
knowing biology will earn me a living	65	4.43	.71
attending biology courses made me understand better the surrounding world	65	4.62	.58

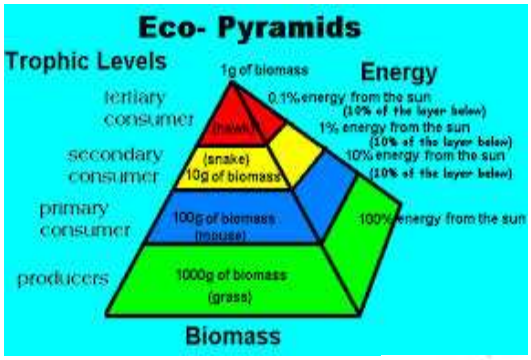
i discuss with my friends things i learn in biology courses	65	4.57	.68
getting a teacher to take me seriously in biology is a problem	65	4.54	.66
my teachers have encouraged me to study more biology	65	4.48	.71
i' not the type to do well in biology	65	4.51	.59
Valid N (listwise)	65		

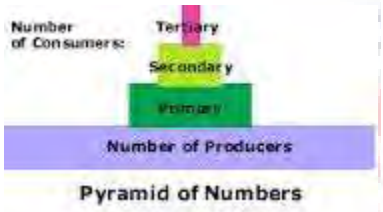
APPENDIX H

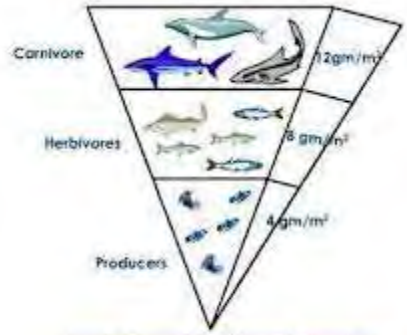


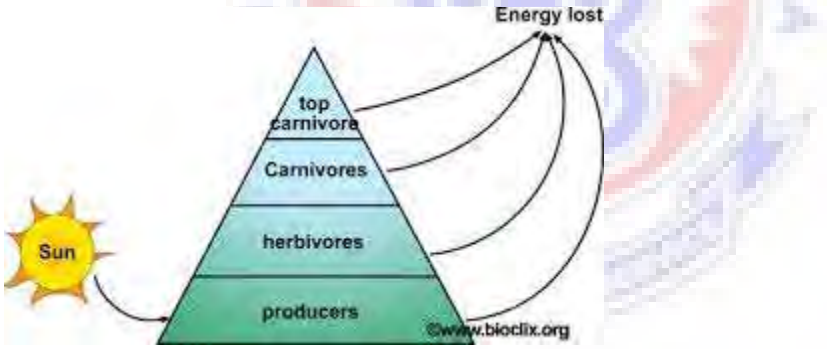


APPENDIX I (Pyramids)









APPENDIX J

GROUPS' WORK PRESENTATIONS

APPENDIX K

ANSWER SHEETS

APPENDIX L

Paired t-test independent sample analysis of pre and post tests

	Pre-test	Post-test
N	63	63
Mean	48.0635	65.7143
Standard Deviation	16.4982	13.9185
Standard Error	2.0786	1.7536
t	20.385	
df	62	
Sig. (2-tailed)	0.00	

Correlations coefficient of pre and post-tests

		N	Correlation	Sig.
Pair 1	Pre-test&Post-test	63	.912	.000

APPENDIX M

INTRODUCTION LETTER