UNIVERSITY OF EDUCATION, WINNEBA

USING THE JIGSAW COOPERATIVE LEARNING MODEL TO IMPROVE THE TEACHING OF INTEGRATED SCIENCE AT SAINT MONICA'S JUNIOR HIGH SCHOOL

BY

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USING THE JIGSAW COOPERATIVE LEARNING MODEL TO IMPROVE THE TEACHING OF INTEGRATED SCIENCE IN ST. MONICA'S JUNIOR HIGH SCHOOL

BY

MARFO PATRICIA

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MAY, 2009

DECLARATION

STUDENT'S DECLARATION

I, **PATRICIA MARFO**, DECLARE THAT THIS DISSERTATION, WITH THE EXCEPTION OF QUOTATIONS AND REFERENCES CONTAINED IN PUBLISHED WORKS WHICH HAVE ALL BEEN IDENTIFIED AND ACKNOWLEDGED, IS ENTIRELY MY OWN ORIGINAL WORK, AND IT HAS NOT BEEN SUBMITTED EITHER IN PART OR WHOLE FOR ANOTHER DEGREE ELSEWHERE.

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SUPERVISOR'S DECLARATION

I, DR. KODJO DONKOR TAALE, DECLARE THAT THE PREPARATION AND PRESENTATION OF THIS DISSERTATION WERE SUPERVISED BY ME IN ACCORDANCE WITH THE GUIDELINES ON SUPERVISION OF DISSERTATION LAID DOWN BY THE UNIVERSITY OF EDUCATION, WINNEBA.

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DATE:…….

ACKNOWLEDGEMENT

To the Almighty God, the cherisher, the nourisher and the sustainer of the whole universe, be the first and foremost acknowledgement of my thanks. He protected, guided and strengthened my indefatigable supervisor and me. Thank you God for bringing us this far.

I sincerely thank my dedicated and distinguished supervisor, Dr. K.D Taale of the Department of Science Education, University of Education, Winneba. May God Almighty richly bless you and increase your in knowledge and wisdom.

My profound gratitude further goes to all tutors in the Science Department, St. Monica‟s College of Education, and my dear husband Mr. Joseph Yaw Amponsah.

DEDICATION

I dedicate this great work to my family for their great support throughout my educational pursuit.

ABSTRACT

An action research was undertaken to investigate into the effects of using cooperative learning on pre-service teachers in enhancing their performance in teaching Integrated Science at Junior High School (JHS).

The investigation sought to motivate and improve the attitudes of the female pre-service teachers towards learning and teaching science through cooperative learning. The data collection instruments were researcher observation, questionnaires and achievement tests.

This study was done at St. Monica‟s College of Education. The population of study was all the second year pre-service teachers pursuing the Diploma in Basic Education (DBE). The sample was made up of all the 40 female pre-service teachers in the class.

The results of the study showed that cooperative learning strategy was very relevant and beneficial in helping the DBE pre-service teachers of St. Monica‟s College of Education to improve upon their performance in teaching "Integrated Science" in Junior High School, because they were able to secure higher test scores after the intervention as compared to their test score before the intervention.

It is recommended that classroom teachers should endeavour to integrate cooperative learning into their routine methods of instruction in science classes. Educational policy makers should undertake the establishment and promotion of cooperative learning centres to plan, oversee, and coordinate cooperative learning in our schools in the country irrespective of the level of education.

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CHAPTER ONE

INTRODUCTION

Background to the Study

In most parts of the world today basic education recognizes science as one of the most important foundation subjects which is given a place in the core of the educational curriculum. This is because of the fact that the study of science can improve one‟s chance in social achievements. Thus science occupies a privileged position in the school curriculum. The rationale for the teaching and learning of the Junior High School (JHS) science is for the attainment of one crucial goal; to enable all Ghanaian young persons acquires the science skills, insights, attitudes, and values that they will need to be successful in their chosen careers and daily lives. It is based on the twin premises that all pupils can learn science and that all need to learn science. Science at the JHS builds on the knowledge and competencies developed at the primary school level.

The need to improve teaching and learning is widely accepted. Research and field experiences have made us understand better the factors that contribute to effective teaching methodologies with accompanying learning strategies. Improving the quality of teaching and learning in basic schools in Ghana has been a major concern among educational authorities, teacher educators and trainers, and teachers‟ professional organizations. Chantler (1996), everyday, teachers prepare and present science lessons using well known

rituals with minor variation. Most often, teachers are unaware of how effective their teaching has been until they have tested it against some form of product oriented assessment outline, such as informal testing, written tests and examinations. These inadequacies are manifested in Junior High School students‟ low performance in challenging content areas in chemistry as compared to performance in biology among others, in national examinations such as Basic Education Certificate Examination. Report from the Chief Examiner of Integrated Science for the DBE (Diploma in Basic Education) course (2007) indicates that 82% were the highest scores in integrated science and as many as 273 students scored below 10%. This catastrophic situation could be due to the fact that the aims/objectives of learning which the intended curriculum set to be attained, such as improved scientific thinking and understanding and problem-solving skills or experiences of the learners were not properly enhanced at the implementation stage, which is due to the learning culture of science in schools in Ghana.

Students learn science by listening to their teacher and copying from the chalk board rather than asking questions for clarifications and justification, discussing, and negotiating meanings and conjectures, consequently. Students learn science as a body of objective facts rather than a product of human invention.

Students could go to the library to read newspapers or novels, not science. Science is learned only in the science classrooms or for examinations, quizzes, or tests. Students could form a small study group outside of their classroom to do home work assignments or prepare for an examination or test, but not for discussing scientific concepts that were taught to them in the classrooms.

Students accept whatever the teacher teaches them. The teacher is the sole authority of scientific knowledge in the classroom, while the students are mere receptors of scientific

facts, principles, formulas, and theorems. Thus, if the teacher makes any mistake, the students would most likely also make the same mistake that the teacher makes.

Most students do science assignments and exercises not as way of learning science, but as a way of disposing off those assignments to please the teacher. This implies that science assignments are not construed as an instrument for learning.

Students learn science with the goal to attain computational fluency, not conceptual understanding or meaning. Students learn science with the aim to pass a test or examination. After passing the test, examination in science is no longer of importance to the students. It is generally believed that only science-oriented students must learn and master scientific principles not so-called arts or business students. Alternatively, most people (including some science teachers) believe that art or business students require a pass in science in their final examinations. Sorunke (1982). There is the need for us to change this culture of teaching and learning in the JHS and for that matter in the whole educational system, in order to improve performance in science in schools in Ghana. Olorukooba (2000) suggested that in order to improve science performance in schools, we first have to change our science methodology and pedagogy to allow students opportunities for problem solving, problem-posing, and active participation in science learning in the classroom. Beside this, curriculum developers and textbook writers should ensure that their products communicate the methods they really intend teachers to use in the delivery of the content they put in their materials; and this method should be one that will lead to the development of learning community environments in science classrooms. The Ministry of Education, through the GES in conjunction with curriculum developers should put in place stringent measures to ensure that the specifications of the planned curriculum are strictly followed at

the implementation stage. Teachers should also endeavour to improve meaningful learning by using effective instructional strategies in measurement lessons

On one hand the poor performances reported above could be attributed to the fact that, many basic school teachers face severe time constraints working individually with a sizeable number of pupils who need extra help or attention. According to Kraft (1994), research from other countries indicates that (¼) of the time in school is actual "academic learning time". In Ghana, research indicates that, due to tiredness, student and teacher absence, lack of instructional materials and a range of interruptions, the actual time given to Science is even more severely limited Kraft (1994). Evidences are that, pupils who need such special attention may not receive it, Kraft (1994) had said the amount of time spent on the basics of language and science is a critical factor in the achievement levels of students.

Additionally, the country"s teacher education programmers are so hard pressed with time, that, teachers trained from the colleges do not receive sufficient hands-on experiences needed to teach basic school science. The methodology courses designed to improve trainees" proficiencies in teaching science are not adequately met with ample time needed to emphasize and provide concrete field experiences using activities. However, due to most teachers" deficiencies in using activity approaches or reluctance to use activities, the best alternatives are imposing the rules "take as is given". Subsequently, students memorize the rules, drill and practice in order to survive short term examinations; even with that, students fail because they cannot adjust to new situations. These will compound and breed the malicious handicaps of many teachers" knowledge, skills and experiences in using activities to teach science concepts, skills, generalizations, etc, to bring about meaningful learning. And to some extent some teachers avoid teaching difficult topics especially in chemistry such as "moles" and "molar mass". This is evidenced in most students in the J.H.S who

fear and have some negative attitudes in learning integrated science. The above explained the realities and challenges on the ground with respect to the teaching and learning of integrated science in most Ghanaian J.H.S.

Vygotsky (1978) stated that learning awakens in children a variety of internal developmental processes that can operate only when they interact with more competent people in their environment and in cooperation with their peers. He stressed that students develop in a social matrix that is formed by their relationships and interactions with other children. The social environment is a major contributor to the cognition of students because of the open area of communication that exists and allows them to express and negotiate ideas as well as contribute to each other‟s understanding.

Pre-service teachers of St. Monica‟s College of Education, posted to their respective schools in the neighbouring villages of the college, were expected to teach effectively since they were fresh from college. It was believed that their pedagogical skills, pedagogical content knowledge and content knowledge in science are functional, and as such could teach even better than in-service teachers. However, the situation is practically different. Since the inception of the Diploma in Basic Education programme in the Colleges of Education, trends in records from the teaching practice supervision/assessment of the Colleges‟ students have shown that pre-service students perform poorly in teaching primary school science as well as JHS science. The researcher has since observed that not much has been done to overcome this problem facing pre-service teachers on their internship programme. The researcher has observed that the methodology course (methods of teaching JHS science) offered in the college‟s programmes, is faced with severe time constraint to enhance trainees‟ proficiency in teaching science. Trainees do not have ample time to pursue the course work as well as field experience. In fact many pre-service teachers have

expressed similar complaints. In most cases Pre-service teachers study the methodology course only to pass their End-of-Semester Examinations.

It is evidenced that the approach to teaching / learning of science in Ghana today does not vary from the well-known rituals whereby the teacher is the source of ideas, facts, and information and sometimes the demonstrator of processes and learners are recipient of the information and the only perceived effective methods, being the drills, lectures, subject-based and teacher-centered (Beach & Reinhats, 1989).

However, these rituals do not work for all the categories of students. From the researcher"s observations, two particular challenges need to be addressed mutually to improve the quality of teaching and learning of Integrated Science in J. H. S. One paramount issue that comes to the fore concerning alternative learning approaches to the traditional approach (competitive learning) is cooperative learning (an activity method approach). The challenge in education today is to effectively teach students of diverse ability and differing rates of learning. Teachers are expected to teach in a way that enables students to learn integrated science and integrate science concepts while acquiring process skills, positive attitudes and values and problem-solving skills. A variety of teaching strategies have been advocated for use in integrated science and integrated science classrooms moving away from the teacher-centered approach to more students"-centered ones. In the last decade, there is a vast amount of research done on cooperative learning in integrated science.

Cooperative learning is grounded in the belief that learning is most effective when students are actively involved in sharing ideas and work cooperatively to complete academic tasks. Cooperative learning has been used as both an instructional method and as a learning tool at various levels of education and in various subject areas. There is a substantial evidence of the research work done (Olorukooba, 2002), where he indicated that girls favour and

achieve higher in cooperative learning than in competitive learning. Thus cooperative learning strategy is found to be gender-friendly.

Statement of the Problem

The inability of students to participate in Science lessons is a major contributory problem to the teaching and learning of Science.

During my teaching at Saint Monica"s College of Education, it was noticed that students do not perform well in Integrated Science. When investigated by the researcher, it came to light that, the students do not learn in groups but rather learn individually.

This resulted in the researcher"s interest to identify the possible effects and develop the appropriate interventions to solve the problem of the students" low performance in Integrated Science. The researcher decided to use Cooperative Learning (JIGSAW) approach to serve as the alternative to the individual learning to help pre-service students to improve their performance in Integrated Science and also when they embark on their teaching practice programme, they will have the interest to teach the Integrated Science.

Purpose of the Study

This action research was purposely designed to meet the pressing need for improvement in the quality of teaching and learning of integrated science in Ghanaian basic schools. By its nature, it focused on a kind of teaching and learning environment that always subordinated learning to teaching. Teachers were only functioning as facilitators. According to Rapport (1970), action research is concerned both with action (solving concrete problems in real

situations) and research (trying to further the goals of science). It is the possible solution to the problem of ensuring that research findings actually get used. With this drive to achieve better standards in teaching and learning of integrated science and the momentum building about using cooperative learning across all the educational institutions in the whole world and for that matter Ghana as whole, so the purposes of the study were.

Research Questions

The research questions that guided the entire study were:

1. Can cooperative learning approach improve Pre-service Teachers‟ performance in integrated science?
2. Can cooperative learning approach enhance Pre-service Teachers‟ content knowledge in integrated science?
3. Can cooperative learning approach enhance students‟ attitude towards integrated science?
4. Can the cooperative learning approach motivate Pre-service Teachers to learn integrated science?

Significance of the Study

This study would be of great importance to the classroom teachers, Pre-service teachers, all categories of students-low and high achievers, and the nation as a whole with regard to

educational theories, practices and policies. It could serve as an in-service training for classroom teachers as it would enhance their knowledge, skills and experiences in using cooperative learning to guide students to learn measurements.

Furthermore, the teachers could find this approach to learning as a timely intervention measure to relieve them of the ordeal of maintaining forward progress of the high-achievers in science, while at the same time re-teaching the same topic over and over again to low achievers in the class. This was because the cooperative learning provided varieties in using heterogeneous experiences to help students to construct the knowledge needed. In a nutshell, this action research approach would go a long way to improve and support quality teaching and learning of measurements and science as a subject and thus, solving the national problem of falling standards in science education.

Limitations

The researcher encountered many problems which might affect the result of findings and some of these problems are explained below:

First and foremost, the researcher faced financial constraints. Financial constraints in the sense that more money was involved in this dissertation in so many cases. Examples are calling supervisors sending dissertation for vetting and printing.

Another problem is delayance in getting feedbacks on the part of students, parents and some teachers since some of them think this project may put their wards into trouble.

Also some of the pupils selected for the work were nor frequent at school and also time given to the researcher was not enough but limited so the researcher was not able to obtain all necessary information needed for the research work and all these affected the result of the study and made things a bit difficult and tedious for the researcher.

Delimitation

The study should have covered the schools in Mampong Municipal as a whole, however due to the complex nature of data collected, techniques of data analysis, and large number of students limited the study to only one class and that is Saint Monica‟s Junior High School, JHS 2 students.

The selection of this class in Saint Monica‟s Junior High School, JHS 2, is due to the fact that Saint Monica‟s Junior High School, JHS 2 students recorded poor participation in Science lessons and so it is believe that the findings the this research work would be appropriate to a whole wide range of situation in the teaching and learning of science in this school.

Organization of the Study

This study is made up of five chapters. Chapter one is captioned introduction. It gives a general overview of the study. It is composed of the background to the study, statement of the problem, purpose of the study, research questions, significance of the study, limitations, delimitations and organization of the study.

Chapter two is review of related literature which deals with research ideas about the topic. This is followed by chapter three, the Methodology guiding the study, which includes sampling design, population and sample, instrument used, procedure and analysis of the data collected. This also covers pre-intervention, intervention, post intervention and data analysis. Chapter four involves results, findings and discussion of the findings. The last chapter deals with the summary, conclusions and recommendation(s).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter comprises of the following

1. Various definitions of cooperative learning.
2. Why use cooperative learning.
3. How cooperative learning helps students to learn.
4. Key elements of successful cooperative learning
5. Interdependence
6. Interactions
7. Achievement
8. Cooperative learning: An alternative to traditional method.
9. Expected Education outcomes of cooperative learning.
10. Challenges.

Various Definitions of Cooperative Learning

Cooperative learning is a topic frequently mentioned in conversations about improving education, regardless of the discipline or level of instruction. Some recent definitions of cooperative learning include:

An activity involving a small group of learners who work together as a team to solve a problem, complete a task, or accomplish a common goal (Artzt & Newman, 1990).

The instructional use of small groups so that student work together to maximize their own and each other"s learning (Johnson, Smith, 1991). Cooperative learning is a task for group discussion and resolution (if possible), requiring face-to-face interaction, an atmosphere of cooperative and mutual helpfulness, and individual accountability (Davidson,1990).

Cooperative learning also falls in the more general category of "collaborative learning," which is described as working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product Good-sell, (Mather & Tinto, 1992).

Davidson and Kroll (1991) also defined cooperative learning as a kind of learning situation in which students are expected to work as a team collaboratively in a relatively small group while they share ideas and experiences in the processes.

All these definitions aim at one goal, thus it is a learning in which the goals of different persons are to link and share a common end-objectives. They learn together and share ideas and opportunities which are essential in achieving their learning task. As the students work together, they seek each other"s assistance and help, and also arrive at joint decisions. The achievement of a goal by an individual also means the achievement of success by others in the groups. In other words, success in the attainment of learning goals of an individual will automatically increase the chances of success of other group members.

Why use Cooperative Learning

There have been several recent reports urging reform of science education in general, and Cobb (1992), has described the need for specific changes in teaching. Instead of traditional lectures where teachers "tell" students information that they are to "remember", teachers are encouraged to introduce active-learning activities where students are able to construct knowledge. One way for teachers to incorporate active-learning in their classes is to structure opportunities for students to learn together in small groups. The suggestions made in these reports are supported by a growing set of research studies (over 375 studies, according to Johnson, 1991) documenting the effectiveness of cooperative learning activities in classrooms.

A majority of the published research studies examine cooperative learning activities in basic, J. H. S. and Senior High Schools, and a subgroup of these studies focus on science classes. The implication of these studies is that the use of small group learning activities leads to better group productivity, improved altitudes, and sometimes, increased achievement.

Dietz (1993) found that a cooperative learning activity on methods of selecting a sample allowed students to "intent" for themselves standard sampling methods, which resulted in better understanding of these methods.

Another argument for using cooperative groups relates to the constructivist theory of learning, on which much of the current reform in science education is based. This theory describes learning as actively constructing one‟s own knowledge. Constructivists view students as bringing to the classroom their own ideas, experiences, and beliefs that affect how they understand and learn new material. Rather than "receiving" material in class as it

is “delivered”, students restructure the new information to fit into their own cognitive frameworks. In this manner, they actively and individually construct their own knowledge, rather copying knowledge “transmitted” or “conveyed” to them. A related theory of teaching focuses on developing students‟ understanding, rather than on rote skill development.

Small-group learning activities may be designed to encourage students to construct knowledge as they learn new material, transforming the classroom into a community of learners actively working together to understand science. The role of the teacher changes accordingly from that of “source of information” to “facilitator of learning”.

As part of the resent reform of assessment of student performance, instructors are being encouraged to collect a variety of assessment information from sources other than individual student tests. Cooperative group activities may be structured to provide some rich information for teachers to use in assessing the nature of student learning. While walking around the class and observing students as they work in groups, the instructor is able to hear students express their understanding of what they have learned, which provides instructors with an ongoing, informal assessment of how well students are learning and understanding scientific ideas. Written reports on group activities may be used to assess students‟ ability to solve a particular problem, apply a skill, demonstrate understanding of an important concept, or use higher-level reasoning skills (Eurasia, 2007).

A final reason for using cooperative group learning activities in science classes is that businesses are increasingly looking for employees who are able to work collaboratively on projects and to solve problems as a team. Therefore, it is important to give students practice in developing these skills by working cooperatively on a variety of activities. This type of experience will not only build collaborative problem-solving skills, but will also

help students learn to respect other viewpoints, other approaches to solving a problem, and other learning styles.

The more one works in cooperative learning groups, the more that person learns, the better understanding what is learned, the easier it is to remember what he/she learns, and the better he/she feels about himself or herself, the class and his/her classmates. It can also revitalize studies and faculty by providing a structured environment for sharing some of the responsibilities for learning.

Students learn more, have more fun, and develop many works with one another. According to Shaughnessy (1992), cooperative learning has the following importance:

1. It promotes critical thinking skills.
2. It involves students actively in the learning process
3. Improves classroom results
4. Models appropriate student problem solving techniques
5. Personalizes large lectures
6. Motivates students in specific curriculum
7. Develops a social support system for students
8. Builds diversity understanding among students and staff
9. Establishes a positive atmosphere for modeling and practicing cooperation
10. Develops learning communities
11. Raises students‟ self-esteem
12. Reduces anxieties
13. Develops positive attitudes towards teachers
14. Utilizes a variety of assessment techniques

How Cooperative Learning Activities Help Students to Learn

The use of small-group learning activities appears to benefit students in different ways. These activities often result in students teaching each other. Those students who take on a "teaching" role often find that teaching someone else leads to their own improved understanding of the material. This result is reinforced by research on peer teaching that suggests that having students, teach each other is an extremely effective way to increase students" learning (Smith, 1986).

Just as "two heads are better than one", having students work together in a group activity often results in a higher level of learning and achievement than could be obtained individually. A necessary condition for this to occur is called "positive inter dependence" the ability of group members to encourage and facilitate each other"s efforts (Johnson, 1991). Positive interdependence can be promoted by careful design and monitoring of group activities.

Working together with peers encourages comparison of different solutions to scientific problems, problem solving strategies, and ways of understanding particular problems. This allows students to learn first-hand experience that there is not just one correct way to solve most scientific problems. Small group activities also provide students with opportunities to verbally express their understanding of what they have learned, as opposed to only interacting with materials by listening and reading. By having frequent opportunities to practice communicating using scientific language they are better able to see where they have not yet mastered the material when they are unable to explain something adequately or communicate effectively with group members.

Small-group discussion also allows students to ask and answer more questions than they would be able to in large-group discussions where typically a few students dominate the discussion.

Finally, students‟ achievement motivation is often higher in small-group activities because students feel more positive about being able to complete a task with others than by working individually (Johnson, 1991). Working together towards a mutual goal also results in emotional bonding where group members develop positive feelings towards the group and commitment towards working together. This increase in motivation may also lead to improve student attitudes towards the subject and course.

Cooperative learning provides teachers on the other hand with effective ways to respond to diverse student and cross-cultural understanding. Teachers are not alone in coping with the culture shock they may feel as they recognize the diversity among their students from diverse backgrounds.

Students and teachers need strategies to help turn diversity into a positive force for developing themselves as individuals as well as supporting the growth of others. Cooperative learning is a powerful educational approach for helping all students attain content standards and develop the interpersonal skills needed for succeeding in a multicultural world.

Key Elements of Successful Cooperative Learning

Cooperative learning takes many forms and definitions, but most cooperative approaches involve small, heterogeneous teams, usually of four or five members, working together towards a group task in which each member is individually accountable for part of an

outcome that cannot be completed unless the members work together; in other words, the group members are positively interdependent.

Positive interdependence is critical to the success of the cooperative group, because the dynamic of interconnectedness helps students learn to give and take, to realize that in the group, as well as in much of life, each of us can do something but none of us can do everything. When cooperation is successful, synergy is released, and the whole becomes greater than the sum of its parts.

For cooperative groups to be effective, members should engage in teambuilding activities and other tasks that deal explicitly with the development of social skills needed for effective teamwork. Members should also engage in group processing activities in which they discuss the interpersonal skills that influence their effectiveness in working together. When full cooperative learning structures are implemented, the benefit in student achievement often can be astounding (Williams, 2007).

Interdependence

The essence of cooperative learning group is the development and maintenance of positive interdependence among team members. A sense of interconnectedness can help students transcend the gender, racial, cultural and other differences they may sense among themselves. These differences often are at the root of prejudice and other interpersonal stress that students experience in schools.

Students need access to activities in which they learn to depend on each other as they ask for and receive help from one another. Individualistic and competitive teaching methods certainly have their place in the instructional programme, but they should be balanced with cooperative learning (Johnson & Johnson, 1994).

When students work in cooperative teams in which „„all work for one"" and „„one for all"", team members receive the emotional and academic support that helps them persevere against the many obstacles they face in school. As cooperative norms are established, students are positively linked to others in the class who will help them and depend on them for completing shared task.

When the environment becomes more equitable, students are better able to participate based on their actual, rather than their perceived knowledge and abilities. Teamwork, fostered by positive interdependence among the members, helps students learn valuable interpersonal skills that will benefit them socially and vocationally.

Interaction

Academic and language learning requires that students have opportunities to comprehend what they hear and read as well as express themselves in meaningful task (McGroarty, 1993). Collaborative Learning creates naturals, interactive contexts in which students have authentic reasons for listening to one another, asking questions, clarifying issues and re-stating points of view.

Cooperative groups increase opportunities for students to produce and comprehend language and obtain modeling and feedback from their peers. Much of the value of cooperative learning lies in that teamwork encourages students to engage in such high-level thinking skills as analyzing, explaining, synthesizing and elaborating.

Interaction task also naturally stimulates and develops the students" cognitive and social abilities. Cooperative activities integrate the acquisition of these skills and create powerful learning opportunities. Such interactive experiences are particularly valuable for students

who are learning integrated science, who face simultaneously the challenges of learning scientific knowledge, academic learning and social adaptation. (Swain, 1985)

Students do not know instinctively how to interact effectively with others. Social skills like other skills should be taught and reinforced. Teambuilding activities will help students get to know and trust one another. Other important social skills include accepting and supporting one another and resolving conflicts constructively. Teachers need to model positive interpersonal skills, and encourage the students to practice the skills, and encourage the students to process how effectively they are performing the skills. Focusing on social skills development will increase student achievement and enhance the students‟ employability, interpersonal relationships, and general psychological health (Johnson, 1990).

Cooperative methods are flexible and can be adapted for students with special needs. In diverse language settings, differences in students‟ integrated science proficiencies make it necessary for teachers to modify the methods to ensure integrated science learners can participate fully with fellow team members. For example, teachers may ask one member of each team to be a facilitator who helps students work together. In addition, activities that focus on social skills development and team-building should be used frequently to facilitate cross-cultural communication and understanding among team members.

Achievement

Cooperation learning represents a valuable strategy for helping students attain high academic standards (Kagan, 1993). After nearly fifty years of research and scores of students, there is strong agreement among researchers that cooperative methods can usually do have positive effects on students‟ achievement. However, achievement effects are not seen for all forms of cooperative learning; the effectiveness depend on the implementation

of cooperative learning method that are characterized by at least two essential elements; positive interdependence and individual accountability (Slavin, 1990).

In areas other than achievement, there is even broader consensus about the effects of cooperative learning. For example, when students of racial or ethnic backgrounds work together towards a common goal, they gain in liking and respect for one another. Cooperative learning also improves social acceptance of mainstreamed students with learning disabilities.

Cooperative Learning: An alternative to traditional Method

The challenge in education today is to effectively teach students of diverse ability and differing rates of learning. Teachers are expected to teach in a way that enables pupils to learn science concepts while acquiring process skills. A variety of teaching strategies have been advocated for use in science classrooms, ranging from teacher centered approach to more student-centered ones. Cooperative learning is grounded in the belief that learning is most effective when students are actively involved in sharing ideas and work cooperatively to complete academic tasks. Cooperative learning has been used as both an instructional method and as a learning tool at various levels of education and in various subject areas. Johnson, Johnson and Hollenbeck, (1994) proposed five essential elements of cooperative learning:

1. Positive interdependence: The success of one learner is dependent on the success of the other learners.

2. Promotive interaction: Individuals can achieve promotive interaction by helping each other, exchanging resources, challenging each other‟s conclusions, providing feedback, encouraging and striving for mutual benefits.

3. Individual accountability: Teachers should assess the amount of effort that each member is contributing. These can be done by giving an individual test to each student and randomly calling students to present their group‟s work.

4. Interpersonal and small-group skills: Teachers must provide opportunities for group members to know each other, accept and support each other, communicate accurately and resolve differences constructively.

5. Group processing: Teachers must also provide opportunities for the class to assess group progress. Group processing enables group to focus on group working relationship, facilitates the learning of cooperative skills and ensures that members receive feedback.

Essentially, then, cooperative learning, represents a shift in educational paradigm from teacher-students centered learning in small group. It creates excellent opportunities for students to engage in problem-solving with the help of their group members (Effandi, 2005).

In Malaysia, research on cooperative learning has been carried out since the 1990s (Nor Azizah & Chong, 2000). The revised curriculum of the primary J.H.S. and Senior High Schools emphasized the use of cooperative learning as an alternative to traditional method of teaching (Grouws & Cebulla, 1994). Cooperative learning is generally understood as

learning that takes place in small groups where students share ideas and work collaboratively to complete a given task. There are several models of cooperative learning that vary considerably from each other (Slavin, 1995). Examples are:

1. STAD (Student Teams-Achievement Divisions), students are grouped according to mixed ability, sex and ethnicity. The teachers present materials in the same way they always have, and then students work within their groups to make sure all of them mastered the content. Finally, all students take individual quizzes. Students earn team points based on how well they scored on the quiz compared to past performance.

2. In TGT (Teams-Games-Tournament) quizzes are replaced by tournaments. Students compete at tournaments table against students from other teams who are equal to them in terms of past performance. Students earn team points based on how well they do at their tournament tables.

3. JIGSAW is another model in which students are responsible for teaching each other the material to be learned. Assignment is divided into several expert areas, and each student is assigned with one area. Experts from different groups meet together and discuss their expert areas. Students then return to their group and take turns teaching.

The effectiveness of cooperative learning in science is well established by research. Cooperative learning created many learning opportunities that do not typically occur in traditional classrooms. According to (Nor Azizah, 1996), cooperative learning has the potential in science classroom because of the following factors:

1. Science students always work in group during science experiments in the laboratory. Therefore what they need is the skill to work in groups.

2. Science laboratory is spacious with intact desks and chairs.

3. Science classes are usually two periods with 40 minutes each, enough time for cooperative learning.

4. During experiment many values can be inculcated, example cleanliness, trustworthy (Goodshell, 1992).

Expected Educational Outcomes of Cooperative Learning

Central to the goals of cooperative learning in science education is the enhancement of achievement, problem solving skills, altitudes and inculcate values. How cooperative learning affects student achievement and problem solving skills was investigated by (Effandi, 2003). This study of intact groups compared students‟ science achievement and problem solving skills. The experimental section was instructed using cooperative learning method and the control section was instructed using the traditional lecture method. Cooperative group instruction showed significantly better results in science achievement and problem solving skills. The effect size was moderate and therefore practically meaningful. He also found that students in the cooperative learning methods are a preferable alternative to traditional instructional method.

Another study by (Lee, 1999), found that students who were taught with a cooperative structure outperformed the students in individualistic goal structure in science problem solving. Other researchers have reported similar findings that point to the achievement benefits of using cooperative learning, for example, (Faizah, 1995).

Apart from achievement and problem solving, students should be inculcated with altitudes and values that are appropriate to their life as a student. (Azizah, 1996) found that cooperative learning can inculcate values such as independent, love and cleanliness. A similar study done by (Siti, 1998) concluded that the values of self dependent, rational, love

and hardworking are prominently inculcated. It was also found that cooperative learning can enhance scientific skills, promote enquiry learning and increase science achievement. The students were found to enjoy learning in groups.

Attitude has also been the focus of more than one study in cooperative learning. A study conducted by (Abdul, 2000) found the students in the experimental group held positive attitudes toward science.

CHAPTER THREE

METHODOLOGY

This chapter consists of three major components: the subjects: procedure; and data analysis. The subjects consist of the population and sample size. The research design, instrument, and data collection procedures together constituted the procedure in the study. The method employed in the analysis of the data form the third component. The order of presentation is as follows:

i) research design

ii) population and sample

iii) instruments

iv) data collection procedure

v) data analysis plan

Research Design

The priority of this research is to help pre-service teachers to overcome their difficulties in teaching integrated science in the Basic schools through cooperative learning strategies. The action research design was employed. Rapport (1970) described what he emphasized as the "dual concern "of action research by its nature. In his explanation of the "dual concern" he said that action research "aims to contribute to both the practical concerns of people in an immediate problematic situation and to the goals of social science by joint collaboration within a mutually accepted framework". Stenhouse (1985) said that "improvement and involvement seem central to all uses of the term" when he was focusing on the applicability of action research to teaching in isolation. Whyte (1984) sees that central to action research was "the requirement for collaboration between researchers and practitioners, and for practitioner participation in the process". In addition to above strengths in action research, its democratic aspirations were emphasized by the proponent of action research (Lewin, 1946). He said it brings about democracy. Later action researchers see it as more an embodiment of democratic principles in research (Robsion, 1995). He said that the researchers have called for a direct involvement of practitioners in the design, direction, development and use of research so that the conditions under which they work could be changed.

The strengths of this design, evidenced from the above, strongly support the decision confidently taken by the researcher to employ it for a successful research work. Thus

focusing on the problems identified, implementing the practice(s), and try to produce change in the setting within which the researcher identified the problem.

Despite all the above advantages of the design chosen, it has been subjected to some form of criticisms. Adelman (1989) considers much of educational research to be "inward looking and a historical" and of poor quality. In his view, the claims for action research as an "alternative research paradigm, as a democratizing force and a means of achieving informed, practical change arising from issues at the grassroots" are "over bearing" (Robison, 1995). One of the difficulties that were encountered with this design was how to ensure that the test questions used to collect the data for the study were clear and unambiguous. However, this was accomplished to a fair extent by ensuring that the test questions, sampled from the set of past questions since the inception of the Diploma in Basic Education (DBE) programme, were significantly testing critical thinking and understanding of the pre-service teachers in the content knowledge and pedagogical skills in teaching integrated science. Hence the questions focused on recognition, analysis, and informal deductions in teaching integrated science. All these were put together to help the subjects to concentrate critically on how to help Basic school pupils in learning integrated science.

Recognition means how to identify, name, and compare figures on the bases of their appearance as a whole. Analysis means pupils ability to investigate into their properties, establishing the properties of a class of figures empirically, and using the properties to solve problems. Informal deductions mean pupils‟ understanding on the relations within and between figures, giving informal deductive arguments, and formulation and using definitions.

Population and Sample Selection

The ideal population was all the pre-service teachers in Mampong Muninicipality. However, the accessible population was all the second year studenst of St. Monica‟s College of Education. The problem under study was typically identified in the DBE form one. This class supposedly consisted of students who were at the “bottom” in terms of academic achievements, considering all the year groups‟ academic performances. This reflects the common practices in most basic schools, where the very good students are ranked “A class”, followed by “B-class”, “C- class” and lastly “D-class”. Hence the sample size consisted of all the 40 students in the 1D-class. In addition, the integrated science for the second year group was involved in the study. Thus, the researcher employed the purposive sampling technique. This technique did not leave out any subject in the sample: all the students in the class were exposed to the same sample treatment for the effective change expected to take place in the class. Further, the students were put into ten groups of four.

Research Instruments

The main instruments that were considered and used in the research work were the test items, and questionnaires.

Tests (Pre-test and Post-test)

These tests were sampled from the set of past questions since the inception of the Diploma in Basic Education (DBE) programme from 2006 to 2008. The tests were made of 20 items (same for both the pre-test and post-test) to reveal the kind of thinking and understanding the pre-service teachers were having in teaching integrated science at the basic school levels. Both tests were administered for the duration of one, the questions further required that students explain or give reasons for their answers (See Appendix A for the set of questions).

Questionnaire

This is a way of obtaining information from other people‟s point of view on situation of a problem. The researcher used questionnaire with the reason that it is easy for collecting data.

Another reason was that, student may not fear of being victimized as in an interview, hence the use of questionnaire as they response. Though the questionnaire has all these strengths, it also has some weakness. When a sample of students selected cannot read or write, the information they give will not be valid or not provide correct information for the study. Individual or group selected should be able to provide information about the problem under study or else results or findings will not be valid.

In designing the questionnaire, items were constructed to elicit responses from students. The question was broken into two sections, A and B. Section A consists of background of respondent with 7 open-ended items. The items in Section B include views from students on effects of using cooperative learning. (See Appendix A) for the questions.

Time Schedule

Prior to the actual treatment with experimental group the researcher planned for effective implementation and supervision of the whole study. The planning considered the units of the topic (Digestive System**)** to be taught and time budgeting. The instructional time table used in the college revealed that 4 periods were allocated for integrated science lessons in a week, each period was 30 minutes. The units of the topic (Digestive System) to be taught in this study were: the structure of the digestive system, parts of the digestive system, and the functions of the parts.

Since the whole research was designated for 8 weeks, the researcher used the first week for administering and scoring the pre-test (to both the control and the experimental groups) as well as educating the experimental group on the rules and regulations for an effective and efficient cooperative learning environment and forming the various smaller groups in the experimental group. In the subsequent 6 weeks the researcher taught the experimental group the topics to be covered in the teaching of digestive system in basic schools to the experimental group using the cooperative learning models STAD and JIGSAW (Nor Azizah, 2000), while at the same time taught the control group through the traditional method as it is practiced in the college. In the eighth week, the researcher administered and scored the post-test to both the experimental and the control groups. After the test the experimental group was required to write journals individually for evaluating their learning experiences throughout the treatment.

Data Collection Procedure

This component of the research highlights on the processes followed by the research to collect data associated with the study. Empirical research of this nature required that data should be collected on the variables under study for analysis. This section consisted of:

1. Pre-intervention data collection
2. Intervention
3. Post-intervention data collection.

Pre-intervention

The subjects in the two classes that were used in the study were pre-tested at the same time to determine their entry points with respect to the teaching of digestive system in the JHS schools. The pre-test was the diagnostic test that the researcher used to fairly determine the class that can best be designated the experimental group and which class can be the control

group. The test questions were sampled from the set of past questions since the inception of the Diploma in Basic Education (DBE) programme (2006-2008) and were significantly testing critical thinking and understanding of the pre-service teachers in the content knowledge and pedagogical skills in teaching digestive system at the JHS school level. The pre-test was made of 10 items to cover all the units in the intended topic (teaching JHS school integrated science). This test was administered to the two intact groups for a period of 60 minutes and scored in the first week of the study (See appendix B) for the sample of the pre-test questions.

Intervention

Cooperative learning is generally understood as learning that takes place in small groups where students share ideas and work collaboratively to complete a given task.

Formation of the Control and the Experimental Groups

Step 1

Pre-testing: This was the first step taken to select or group the subjects in the study in to control and experimental groups. The researcher did this by administering a one hour test (pretest) to the two intact classes (DBE 1A and DBE 1B) handled by the researcher in the semester. The test consisted of 10 questions on content knowledge and pedagogical skills in teaching digestive system (See Appendix C for the set of questions). The test was scored out of 100 marks for the two classes used in the study.

Step 2

After scoring the test, the mean scores of the two classes were determined. These mean scores helped the researcher to conveniently designate the two classes as the experimental and the control groups. The class with the higher mean score was the control group and the class with the lower mean score became the experimental group. The DBE 1A class had the lower mean score (3.5) as compared with the mean score of DBE 1B class (4.0). Thus, DBE 1A was the experimental group and DBE 1B was the control group. Both intact groups were given instructions on the topic (integrated science) for 8 weeks based on the syllabus by the researcher. However, the experimental group was exposed to the treatment (cooperative learning strategies) during this period of the study, while the control group was taught using the traditional teaching and learning approach.

Formation of the Heterogeneous Groups and Tutorials within the Cooperative Learning Group

Students were grouped principally according to mixed ability (high and low achievers), and ethnicity was also considered. This grouping was guided/determined by the nature of the task to be accomplished by the groups, and the abilities of the students/the history of the students. The concept of having students with different backgrounds, different questions and point of views, and different talents working together was to encourage them to challenge each other‟s thinking and skills. The challenge presented by different thinkers in the group can have the potential of making the cooperative learning very successful. Additionally, the heterogeneous grouping would ensure acceptance of differences among the diverse students as students meet to interact with one another in cooperatively structured relationship, thus encouraging social integration. The researcher used “Teacher-made” group instead of the traditional “Choose your own groups”. The latter, “Choose your

own groups", turns out to students who are very much like each other with the same strengths and same weaknesses and they often finish their projects or assignments as quickly as they can with as little thought or challenge as possible.

The experimental group was made of 40 students in the class. The researcher formed 10 groups each with the membership strength of 4 students-the highest number recommended for an effective cooperative learning. Structure/ grouping. The entire intervention was strictly guided by the 5 essential elements of cooperative learning proposed by (Johnson and Holubec, 1994). The researcher ensured that the subjects or the various groups conceptualize, reflect and practice according to the requirements of these 5 essential elements of cooperative learning. In other words each of these elements was implemented to the latter throughout the entire study in order to have effective cooperative learning.

These were the elements and how the researcher implemented them in the study.

1. Positive interdependence: Here the groups were required to understand that each group member depends on each other to accomplish a shared goal or task. It is very essential to note that without the help of one member the group is not able to reach the desired goal. In other words the success of one learner is dependent on the success of the other learners.

2. Promotive /face-to-face interaction: The researcher explained to the groups and ensured that individuals can achieve promotive interaction by helping each other, exchanging resources, challenging each other"s conclusions, providing feed back, encouraging and striving for mutual benefits, that is promoting success of group members by praising, encouraging, supporting or assisting each other.

3. Individual accountability: The researcher explained to the subjects and ensured that throughout the entire work each group member was to be held accountable for her work.

This was accomplished to a fair extent by researcher by assessing the amount of effort that each member was contributing to secure the success of their respective groups. These were done by giving an individual test to each student and randomly calling on students to present their group‟s work. This element is very essential and crucial to the success of the study in that individual accountability helped the researcher to avoid the tendencies of some group members "hitchhiking" on the other group members‟ accomplishments.

4. Interpersonal and small-group skills (social skills): Cooperative learning set the stage for students to learn social skills. These skills helped them to build stronger cooperation among group members. Leadership, decision making, trust building, and communication are different skills that are developed in cooperative learning. The researcher provided the opportunities for group members to know each other, accept and support each other, communicate accurately and resolve differences constructively.

5. Group processing: This is an assessment of how the groups are functioning to achieve their goals or tasks. The focus of this element was to allow the researcher and the students or the groups the golden chance to discuss the special needs or problems within the group. This gave the groups the chance to express their feelings about beneficial and unhelpful aspects of the group learning process in order to correct unwanted behaviour and celebrate successful outcomes in the group work. Additionally, the researcher provided opportunities for the class to assess group progress. Group processing enabled groups to focus on good working relationships, facilitated the learning of cooperative skills and ensured that members received feedback.

The Cooperative Learning Structure/Models used in the study

There are several models of cooperative learning that vary considerably from each other. In order to have an effective and efficient cooperative learning. In this study, the researcher

considered employing both the Student Teams-Achievement Divisions (STAD) and the JIGSAW cooperative learning models in an integrated approach.

In STAD (Student Teams-Achievement Divisions), students were grouped according to mixed ability, and ethnicity. Accordingly, the researcher grouped the students in such a way that all the different ability groups in the experimental classroom were fairly represented in each of the groups formed by the researcher. The researcher presented the materials (course outline, and teaching and learning materials from the resource center and library) in the same way they always have, and then students worked within their groups under the supervision of the researcher to make sure all of them mastered the content. Finally, all the students took individual quizzes/test (post-intervention test). Students earned team points based on how well they scored on the quiz/test compared to past performance (i.e. pre-intervention test scores).

In the JIGSAW model on the other hand, students were responsible for teaching each other the material. Assignment was divided into several expert areas, and each student was assigned with one area. Experts from different groups met together and discussed their expert areas. Students then returned to their groups and took turns teaching their colleagues. The rationale for the integration of the two models was that while the STAD ensures active group participation, the JIGSAW had the strong potential of enforcing more active individual participation (individual accountability) in this study. This was necessitated by the fact that the pre-service teachers (the subjects of the study) need to collaborate to acquire both the content knowledge and pedagogical skills and knowledge in teaching digestive system at the JHS level. Thus the ability to demonstrate one understands any object of-concept, skill; generalization etc. is to be able to teach it to a different person to understand equally the same as the teacher.

In this integrated approach, every activity or learning task for the groups was put in the form of a question/ problematic situation so that students will have a good focus about how to accomplish the task in their respective groups. The content of the course taught using the cooperative learning strategies was based on the syllabus designed to help pre-service teachers to integrate science at all the JHS levels in Ghana

Post Intervention

At the end of the intervention, both groups were required to write a test (post-test).This test purposely evaluated the performance or achievements of the experimental and the control groups after the 6 weeks‟ instruction by the researcher. In other words to find out which of the two groups had performed better than the other after the intervention. The posttest consisted of the ten questions as the pretest questions. The duration for the test was one hour. The two set of tests were scored and analyzed.

Data Analysis Plan

Simple Qualitative analysis was employed in the analysis of the responses of the pre-service teachers in their journals (reports) in percentages. The criteria used for analyzing the journal reports included; overcoming their weaknesses, improving upon their strengths, enhancing their confidence, empowering them to be resourceful, motivating them to learn and teach, enhancing their pedagogical skills, improving their content knowledge, achieving higher performance, socialization and accommodation, enhancing their enquiring skills, encouraging them to be hard working, helping them to think rationally, loving colleagues, self dependent, and attaining self esteem The Quantitative analysis that the

researcher used for analyzing the posttest mean scores of the two groups was the t-test statistical significance tool.

CHAPTER FOUR

RESULTS, FINDINGS AND DISCUSSIONS

This study examined the effects of cooperative learning (Small Groups) to promote active learning to enhance pre-service teachers‟ performance in teaching integrated science in the basic school. Data was elicited from all the 40 pre-service teachers in the class. Questionnaires and Tests (pretest and posttest) were used to collect data for the study. The data analysis is presented in the tables below. These represent the overall results after exposing the students to the cooperative learning they were able to achieve higher test scores and responded positively to the questionnaire.

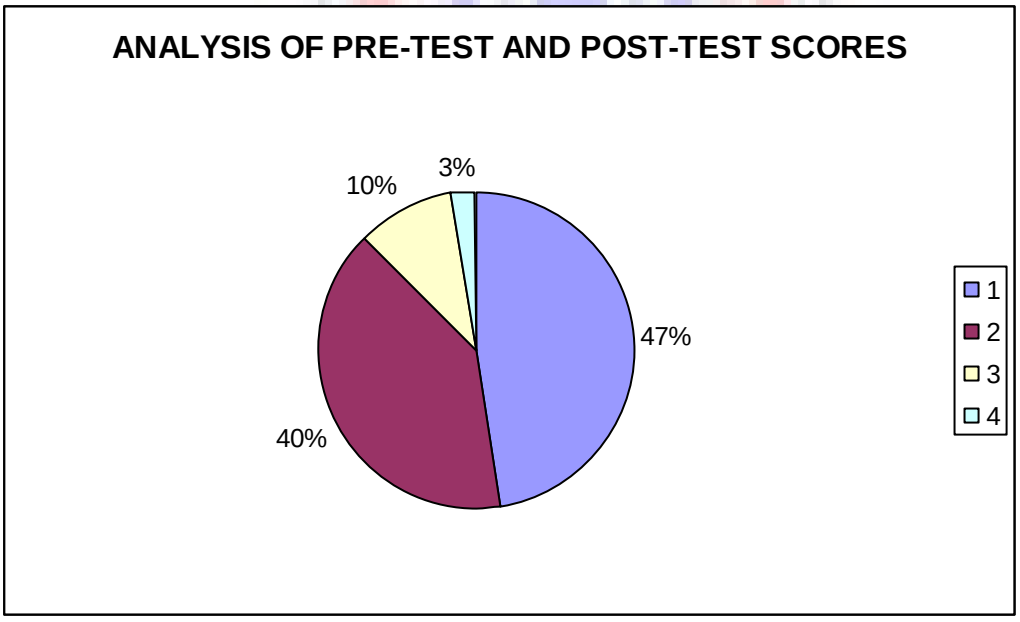
Analysis of pre-test and post-test scores

Table 1

Pre-test scores

Marks	Frequency	Percentage
0-5	19	47.5
6-10	16	40
11-15	4	10
16-20	1	2.5
Total	40	100

Figure 1



Before the intervention the researcher taught the class through the traditional instructional approach as the practice used to be: individualistic and competitive learning environment.

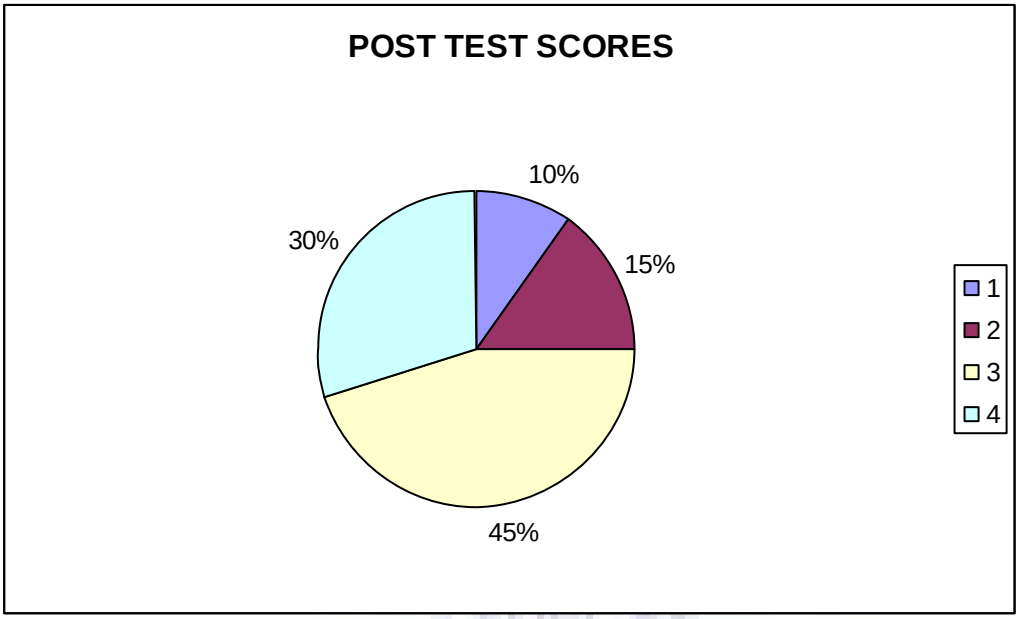
Then after the exhausting all the subtopics, the pre-service teachers were required to write the pretest to determine the impact of the individualistic learning on their performance as could be seen in the pretest table above. From the table, only one pre-service teacher scored a mark in the higher range of 16-20. However, majority of the pupils, totaling 19, scored marks in the lowest range of scores.

Table 2

Post-test scores

Marks	Frequency	Percentage
0-5	4	10
6-10	6	15
11-15	18	45
16-20	12	30
Total	40	100

Figure 2



After the intervention the number of pre-service teachers that scored marks in the lowest range was 4, the least number, as compared to the 19 in that same range in the pretest. Similarly, there was an appreciable increase in the number that scored marks in the highest range of scores in the posttest as compared to the number that scored in the same range thus1 in the pretest as compared to 12 in the post test.

It can also be seen that other higher ranges of scores have increased significantly. The final examination (posttest) demonstrated the benefit of cooperative learning for the pre-service teachers in the class: the percentage that scored in the higher range of scores after the intervention (the cooperative learning) was higher than that of the pre-intervention class (pretest). This is supported by the findings of researchers like Dees (1991) and (Johnson & Johnson, 1985).

The above results might be attributable to the cumulative effect of the more able students helping the less prepared students understand the more difficult materials covered late in the topic. The effect of cooperative learning on pre-service teachers-instructor interaction might also explain differences in test scores. Pre-service teachers seemed less withdrawn about asking questions in the small groups. When pre-service teachers‟ did ask questions, they gained closer interaction with the instructor and immediate feedback on performance.

In the questionnaire, the subjects were required to express their opinions on the effectiveness of cooperative learning after the intervention by choosing one of the following responses: 1 – strongly agree, 2 – agree, 3- don‟t know, 4 – disagree, 5 – strongly disagree. The researcher explained to them the implications of their responses/opinions. But in some instances they were to indicate YES/NO to express their opinions

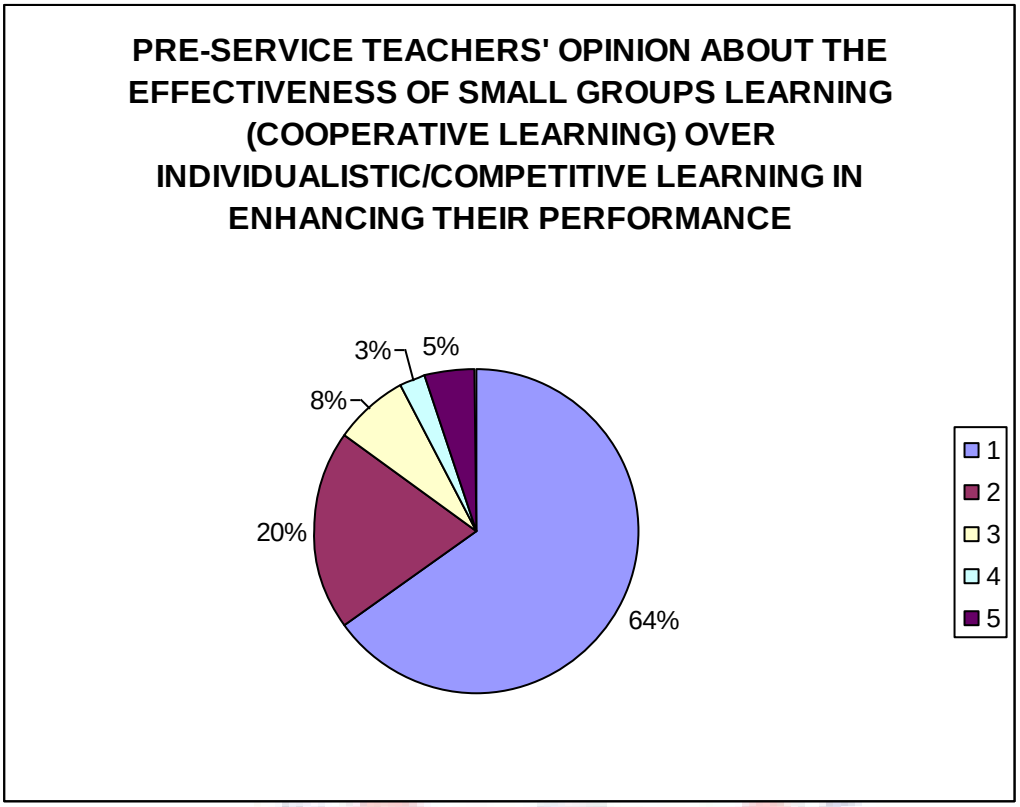
Table 3

Pre-service teachers' opinions about the effectiveness of small groups learning (cooperative learning) over individualistic/competitive learning in enhancing their performances

Opinion (post intervention)	frequency	Percentage (%)
1	26	65
2	8	20
3	3	7.5

4	1	2.5
5	2	5
Total	40	100

Figure 3



After the treatment (effective use of cooperative learning) in the class, a significant number of the students had the opinion that cooperative learning was a very effective an approach to learning as compared to individual/competitive learning. This was evidenced in Table 1 above where 65% indicated that they strongly agree that small group learning was very effective in promoting learning (performances) as compared to the few number (5%) who strongly disagreed with the opinion of the majority as indicated early on.

Perhaps the majority were strongly holding on to that opinion because they have been able to secure higher test score in the post test by virtue of learning in cooperative learning setup as compared to their test scores in the pretest when they were learning in an individualistic learning environment as it used to be (Johnson & Johnson 1985). This could be evidenced in the analysis of the pre and post tests scores where there was an

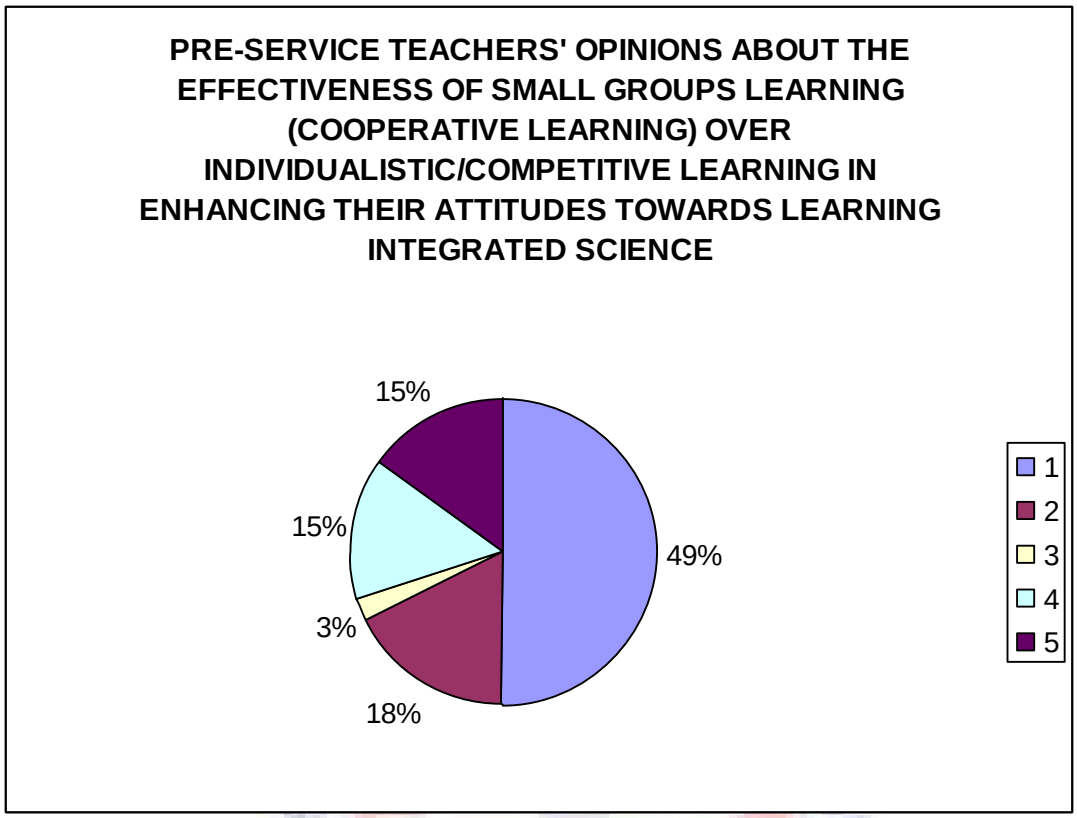
appreciable rise in the number of pre-service teachers who scored marks in the range 16-20 from 1 to 12, representing a percentage increase from 2.5% (pretest) to 30% (posttest).

Table 4

Pre-service teachers' opinions about the effectiveness of small groups learning (cooperative learning) over individualistic/competitive learning in enhancing their attitudes towards learning integrated science

Opinion (post intervention)	frequency	Percentage (%)
1	20	50
2	7	17.5
3	1	2.5
4	6	15
5	6	15
Total	40	100

Figure 4



From the table, 20 pupils representing 50% were of the opinion that cooperative learning has succeeded in enhancing their attitudes towards learning integrated science as compared to 15% who differed in that opinion: individualistic/competitive learning can do even better.

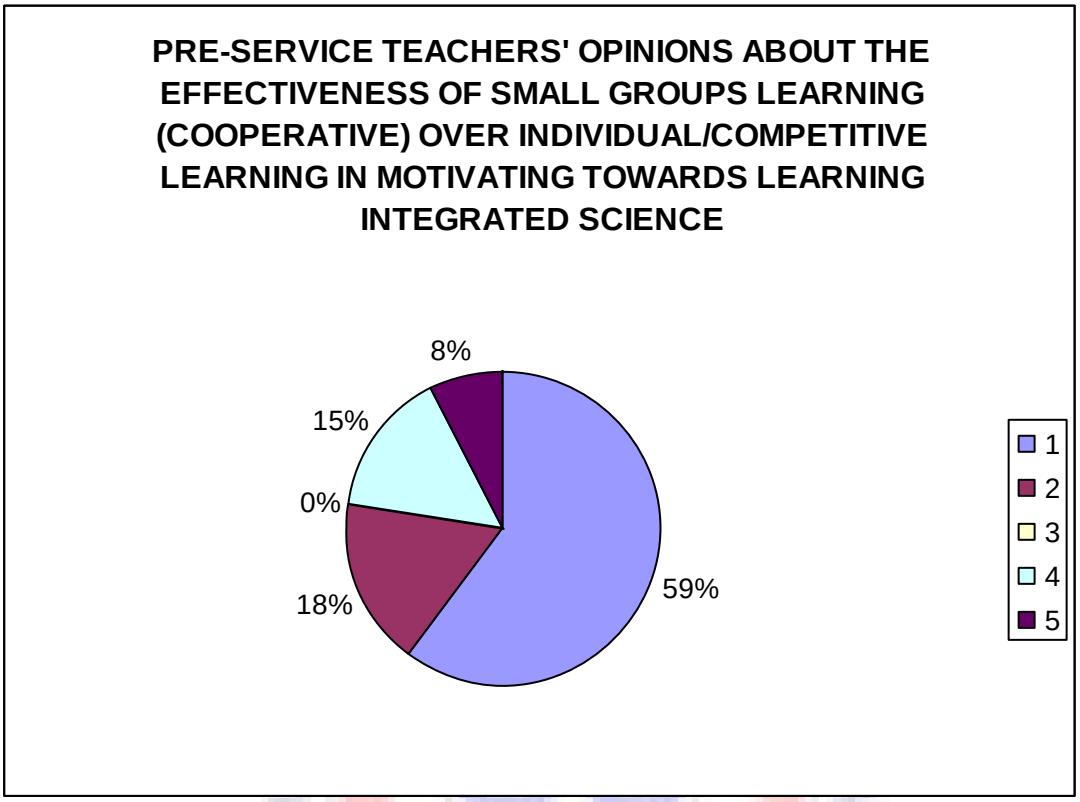
Additionally, the researcher observed that majority of the pre-service teachers who did not like integrated science began to show more interest in the learning of the subject and they enjoyed learning in groups, a finding which is also supported by Jones (1991) and Davidson and Kroll (1991). This means that majority of the pre-service teachers in the class preferred learning in groups as it had the potentiality of enhancing their anxieties towards the subject.

Table 5

Pre-service teachers' opinions about the effectiveness of small groups learning (cooperative learning) over individual/competitive learning in motivating towards learning integrated science

Opinion (post intervention)	frequency	Percentage (%)
1	24	60
2	7	17.5
3	-	-
4	6	15
5	3	7.5
Total	40	100

Figure 5



From the table it is evidenced that only 3 pre-service teachers representing 7.5% had the opinion that they strongly disagree with the impact of cooperative learning in motivating them to learn integrated science. However, out of the 40 pre-service teachers who received the intervention 24 of them strongly agreed with the opinion that cooperative learning had succeeded in motivating them to learn integrated science; a similar outcome was found by Johnson and Johnson (1985).

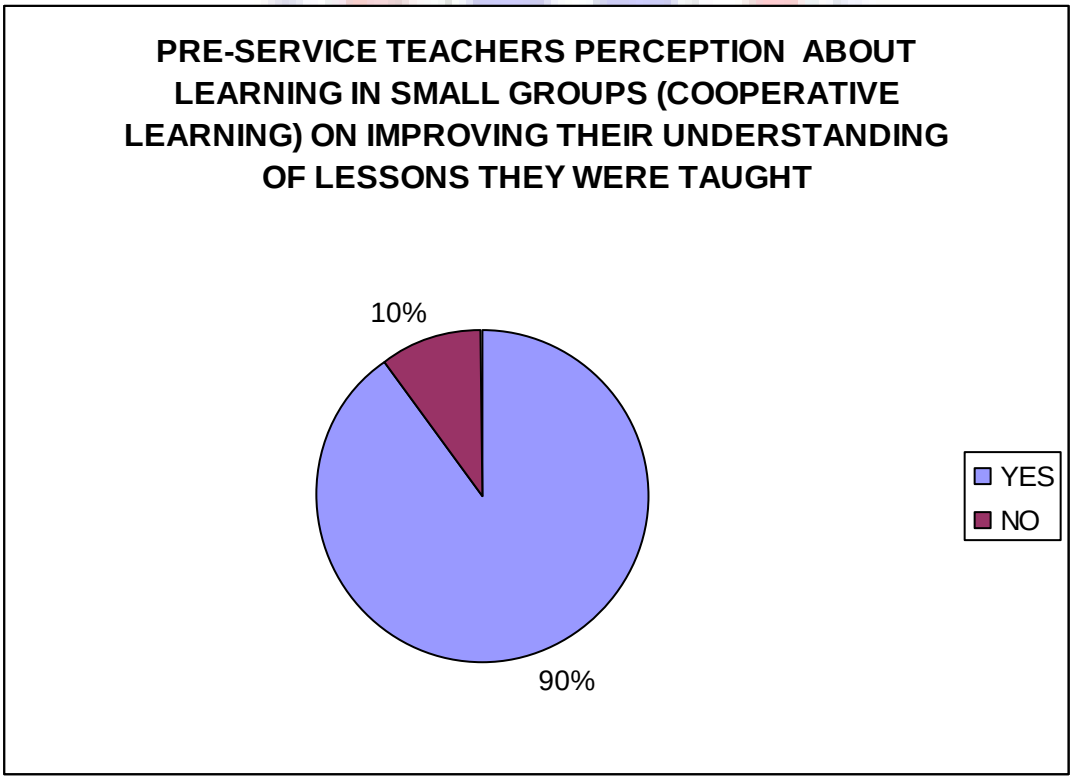
Again from the researcher"s observations, majority of the pre-service teachers preferred that they are allowed them to always learn in variety of groups, because they were always motivated to learn in their groups.

Table 6

Pre-service teachers' perception about learning in small groups (cooperative learning) on improving their understanding of the lessons they were taught

Opinion (post intervention)	frequency	Percentage (%)
YES	36	90
NO	4	10
Total	40	100

Figure 6



The subjects were required to indicate whether or not the cooperative learning situation has had any impact on their understanding of the lesson by ticking YES or NO. From the table

above, 36 pre-service teachers representing 90% said they understand things better when they learn in small groups, while only 4 pre-service teachers, representing 10% said they do not understand things when they work in small groups.

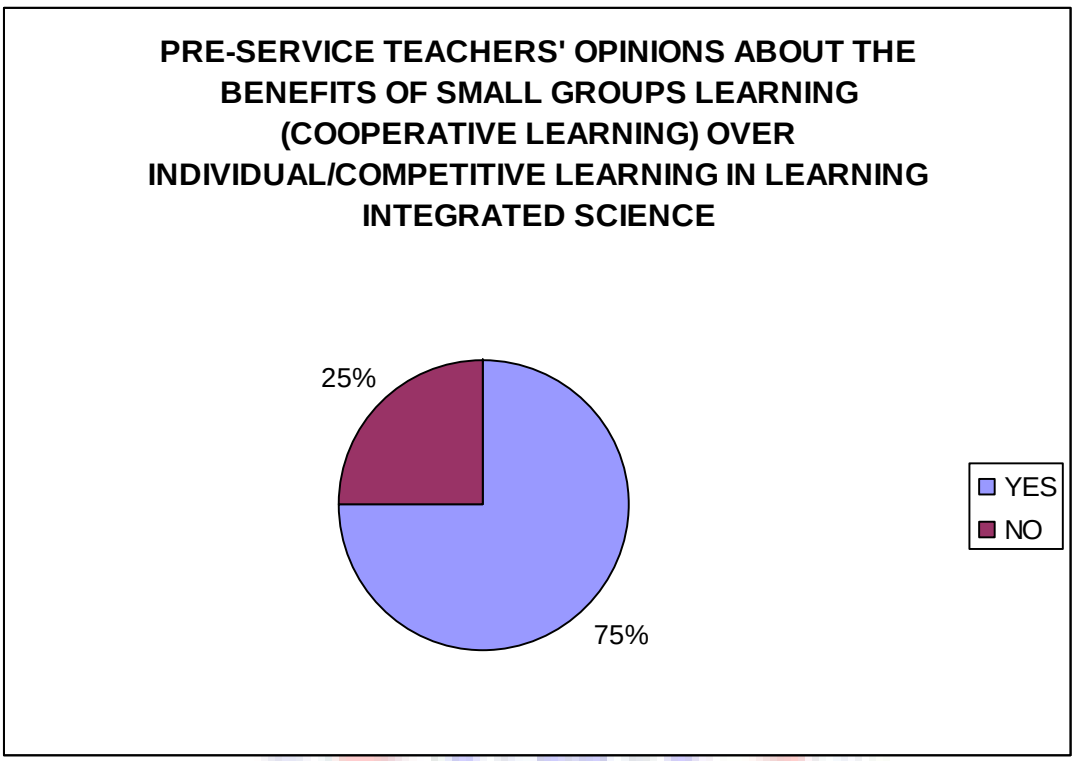
The majority‟s perception was evidenced in the researcher‟s observations: the pupils were actively involved in the discussions; they were making meaningful contributions; and they are always eager to learn new things. This could be due to the positive cooperation among team mates within the groups. Davidson (1977) also found that the use of small groups appeared to help students overcome some misconceptions about integrated science and enhance student learning of scientific concepts.

Table 7

Pre-service teachers' opinions about the benefits of small groups learning (cooperative learning) over individual/competitive learning in learning integrated science

Opinion (post intervention)	frequency	Percentage (%)
YES	30	75
NO	10	25
Total	40	100

Figure 7



When asked whether or not the cooperative learning has been beneficial to their learning, 30 pre-service teachers representing 75% out of the population of 40 pupils, responded that YES it had been beneficial to them. However, 10 pre-service teachers representing 25% showed that NO it had been beneficial to them. On the contrary, the researcher observed the benefits of the intervention in the change in the pre-service teachers‟ attitudes towards learning integrated science, the momentum gathered in their motivations to learn and improvement in their achievement tests (post-test). Garfield, in press, also noted that small group learning activities leads to better group productivity, improved attitudes, and sometimes, increased achievement. Students developed a mutual respect within their base group which, in time, transferred to other situations within the school setting (Schroeder, Basken, Engstrom & Heald, 2000).

Table 8

Responses from students as to whether cooperative learning will help to improve content knowledge

Opinion (post intervention)	frequency	Percentage (%)
YES	35	87.5
NO	5	12.5
Total	40	100

From the table above, it can be deduced that about 87.5% of the students responded that cooperative learning will help improve content knowledge because it will help them to get more ideas from others and answering questions in class without fear as shown in the figure below.

Figure 8

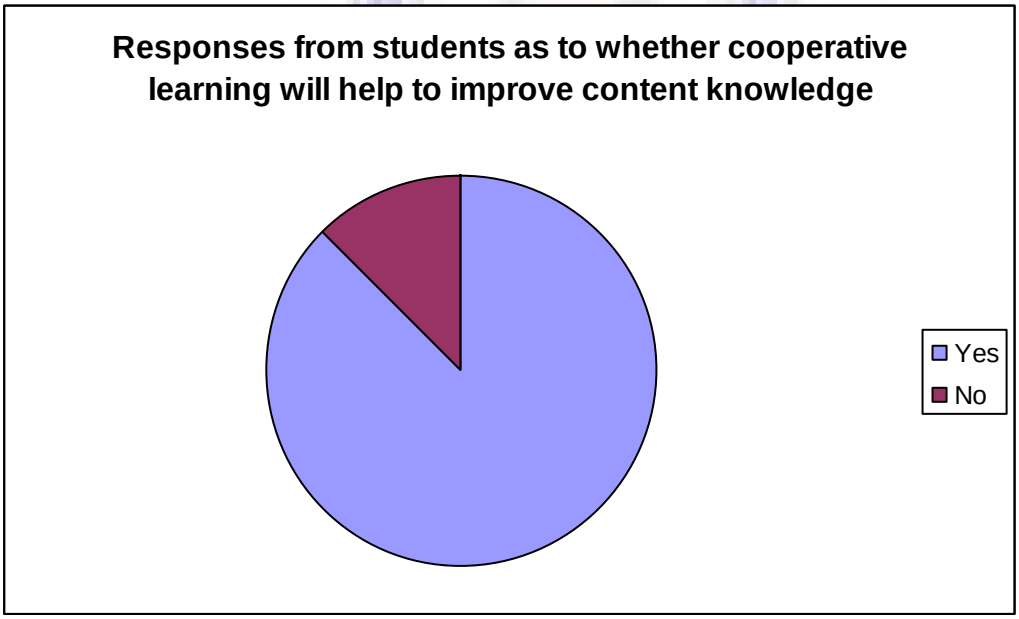


Table 9

Responses from students in disadvantages of cooperative learning

Opinion (post intervention)	frequency	Percentage (%)
YES	30	75
NO	10	25
Total	40	100

It was ascertained from the table above that, about 75% of the students responded that there are some disadvantages associated with cooperative learning of which some are bad behaviours are learnt from others, some students feel superior to others and they also feel that in cooperative learning, some students do not participate. The remaining 25% of the students who objected to this assertion responded that through cooperative learning, ideas and knowledge are acquired which help to improve upon their language, sharing of experiences, and also motivate students to learn. the

Figure 9

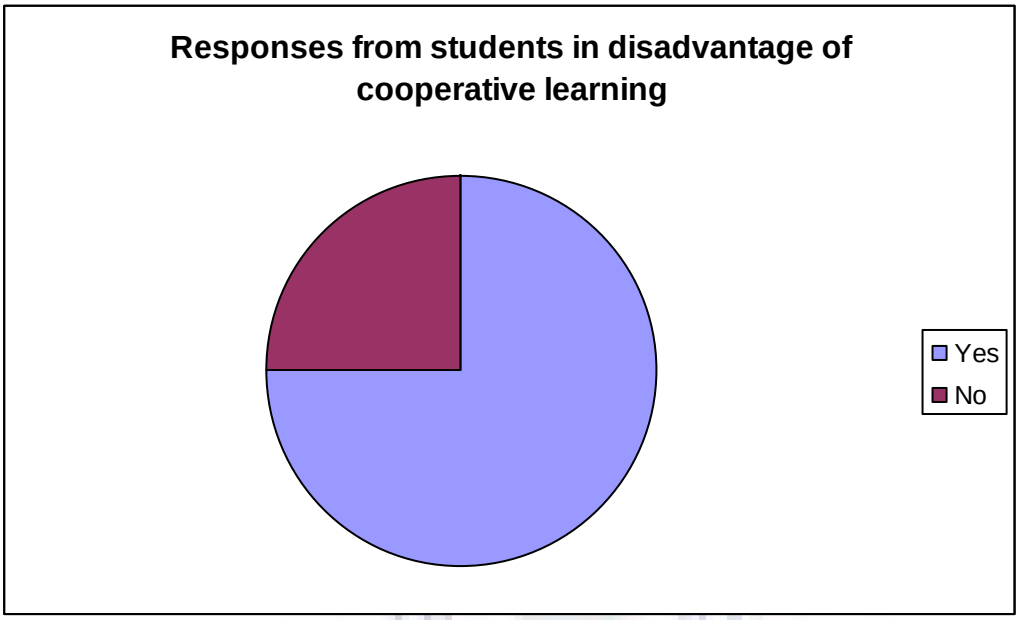


Table 10

Students' responses on recommendations of cooperative learning to be used in teaching and learning in Junior High Schools

Opinion (post intervention)	frequency	Percentage (%)
YES	30	75
NO	10	25
Total	40	100

The table above revealed that about 75% of the students are of the view that cooperative learning should be used in teaching and learning at the Junior High School level in the sense that, it will help students improve upon their performance, sharing of ideas and also help improve upon their language skills whiles those who are against cooperative learning being used in teaching and learning also gave their reasons to be that, negative attitude such as laziness are learnt, some students also do not participate in the work and lastly, at times

brings quarrels among students. The above information is shown graphically in the figure below

Figure 10

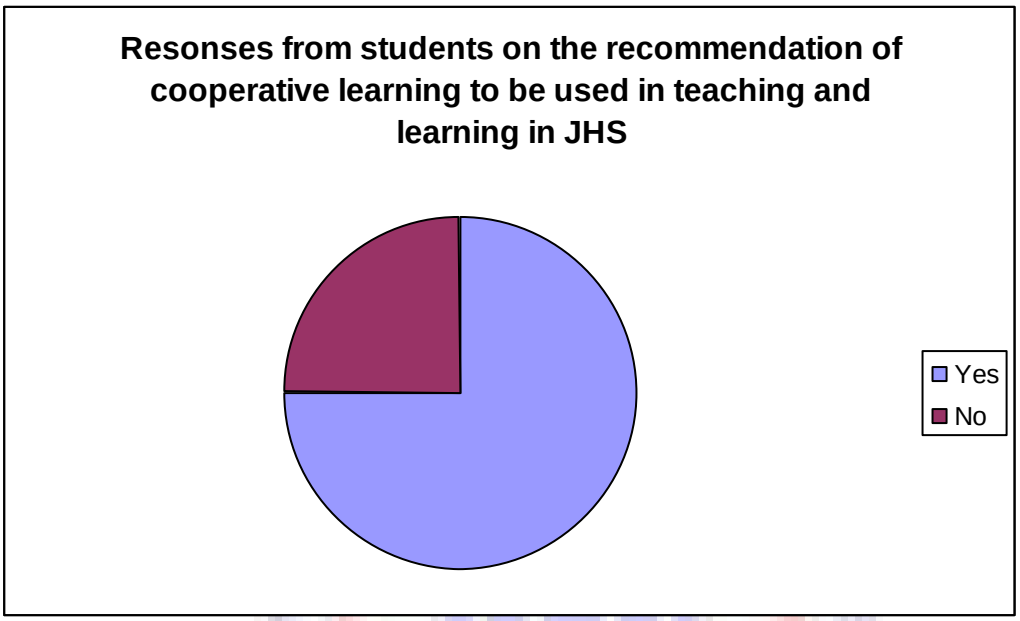


Table 11

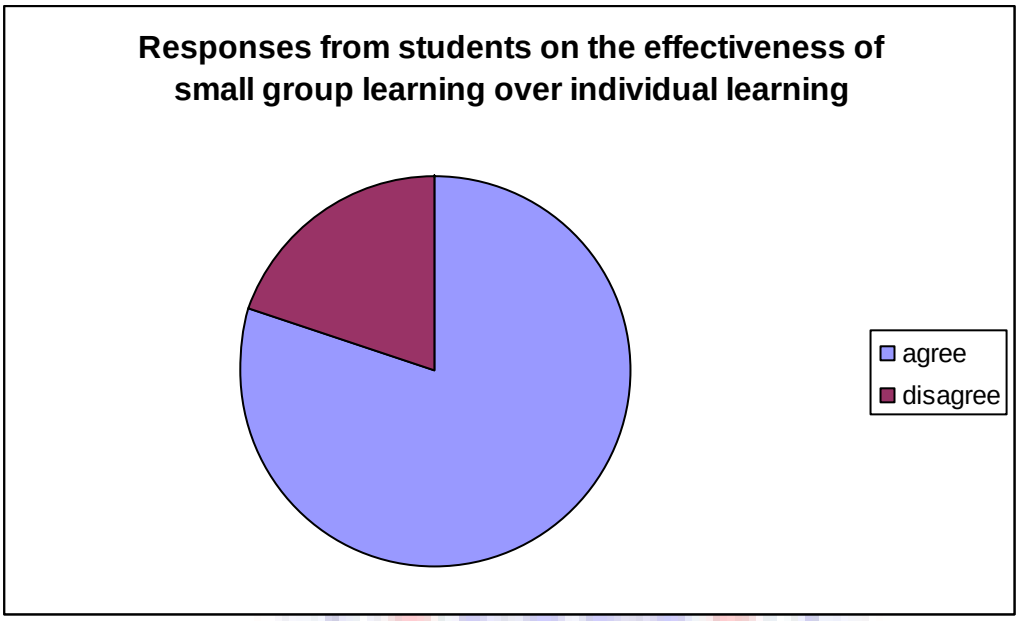
Students' responses on the effectiveness of small group learning over individual learning

Opinion (post intervention)	frequency	Percentage (%)
AGREE	32	80
DISADGREE	8	20
Total	40	100

From the table above about 80% of the students agreed that small group learning is more effective than individual learning in the sense that, small group learning help students to

improve upon their performance through sharing of ideas and also help improve upon their language skills whiles those who disagree also said that some students feel superior to others in small group learning and also some students do not participate in the learning process as this information is shown in the figure below

Figure 11



Discussions

This study examined the effects of cooperative learning (Small Groups) to promote active learning to enhance pupils‟ performance in integrated science in DBE 1A class at St. Monica‟s College of Education. Data was elicited from all the 40 pre-service teachers. Questionnaires and Tests (pre-test and post-test) were used to collect data for the study. The data analysis is presented below: overall, after exposing the students to the cooperative learning showed that they were able to achieve higher test scores and responded positively to in the questionnaires.

After the treatment (effective use of cooperative learning) in the class, a significant number of the students (65%) had the opinion that learning alone was a very ineffective an approach to learning as compared to small group learning. This was evidenced in Table 1 shown earlier where 65% indicated that they strongly disagree that small group learning was effective in promoting learning as compared to the few number (5%) who strongly agree that learning alone was effective. There are many benefits when students work in cooperative learning groups. The researcher has found that cooperative learning changes the pre-service teachers‟ perceptions, their ability to discuss, and their perception of working with one another in integrated science.

First, the use of cooperative learning has changed the perception of some pre-service teachers in the class. The pre-service teachers enjoy class much more when they work together. The researcher has had a couple of pre-service teachers say they feel more comfortable asking their partner questions in small groups. One pre-service teacher stated, “I can ask questions in my group without being made fun of.” All in all, I think the class is better. Students listen when others are speaking. While taking notes, students ask questions that indicate their understanding of the concepts. Many students would stop the lecture and ask “Why?” or “Is this the correct way to look at it?” The researcher found that pre-service teachers in cooperative learning groups are more active and involved in the learning process and, conversely, fell less bored. With cooperative learning groups, the researcher was able to establish a more relaxed and comfortable classroom environment. A comfortable classroom environment reduces the fear of integrated science so commonly found in the integrated science classroom.

Second, pre-service teachers are becoming more confident in their ability to discuss integrated science. After a couple of lessons in which cooperative learning was used,

students were more willing to answer questions for the whole class. Pre-service teachers also said they felt more confident since they had already discussed it with someone else. They are not as insecure since they have someone else‟s opinion to fall back on. One pre-service teacher commented, “Class discussions let me hear the different points everyone has.” In cooperative learning groups, all learners are participants.

As instructor (researcher), I observed differences between the two learning styles, (cooperative learning and traditional learning). Students in the cooperative learning class, when working on assignments in groups, asked questions more often than they did before they were exposed to the cooperative learning (during lecture), even though the researcher frequently asked for questions during lecture. The researcher observed that the randomly assigned groups worked more closely together as the period of study progressed. Students responded positively when the researcher asked them if the small groups helped them understand the material. The researcher felt she was able to gauge the understanding of the cooperative learning students by listening to them discuss problems and assignments, and therefore the researcher felt better able to plan lectures appropriately. In terms of achievement, cooperative learning was more effective than lecture and individual work because pupils who scored lowest in the pretest were able to improve their scores equally effectively. Differences in test scores (between posttest and pretest) were substantively, as well as statistically, significant. Because the cooperative groups were randomly assigned, students who were less prepared for the lesson and low-achievers alike were likely to be in groups with well-prepared students (high-achievers). This contact might explain the significantly higher scores of the low-achieving students in the cooperative learning class when compared to the lecture class (traditional method). This result supports Vygotsky‟s (1978) concept of scaffolding for less able learners.

The comprehensive final examination (posttest) demonstrated the benefit of cooperative learning for the pupils in the class: the mean score for the cooperative class was higher than that of the lecture class (pretest). This result might be attributable to the cumulative effect of the more able students helping the less prepared students understand the more complex/difficult material covered late in the topic. That is, as the scaffold builders help the climbers, both become stronger in their knowledge of the material. This effect would logically be more pronounced in testing over more difficult material.

The effect of cooperative learning on pupils-instructor interaction might also explain differences in test scores. Pupils seemed less inhibited about asking questions in the small groups. As one student said, "It's easier to ask a question when it's not in front of the whole class." When pupils did ask questions, they gained closer interaction with the instructor and immediate feedback on performance.

By using cooperative learning groups for one semester my students did better in the second semester than they had done in the first semester not using the groups. The students, for the most part, seemed to enjoy the opportunity to work with each other to try to solve some of the more complicated problems.

In general the class bonded together. It did not make a difference of ability levels as they quickly found out that they had to work together and help each other improve if they stood a chance of winning the competition prizes. Having group competitions on tests, with the highest group average being declared the winners, was probably the best idea I had. The students really tried hard to improve so that the entire group would do well.

It was also revealed that, there were some students who just did not like to work with others. They felt that they could accomplish more and do it better than the group could. And for the most part at this grade level they could. As eighth graders these students will

see much diversified teaching styles as they continue with their education. Some of their future teachers will use cooperative groups and others will not. Now that they have had a taste of cooperative learning groups the researcher feel they will be better able to handle group situations in the classroom and/or in the business world.

The researcher found that using cooperative learning groups took some of the pressure off me as the teacher. Instead of me having to try to help everybody, I only had to help each group that was having difficulties. That meant that I might be helping two or three students at once instead of one at a time. There were even some days that I taught the new concept and that was all that was needed of me. The students helped each other and took care of business. It was not nearly as stressful for me as I did not have to answer a hundred questions each class period.

Knowing that the students were capable of doing this made it easier to plan for a substitute when I was absent; I knew that the students would be able to work through it together.

The researcher thinks that using cooperative learning groups as a part of the total teaching practice makes goods sense. To use it solely by itself might be leading to trouble for some students down the road. A good mixture of group work and individual work will keep the students thinking for themselves but also able to bounce ideas off others and come to the best possible solution.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter is presented under the following subheadings; summary of key findings, conclusions, recommendations and suggestions for further research.

Summary

This study investigated the impact of using cooperative learning to promote active learning among DBE 1A class of St. Monica‟s College of Education in order to enhance their performance in collecting and handling data. This research study was an action research and it was carried out with all the 40 students in the above named class. Data was collected through the use of achievement tests and questionnaires administered to the subjects. The data was analyzed qualitatively.

Summary of key Findings

The findings from the study included the following:

1. The students were able to demonstrate that they understood the lessons through the improvement in their performance in the posttest scores as compared to the pretest scores discussed in chapter four.

2. All the students at St. Monica‟s College of Education in the class participated in the lessons actively throughout the period of the study.

3. The cooperative learning environment succeeded in motivating the students very much to learn integrated science and they were doing so with very much joy.

4. Overall, the students‟ attitudes towards learning integrated science had been very positive: they learnt the integrated science willingly, attendance and participation during integrated science lessons had improved tremendously.

5. Students feel very comfortable and confident to discuss integrated science lessons in small groups and whole class discussions. This has increased and improved their discourse and consequently enhanced their understanding and performance in integrated science.

Conclusions

Based on the findings that emerged from this study, the following conclusions were drawn:

1. Cooperative learning was very relevant and beneficial in helping the DBE 1A class of St. Monica‟s college of education to improve upon their performance in data collection and handling, because they were able to secure higher test scores after the intervention as compared to their test scores before the intervention.

2. Cooperative learning had succeeded in helping the class teacher (researcher) to positively motivate the DBE 1A class of St. Monica‟s college of education to learn integrated science and inculcate in them positive attitudes towards learning integrated science.

Recommendations

The study purposely investigated the impact of using cooperative learning to help the DBE 1A class of St. Monica‟s College of Education to overcome their difficulties in data collection and handling thus to improve the pupils‟ performance in data collection and handling. Despite the limitations which might accompany the methods used in collecting the data, the findings were quite illuminative. Based on these findings the following recommendations were made:

1. Class teachers at St. Monica‟s College of Education should endeavour to integrate cooperative learning into their routine methods of instruction in integrated science classes.

Suggestions for Further Research

Incorporating cooperative learning in our schools is very necessary towards promoting active learning among students. Just like the successes we are witnessing in businesses today; due to the cooperation among business agencies, our schools can also adopt this strategy to foster collaboration among learners to acquire knowledge. Accordingly, the following are some of the suggestions for further research that could possibly lead to achieving even greater benefits than what the researcher had achieved:

1. Assessing the impact of cooperative learning in promoting pupils‟ discourse in learning integrated science.

2. Using cooperative learning to assist pupils to learn challenging topics in integrated science.

3. Comparing the impacts of cooperative learning and traditional learning methods in promoting active learning among pupils.

4. Findings of cooperative learning studies should be disseminated to all schools in Ghana to encourage other teachers to consider this instructional approach.

5. A staff development program should focus on the need of the teachers.

6. Needs analysis study should be done before running any course in integrated science. The courses should be hands-on and include basic concepts of cooperative learning and the rational for using cooperative learning in school settings.

7. Comparing the performance of female pre-service teachers in the cooperative learning setting to their male counterparts in the same environment.

8. Comparing the performance of mixed sex pre-service teachers in a cooperative learning setting in the same environment.

Although cooperative learning cannot cure all the problems faced by teachers in teaching learning of integrated science, it may serve as an alternative to traditional method of teaching.

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APPENDIX

QUESTIONNAIRE FOR STUDENTS

INTRODUCTION

This study is a pre-condition requirement for graduation, the researcher will be very grateful if you could be considerate to answer the questions below to the best of your knowledge.

I assure you that your response to this questionnaire will be used solely for the purpose of this research and promise that the information provided will be treated with utmost confidentiality.

Thank you in advance for your consideration co-operation.

INSTRUCTIONS

Tick (√) in the box the correct item specified or write the necessary response in the space provided.

Profile of Respondents

1. Sex: [ ] female [ ] Male
2. Age: [ ] 12-18 years [ ] 19-30 years
3. Occupation: [ ] civil servant [ ] student
4. Educational status: [ ] second cycle [ ] tertiary
5. Religion: [ ] Christian [ ] Islamic [ ] traditionalist
6. marital status: [ ] married [ ] single

QUESTIONS

Tick (√) in the box the correct item specified or write the necessary response in the space provided.

1. Working in groups helps me to better learn and understand facts and concepts in integrated science than learning alone. [ ] Yes [ ] No

2. Group learning is beneficial over individual learning. [ ] Yes [ ] No

3. If Yes give reasons ……

……

……

4. Did you learn quicker and retain more knowledge in small cooperative groups for the integrated tests? [ ] Yes [ ] No

5.What new ideas did you get from your team mates? ……

6. Was there any competition among the groups? [ ] Yes [ ] No

7. Do you prefer learning in cooperative small groups or alone? [ ] Yes [ ] No

8. If yes give reasons.

……

9. Do you think co-operative learning groups will help to improve content knowledge in integrated science? [ ] Yes [ ] No

10. What are some of the advantages that you got in learning in cooperative groups?

. ……

……..

……

……

11. Were there some disadvantages in learning in cooperative groups?

[ ] Yea [ ] No

12. If yes give some ……..

13. Do you recommend cooperative learning to be used in integrated science in Basic and J.H.S? [ ] Yes [ ] No

14. If yes give reasons

…….....

……

Instruction for question 14-16; please circle the number that best represents your opinion.

1= Strongly Agree; 2= Agree; 3= Disagree; 4= Strongly Disagree

15. Small groups learning is effective over individual learning in enhancing my performance in integrated science. 1 2 3 4

16. Small group learning is effective over individual learning in enhancing my attitude towards learning integrated science. 1 2 3 4

17. Small group learning motivates me to learn integrated science. 1 2 3 4