UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF SCIENCE EDUCATION

USING ACTIVITY METHOD OF TEACHING TO IMPROVE UPON THE PERFORMANCE OF SHS TWO HOME ECONOMIC STUDENTS IN INTEGRATED SCIENCE AT DIABENE SECONDARY TECHNICAL SCHOOL IN THE WESTERN REGION.

MERCY, AWERBA DADZIE

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MERCY, AWERBA DADZIE

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A dissertation presented to the Department of Science Education of University of Education, Winneba in partial fulfillment of the requirement for the award of a Master Degree in Science Education

JUNE 2012

DECLARATION

Student's Declaration

I, Mercy Awerba Dadzie, hereby declare that except for the references of other people's work which have been cited, this action research is the result of my own effort and that it has neither in whole or in part presented elsewhere.

Signature…….

Date……..

Supervisor's Declaration

I, Dr.Thomas Tachie Young, hereby declare that the preparation and presentation of this research work was supervised in accordance with the guidelines on supervision of action research, as laid down by the University of Education, Winneba.

Signature……. Date**……**

DEDICATION

I dedicate this research work to the glory of God for his protection, guidance and wisdom which has brought me this far. I also dedicate it to my beloved late husband, Mr. John Ransford Amenlemah, my beloved children, Stephanie Efibakyi Amenlemah and Joseph Stephen Yarko Amenlemah and to all my siblings especially my elder sister, Susanna Koomson, my mother Elizabeth Abban for her unceasing motherly love, care, prayers and counseling for bringing this research to a successful completion.

Finally, I dedicate this work to all my colleagues who believe that the Lord God Almighty holds supremacy in all things.

ACKNOWLEGEMENTS

My profound thanks go to Almighty God for his grace and mercies that has sustained me throughout the course. My deepest thanks also go to my supervisor Dr. Thomas Tachie Young a lecturer at science department for his love, guidance, constructive criticisms, salient suggestions, and encouragement that has enabled me to finish this work.

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ABSTRACT

The study aimed at helping SHS 2 Home Economics students' of Diabene Senior High Technical School, Takoradi in the Western Region of Ghana, on their performance in both class test and examinations in Integrated Science. Out of two hundred and fifty (250) students, one hundred and five (105) students made up of 95 boys and 10 girls were selected as sample size. The method for the sampling exercise was simple random sampling. Data were collected through interviews, observations and tests in Integrated Science. The data were analyzed using bar graphs expressed in percentages. Some of the findings derived were lack of teaching and learning materials to teach the subject, lack of class exercises due to large class size and lack of exposure of students to some educational trips. Based on the findings, an intervention was designed and implemented to address the problem of their poor performance. Some of the intervention strategies included the use of demonstration method in teaching science, grouping mixed ability students for practical activities using relevant teaching and learning materials, formation of science clubs, using some of the girls as laboratory assistants and organization of educational trips.

Observation of the students during the implementation of the intervention revealed that they were highly excited when taught using activities that got them involved in the lesson.

CHAPTER ONE

INTRODUCTION

Overview

This chapter covers the background of the study, statement of the problem, diagnosis, the purpose of the study, specific objectives, research questions, significance of the study and organization of work. It also talks about some limitations and delimitations of the problem.

Background of the study

The use of activity method to improve upon students' performance in Integrated Science has been and is still one of the major problems in the teaching and learning of Integrated Science in Senior High Schools, especially Diabene Secondary Technical School in the Western Region of Ghana. The academic requirements into any institution or job placement include an aspect of science. Entrance into higher educational institutions in Ghana today also requires credit or pass in science. In the field of science, one acquires new skills, knowledge, facts, perceptions, principles and new information as a result of learning through practical activities.

In support of schools, the government has made a lot of attempts to solve the problems by introducing incentives and improvised materials to support teaching and learning effectively. Integrated Science which consists of physics, chemistry, biology, agricultural science and information Communication and Technology requires the organization of a lot of activities in the form of experiments, demonstrations, in order to improve the performance of students. The same can be said of the Diabene Secondary Technical School having home economics students.

In the case of Diabene Secondary Technical School, critical observation by the researcher revealed the predominant use of literally approaches to science teaching and learning. These approaches create the impression that the students are merely fed with information with little or no hands – on activities.

The 2008 WASSCE Chief Examiner's Report stated that, there is lack of activity-based method in some Senior High Schools. It was method to focus the students' minds on real – life situations. There is the need to develop new scientific ways of doing things in such sectors as health, transport, security, education, communication, etc, and Science should therefore not to be neglected at all. In Ghana, President J.A. Kuffour in his speech during the 2003 independent day celebration in Accra said "Ghana and its counterpart Malaysia gained independent in the same year 1957 but the latter has advanced tremendously through the efficient use of science and technology. 'Government will therefore take every measure to place the nation at its rightful position on the continent through the use of science and technology' (Daily Graphic 8th March, 2003). If the President's wish is to be actualized then urgent steps should be taken to rekindle the interest of pre – university learner in science.

Statement of the problem

Integrated Science is one of the fundamental subjects which has been designed to offer a body of knowledge and skills to meet the requirements of everyday living, and provide adequate opportunity to further education and training in science, and science related vocations. Integrated Science as prescribed by the Ghana Education Service has components comprising Chemistry, Physics, Biology, Agricultural Science, Information and Communication Technology were introduced into the Home Economics department in 2001/2002 academic year at Diabene Senior Secondary Technical to help students in the Department understand their elective subjects better and also to promote meaningful learning. This was envisaged because most of their elective subjects (e.g. Food and Nutrition, Management in Living, General Arts) have direct link with these three science subjects. Due to its complexity, how integrated science should be taught to students to understand and thus perform well has been spelt in the syllabus. The researcher first conducted two class exercises and scored. Though most of the questions were based on students' previous lessons, the results indicated that most of the students' could not give simple explanations to basic concepts in Integrated Science. Students were taught mainly using the lecture method due to large class size. The following diagnostic procedures were used to ascertain the performance of students in Integrated Science of Diabene Secondary Technical School:

1. Analysis of previous WASSCE results of DSTS.
2. Comments from other colleague teachers
3. Oral questioning, Observations and interviews of students
4. Analysis of previous class exercises

The researcher undertook the action research using activity based method in the teaching and learning of Integrated Science in Diabene Secondary Technical School to improve upon the performance of students.

Causes of the problem

Upon careful and critical analysis, the following were identified as some of the causes of poor performance of home economics students of Diabene Secondary Technical School. The students', especially female students, have pre-conceptions or notion that science is difficult and that most of the concepts are abstract. Students do not perform any practical activities often due to large class sizes. More over, female students are not involved in practical activities. Relevant Previous Knowledge of students was not factored into lesson delivery and also the absence of the use of TLMs during practical activities. As a result, more students feel reluctant to learn Integrated Science or develop interest in the subject.

Purpose of the study

The purpose of the study was to find out the reasons why SHS 2 Home Economics students in Diabene Secondary Technical School rate science as a difficult subject.

Specific Objectives

The project aimed at achieving the following objectives:

1. To find out whether instructional strategies such as frequent class exercise, class tests and prompt feedback to students can bring about improvement in students performance, and sustain their interest in science.
2. To find out whether the use of activity – based methods in teaching Integrated Science can help improve the performance of the students in the study of science.
3. To find out if increased females' participation in practical activities can cause them to develop interest in the learning of Integrated Science.
4. To find out if field trips, debates and quizzes can bring about improvement in the performance of students in Integrated Science.

Research questions

The following research questions were posed to guide the study:

1. Will the use of activity method enhance students' understanding of science the concepts 'test for starch in plants'?
2. Will the use of mixed ability groupings in practical activities help improve the performance of Form 2 Home Economics students?
3. Will the use of activity method in addition to teaching and learning materials improve students' performance?

Significance of the study

It is hoped that the findings of the study would benefit the SHS2 Home Economics students of Diabene Secondary Technical School. It would also sensitize Integrated Science teachers to gain insight into other teaching methods aside the usual lecture method. It would help the teachers to be aware and apply the appropriate teaching methods in teaching science which will enable students to appreciate science concepts without much difficulty.

Limitations

The research couldn't cover all the students in Diabene Secondary Technical School due to limited time and financial difficulties. The instrument also used which included interview and class tests requires enough time and resources to do in – depth study of all the individual students of the class.

Delimitations

This project could have covered all students of Diabene Secondary Technical School since they all offer Integrated Science as core subject but the research was carried out in the SHS 2 Home Economics class only which the researcher teaches.

Definition of operational terms and abbreviations

G.E.S: Ghana Education Service.

R.P.K: Relevant previous knowledge.

S .H. S: Senior High School**.**

D.S.T.S: Diabene Secondary Technical School.

W.A.S.S.C.E: West African Senior Secondary Certificate Examination.

FAWE: Forum for African Women Educationist

N.G.O: Non- Governmental Organization

W. A. E. C: West African Examination Council

C.R.D.D: Curriculum Research and Development Division of Ministry of Education.

N C E L: North Central Education Laboratory

S T E M: Science, Technology, Engineering and Mathematics

Organization of the Report

This report is organized into five chapters. The first chapter provides the Introduction and background of the study as well as the problem statement, objectives of the study, research questions and significance of the study, limitation and delimitation of the study. The second chapter entails the review of related literature whiles the third chapter describes the methodology which include the description of study area, the research design, the study population, sampling, instrumentation, source and type of data collection. The data collection procedure and technique used for analyzing the data were also discussed. The fourth chapter presents the results of the study. The fifth chapter provides the summary, conclusions and recommendations of the study and suggestions for further studies.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter outlines the theoretical framework, hands – on activities, how students learn, arousing and sustaining students' interest in learning, attitudes towards science, gender issues in science education, importance of science education, (girls and science education) generally and (female participation in science) and teacher – students' interaction and gender.

Theoretical framework

Science and technology have been adopted by the Government of Ghana as the engine to drive the country's agricultural and industrialization in order to raise the country to a middle income status by 2020 (Government of Ghana, 2001). Also, science teaching and learning is to result in enculturation of science and hence scientific and technological literacy among the citizenry. Thus, science teaching and learning should be relevant to the Ghanaian child so that the beneficiaries of science education would be able to operate meaningfully in their communities and contribute effectively towards the national cause. A recent theory of learning which has been widely accepted in education communities starts from earlier work by Jean Piaget, and has been labeled "constructivism". This theory describes learning as actively constructed one's own knowledge (von Glasersfeld, 1987).

It is therefore important to infuse the teaching and learning of science within the cultural and social context of the child, hence the choice of situated learning theory as the theoretical framework to guide the study.

Constructivist teaching is based on constructivist learning theory. This theoretical framework holds that learning always build upon knowledge that a student already knows; this prior knowledge is called a schema. Because all learning is filtered through pre-existing schemata, constructivism suggests that learning is more effective when a student is actively engaged in the learning process rather than attempting to receive knowledge passively. A wide variety of methods claim to be based on constructivist learning theory. Most of these methods rely on some form of guided discovery where the teacher avoids most direct instruction and attempts to lead the student through questions and activities to discover, discuss, appreciate and verbalize the new knowledge.

Constructivist teaching methods are based on constructivist learning theory. Along with John Dewey, Jean Piaget researched childhood development and education (Piaget, 1965).

Their theories are now encompassed in the broader movement of progressive education. The Constructivist learning theory says all knowledge is constructed from a base of prior knowledge. Children minds are not a blank slate and knowledge cannot be imparted without the child making sense of it according to his or her current conceptions. Therefore children learn best when they are allowed to construct a personal understanding based on experiencing things and reflecting on those experiences (Piaget, 1985).

Constructivist activities

In the Constructivists classroom, students work primarily in groups. Learning and knowledge generation are interactive and dynamic. There is a great focus and emphasis on social and communication skills, as well as, collaboration and exchange

of ideas. This is contrary to the traditional classroom in which students are spoon fed. Learning is achieved through repetition, and the subjects are strictly adhered to and are guided by a textbook. Some activities encouraged in constructivist classrooms are:

- Experimentation: students individually perform an experiment and then come together as a class to discuss the results.
- Research projects: students are given topics and they can present their findings to the class.
- Field trips: This allows students to put the concepts and ideas discussed in class in a real-world context. Field trips are usually followed by class discussions.
- Films: These provide visual context and thus bring another sense into the learning experience.
- Class discussion: This technique is used in all of the methods described above. It is one of the most important distinctions of constructivist teaching methods.

Constructivist approaches can also be used in online learning. For example, tools such as discussion forums, wikis and blogs can enable learners to actively construct knowledge.

Because existing knowledge schemata are explicitly acknowledged as a starting point for new learning, constructivist approaches tend to validate individual and cultural differences and diversity.

In the constructivist classroom, the teacher's role is to prompt and facilitate discussion. Thus; the teacher's main focus should be on the subject.

The social learning theory of Bandura (1977) and social development theory of Vygotsky (1978) provide a strong foundation for understanding situated learning, that is, how students learn and how educators can structure teaching to maximize student learning. Vygotsky believed that the learner and his/her environment can not be separated; the learner both creates and is created by his/her culture (Miller, 2002). Bandura (1997) proposed a similar relationship, stating that learning is an interaction of three factors: the learner's biological and psychological characteristics, the learner's behaviour, and the environment. He described this interaction as triadic reciprocal causation: the environment shapes the learner and, at the same time, the learner is an active agent who can create and shape the environment. While Bandura's theory, based on behaviourism, is at odds with the constructivist theory of Vygotsky, a more holistic view of the learner-environment relationship emerges from the synthesis of these varying ideas. The encountering of new experiences can create antithesis from which learning may occur; the learner, however, can also create antithesis through their own actions. Thus, the relationship between learner and environment is dynamic and interconnected. Through action and reaction, the learner and the learning environment constantly interact.

Hands – On Activities

Science exploration and discovery can take place almost anywhere! When learners are actively engaged in science activities, they often gain better understanding of scientific principles, have better retention, and enjoy the learning process more than when they are taught through passive techniques Brooks & Brooks, (1993) as cited

in the North Central Region Education Laboratory (NCREL, 1993) reported that a new vision of science learning is emerging, one that calls for instructional conceptualizations. The new paradigm for learning science emphasizes engagement and meaning in ways that are not consistent with past practices. The anticipated outcome of this new approach to teaching is a higher level to student's achievement in the science. It calls for learning that is hands - on, minds - on and authentic. This approach to teaching and learning of science enables students to participate in a community where the teacher is not the only source of knowledge and information. It encourages full involvement in a community of learners that includes other students, parents, teachers and outside experts.

How Student Learn

Learning a course is more complex than merely remembering what students have read or been told, students do not necessarily learn by one explaining to them how to solve a problem. In fact, it is frustrating to work out a problem elegantly, explaining all the steps clearly, and then find out that hardly any of the students has mastered the steps.

Many informal learning theories guide teaching approaches. Some theories of learning are well defined and have recognizable names such as behaviorism or cognitivism. In describing how student learn or think, theories of learning serve as a basis for theories of instruction that draw conclusions about how instruction should be carried out (Romberg & Carpenter, 1986).

What happens in a particular course can be viewed as an interaction between the teacher's goals for what students should learn views of students' characteristics and

abilities, theory of how students learn, and assumptions about how students should be taught.

Today, this is the guiding theory for much research and reform in ICT education. Constructivists view students as bringing to the classroom their own ideas, rather than 'receiving' material in class as it is given, students restructure the new information to fit into their own cognitive frameworks. The near learner-centered teaching approach observed in Senior High School science classrooms was 'question and answer method' with the teachers always asking or posing the questions and the pupils supplying the answers. Teaching and learning materials were rarely used during lesson delivery (Osei, 2004).

Arousing and sustaining students' interest in learning (Motivation)

One factor that contributes significantly to how learning takes place is motivation. According to Elliot and Carol (2000), 'motivation is an internal state that arouses us to action, pushes us in particular directions and keeps us engaging in certain activities'. This means that a person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized towards an end is considered motivated.

Learning and motivation synchronize to achieve a zenith performance. Learning enables us to acquire new knowledge and skills whiles motivation provides the impetus for showing what we have learned. Motivation is an important psychological construct that affects learning and performance in some ways which includes the following:

1. Motivation increases an individual's energy and activity level. It influences the extent to which an individual is likely to engage in a certain activity.
2. Motivation directs an individual towards certain goals. Motivation affects choices people make and the results they find rewarding.
3. Motivation promotes initiation of certain activities and persistence in those activities. It increases the likelihood that people will begin something on their own, persist in the face of difficulty, and resume a task after a temporary interruption.

Attitude towards science

Many researchers perceive that learners' attitudes and beliefs toward subject matter, especially science and mathematics, are important as achievement (Cognition and Technology Group at Vanderbilt (CTGV), 1992; Sedighian & Sedighian, 1996). With science, and chemistry in particular, this linking of attitudes, motivation, and beliefs to achievement can be of particular importance because many researchers reported that, students have a poor attitude towards science and mathematics when they enter science or mathematics related courses (Gal & Ginsburg, 1994; Sedighian & Sedighian, 1996).

Performance in mathematical problem solving is also related to beliefs about mathematics and science (Schoenfeld, 1985) and attitude toward these subjects can determine the likelihood of continued study and perseverance. Conversely, poor attitude towards content can result in poor learning and performance in these subject areas (Gal & Ginsburg, 1994). Attitudes, therefore, are important considerations in learning science.

Research in science education shows the difficulties students have in acquisition of scientific concepts such as balancing chemical equations due to its abstract nature. These in turn have had adverse effect on the students performance and attitude towards science particularly chemistry.

Gender issues in science education

Science is an activity that is designed to gather data about things in the environment in order to generate understanding of nature. According to Berube (2008), it is a system of knowing about the universe through data collection by observation and controlled experiments. Science is seen as a product and as a process and that principles, facts, knowledge, ideas are derived at and based on them human problems are solved. Science can generally be observed as 'problem solving', and in human institutions, solutions are always needed for our daily problems. A country's development therefore rests on science and its application irrespective of gender. In his address to the British Association and Advancement of Science (BASS), in Duke of Argyll stated among others that what is expected of teachers is that they should teach the young ones to appreciate science and that they should not rely so much on the results. There is the need to start the teaching and learning of science at early stages of every individual and by the objectives of the policy, science is taught as a core subject at the Basic, Secondary and College levels in Ghana's Educational System. Knowledgeable and resourceful teachers are therefore needed to lay good foundation for science in these young ones, but unfortunately despite the government drive to draw more students to science, especially at the second cycle level more students' mainly female keep running away from it.

The importance of female education was underscored by one of Ghana's eminent educationist in the person of Dr. Kwegyir Aggrey that when a woman is educated, it means a society has received education in contrast to when a man receives education. This saying was born out of the family structures of the Ghanaian society whereby women are seen to nurture the young ones. In fact, a casual observation through the lower basic levels of Ghana shows that women dominate the teaching profession. It is an undeniably fact that ones success in later academic pursuits largely depends on what one received at the initial stages of education.

Importance of science education

The importance of science education has been amply demonstrated by the Government of Ghana. For instance, this importance is exhibited in the policy whereby the public universities are urged to organize special entrance examinations for student who did not meet the entry requirements but have the ability to pursue the science related course when the pre – entry classes are organized to prepare them for the task ahead.

Besides, special clinics have been organized for girls in particular at the Basic and Second Cycle levels to improve the female participation in science education. Available records indicate that the Government of Ghana is doing everything within its power to improve the study of science among females. A couple of examples buttress the above point made. Dadzie (2006), the then Western Regional Director of Education recount the importance of science at a Zonal Science, Technology and Mathematics Education (STME) Clinic for 43 girls and 18 boys drawn from eight circuits in the Mpohor Wassa East District at Daboase. That particular STME Clinic was under the theme: STME, the Engine for Growth of the Nation. At Cape Coast,

Edumadze, the then Central Regional Minister at the opening of STME Clinic noted that education contributes immensely to poverty eradication by increasing peoples' income, producing better health outcome, empowerment and leverage life. It was noted that the inability to utilize the abundant rich natural resources, for the people who continued to live in abject poverty due to the lack of scientifically based technology. It is important to acquire some scientific knowledge to enable students with skills to transform the economy. Ignorance and poverty have come about as a result of low scientific and technological knowledge and application, and has made the African accept subordinate and inferior position. It is divine duty of every nation to ensure that its citizenry were lifted from the shackles of ignorance in the scientific and technological era, and there cannot be development without the study of science. From a similar forum, Awuni (2009) makes a case for science education by calling on all stake holders to ensure that the STME Clinic for girls was successfully whenever they were organized. Awuni made an appeal at an STME for girls from selected schools in the Upper East Region of Ghana. She particularly understood the fact that Ghana needs young people with knowledge and skills in the application of science and technology to enable the country to exploit its natural resources. It is not only Ghana, where the importance of the study of science is thought of, even in the United States where development is advanced, the importance of science education is not left to chance. According to the American Association for the Advancement of Science (1990) as cited by Geoffrey (2004); a scientifically literate person has acquired the ability to hold a scientific worldview, engage in scientific inquiry, and appreciate the scientific enterprise. A scientific worldview involves perceiving a largely understandable world, seeing scientific knowledge as durable but subject to

change and knowing when scientific inquiry is appropriate, and knowing that science does not claim to have all the answers.

Again, a scientific inquiry is a process of making sense of the world and developing explanations of the natural world often through the use of models. It is a scaffold endeavour, integrating scientific content and disciplinary procedures; as such, inquiry will look different in a biology class, or an earth sciences class, or in a physics class because scientific methodology itself is different in those disciplines. The methodologies reflect the needs and structure of the discipline; someone who is scientifically literate should be able to understand and identify the roles of the different methods. The scientific enterprise plays a monumental role in contemporary society; in fact, it may be the modern era's defining feature. Residents in these times run the risk of being powerless if they fail to understand science as a complex social activity, run by humans. No scientific research is ever completely objective.

Girls and Science Education

The importance of girls' formal education has been emphasized in this study. Records have it that governments in many parts of Africa are aware of the benefits of female education and that females have a profound effect on national development as lack of their education has been linked to low birth weight, poor health and high mortality rates in children, high fertility rates, poor family nutrition, low life expectancy, poor sanitation and high illiteracy rates. The socio – economic importance of female education can thus not be over emphasized (FEMSA, 2009). Because of the importance of girls' formal education, several studies have been promoted by FEMSA and some of the finding point to the fact that efforts to boost

female education has been made by governments, international organizations and NGOs. However, there is still a gender disparity in education. Females still have low access to education, low participation and poor performance in many subjects, especially Mathematics and Science subjects. Many factors which are home, community and school based, continue to restrict developments in female education (Torto, 2009).

From the international scene, Tomaskoviv-Devey, Thomas, and Johnson (2005) report that most parents and many teachers believe that if middle-school and high school – girls show no interest in science or mathematics, there is little anyone can do about it. This was because new research by a team that included vocational psychologists at the University of Wisconsin-Milwaukee (UWM) indicates that the self- confidence instilled by parents and teachers is more important for young girls learning mathematics and science than their initial interest. This research finding stresses that while interest is certainly a factor in getting older girls to study and pursue a career in these disciplines, more attention should be given to building confidence in their abilities early in their education (Fouad, 2003). Fouad's research aimed at identifying supports and barriers that steer girls toward or away from science and mathematics during their education. "The relationship between confidence and interest is close ...if they feel they can do it, it feeds their interest" (p.7).

Furthermore, Kim (2000) indicates that it is a high-priority question for members of organizations like the National Science Foundation (NSF) and the National Research Council to ponder over how to reverse the rapidly declining numbers of women in

Science, Technology, Engineering and Mathematics (STEM) careers. Many young students, particularly girls see mathematics and science as difficult, and don't take any more classes than they have to, not realizing they are cutting themselves off from lucrative opportunities in college and careers. The NSF-funded study – the most highly detailed study on this topic – dug deeply to identify the specific factors that would be interesting. "For the last 20 years, there has been all this work done on boosting interest of girls earlier on. But I don't think that is it" (Fouad, 2003, p.489).

Also, Sheppard and Robbins (2007) maintain that the study tracked girls and boys in middle schools, high school and their more years in college in both Milwaukee and Phoenix, with the main goal of pinpointing when the barriers for girls appear and how influential they are. Self efficacy – is not the only important factor for girls, for one thing, mathematics and science cannot be lumped together when designing interventions because the barriers and supports for each discipline are not the same.

Teacher – students' interaction and gender

Research on gender perceptions has found significant difference in the perceptions of female and male in the scales of the QTI**.** The QTI, a structured questionnaire that was developed in Australia**.** Khine and Fisher (2001) observed that female students perceived positively the leadership exhibited by their teachers and the helping or friendly and understanding behaviour of their teachers than boys. On the contrary, male students perceive that their teachers displayed more uncertain, admonishing and dissatisfied behaviours. However, Fisher and Waldrip (1999) noted that in provincial schools in Australia, male students saw more leadership and helpful or friendly behaviour in their teachers than did female students. However, in rural

schools, they observed that male perceived more, admonishing and strict behaviours in their teachers while in mining towns, they noted that male students perceived less understanding but perceived more uncertainty, dissatisfied and admonishing behaviours compared to their female counterparts. Fisher and Rickard (1998) reported on Australian high school students and found that seven scales of the QTI had significant difference in the perceptions of students between genders. Khine and Fisher (2001) in the study in Brunei found that six scales of the QTI had significant differences in the perceptions of students between genders. That is higher cognitive outcome scores and positive students' attitudes are associated with leadership, helping friendly and understanding teacher behaviors while strict or controlling behaviours are associated with higher cognitive outcomes and a lesser extent with attitudes (She & Fisher 2000). The more the students perceive their teachers to be dominant and cooperative, the more they will achieve cognitively and affectively. (Kim, Fisher & Fraser, 2000).

Teacher influence in classroom interactions

The role of the teacher cannot be ignored in the science classroom. This is because the teacher still plays a primary role in the students learning process. This role is manifested in the kind of science classroom s/he creates, and thus, the kind of interaction that goes on in the class between the teacher and the pupils and among pupils. One of the two possible learning environments likely to be encountered in any science classroom is student-centered or teacher-centered science classroom. In a teacher-centered science classroom where there is little interaction among the

students, students may come to see learning as something imposed by an 'expert' rather than learning to see themselves as life long learners.

A learner-centered environment refers to an environment that pays attention to the knowledge, skills, attitudes, and beliefs the pupil brings to the educational setting. Science teachers who are learner-centered recognize the importance of building on the conceptual and cultural knowledge that pupils bring with them to the science classroom (Bransford, Brown & Cocking, 1999). The teachers also apply instructional strategies that are sensitive to the cultural practices of their students and they are mindful of the effect of these practices on classroom learning (Branford, Brown & Cocking, 1999). According to Weiner (2002), learner-centered instruction is a system of instruction based on a student's individual choices, interests, needs, abilities, learning styles, types of intelligence and educational goals within an authentic context where situated thinking is deemed important. Building on knowledge, skills, beliefs and attitudes that learners bring to school is a fundamental tenet of learner-centered instruction (Weiner, 2002). For this reason learner-centered instructional approaches should be from the perspective of the learner rather than the perspective of the teacher. The teacher tailors instruction and subject matter to students' needs, interests and practices. The instructional methods suggested in the science syllabus (CRDD, 2007) ascribe to this and it behoves the science teacher to use these methods, such as project work, role play, discussion, demonstration etc. in their science classrooms.

Summary

Research has shown that the more the senses used in learning, the better the understanding and learners retain what they are taught for a long time (Hansen, 2002). For example, in a science class, when students are given the chance to touch, smell, hear, and see what they are being taught, it influences their understanding and high retention of the new concept (Hansen, 2002; Sjoberg, 2002). In order words, when artifacts, tools, art and craft within a culture are brought from the local environment or the society for the students to play or interact within the science class, it influences or facilitates the understanding of the science concept. The importance of science education is therefore to help individuals apply the scientific principles in their daily activities, such as soap making, brewery, baking and the like.

Teaching methods are the various ways teachers use to impact knowledge to students. Teaching of Integrated Science thrives well with methods that get students involve in the lesson and sustain their interest throughout the lesson. Teaching methods discussed included demonstration, activity method of teaching, debate and quizzes and field trips. Due to the above, Integrated Science teacher needs to plan carefully, and use well prepared combination of teaching and learning methods appropriate to a given teaching and learning situation to achieve good results. The combination of different teaching methods helps to compensate for each other's limitation.

CHAPTER THREE

METHODOLOGY

Overview

This chapter presents the methodology used to carry out the study. It focuses on the design, the population, the sample as well as the sampling procedure used in the study. It also discusses the research instruments used, their validity and reliability, scoring data collection procedures, and data analyzed.

Design of the study

The research design used was an action research. Action research is “learning by doing” - a group of people identify a problem, do something to resolve it, see how successful their efforts were, and if not satisfied, try again. While this is the essence of the approach, there are other key attributes of action research that differentiate it from common problem-solving activities that we all engage in every day. A more succinct definition is “Action research aims at contributing both to the practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously. Thus, there is a dual commitment in action research to study a system and concurrently to collaborate with members of the system in changing it in what is together regarded as a desirable direction. Accomplishing this twin goal requires the active collaboration of researcher and client, and thus it stresses the importance of co-learning as a primary aspect of the research process."

According to McMillan and Schumacher (1997), research design refers to the plan and structure of the investigation used to obtain evidence to answer research questions. A research design provides the procedure that holds the research project

together. The design is used to structure the research to show all of the major parts of the research project, the samples, or groups, measures, treatments or programmes and methods of assignment work together to address the research questions.

The study was aimed at using the activity method to improve upon the performance of SHS 2 Home Economics students in Integrated Science at the Diabene Secondary Technical School in the Western Region of Ghana.

Population

The target population for the study was all SHS students of Diabene Secondary Technical School. The accessible population was Home Economics form two (2) students of Diabene Secondary Technical School.

The reasons for the selected class were on the assumptions that the researcher was very conversant with these students and had taught in the school for more than three years. The total number of students offering integrated science was one hundred and five students consisting of 95 girls and 10 boys with six teachers teaching integrated science as core subject.

Sample and sampling procedure

In all, the class was made up of one hundred and five (105) students made up of ninety five (95) girls and ten (10) boys. A sample is a small part of anything which is intended to stand for, or represent the whole (Wellington, 2006). A good sample must be nearly representative of the entire population as possible. Sampling helps to select a representative sample. Sampling means selecting a given number of subjects from a defined population as representative of that population (Borg & Gall, 1983).

Purposive sampling method was used to select the school and the class. The purpose for the choice is that, the researcher teaches in the school and knows the class (Home Economics 2) and ninety (90) percent of the girls in that class have poor attitude towards science. Their attitude has apparently been the cause of abysmal performance in Integrated Science.

Instrumentation

The instruments used for collecting data for the study consisted of tests, interviews and observation. There were three tests which were in two forms. The first test was a diagnostic test (pre- intervention test), from which the researcher got a clear picture of students' strengths and weaknesses on some concepts in Integrated Science. The other two tests which were evaluative were used to measure the strengths and weaknesses of the methods (interventions) used and to determine the extent to which students understood the concepts taught. The mid – intervention test was conducted after intervention (Activity 1) while the post- intervention test conducted after intervention (Activities 2 and 3) to know the students' final performance. All these tests items were conducted under the supervision of the researcher.

Interviews

An interview schedule was employed in this research to collect more information from the students own point of view. In this case, the interview was used as a form of triangulation. This is because, where a quantitative study has been carried out, qualitative data can be used to validate particular measures or to clarify and illustrate the meaning of the findings, and to see whether their experiences concur with the ratings on the measure (King, 1994). This was the prime focus of the researcher's

opinion about interview. Also, it was used to determine whether the respondents (students) expressed views were consistent with their tests items, and finally, to assist in interpreting and explaining the findings using the interview data.

The students' interview (Appendix A) was semi- structured type of interview. The interview formed the secondary source of data to supplement that of the primary source, the test. The interview was made up of ten (10) items.

Observation

This was also employed to determine whether the respondents expressed views on both test and interview were consistent with what the researcher observed. Observation was centered on areas such as their behaviours towards science lessons in class, whether they have interest of participating in it or not, vis-a- vis their response to questions asked by the teacher. Keen interest in observing sample of student's work and notes in their exercise books were not part of the teachers' routine activities.

Pre – intervention Activities

The following activities were carried out to help identify the problems associated with the performance of students in Integrated Science. These were unstructured interviews, observation of previous exercises and administration of a class test. These were done to help the researcher have a clear picture about the students' problems in order to design the right intervention to remedy them.

Pre – intervention Findings

Responses of students in the pre-test indicated that students have problems in understanding science concepts in integrated science, and hence their poor performance. Responses from students as to the causes of their poor performance in Integrated Science during the interview revealed the following:

- Lessons were taught in abstract due to large class size which makes the organization of practical work difficult.
- Students feel reluctant to copy notes due to lack of furniture in the classroom.
- Insufficient teaching and learning materials in performing practicals.
- Lack of students' involvement during activities.
- Teachers' inability to discuss answers to exercises or tests with students.

Intervention design

The results that emanated from the pre – intervention activities enabled the researcher to plan appropriate measures to bring the situation under control.

Based on the pre-intervention findings, some interventions were implemented to help form (two) 2 Home Economic students to overcome their poor performance, and develop, interest in Integrated Science. Some topics that were used for the intervention included test for starch in green plants, test for lipids, fats and proteins. The intervention strategy involved the following:

i. Carrying out practical work with mixed ability groups.
ii. Demonstration method of teaching using teaching and learning materials
iii. Using some of the girls as laboratory assistants

iv. Organized debate and quizzes.

v. Organized field trips

vi. Formation of science clubs

vii. Students given series of class exercises.

Implementation Design

Activity 1 (Carrying out practical work with mixed ability groups)

The following were considered for the grouping:

Two boys were mixed up with eight to nine girls since the girls are more than the boys to ensure gender balance.

There were ten groups in all, made up of between 10 to 11 students.

Instructions for the experiments were printed and distributed to the individual group leaders.

Practical Activity 1

Topic: Test for starch in green plants

Duration: 90 minutes

Class: SHS 2 Home Economics

Objective: To investigate and explain the presence of starch in green plants

Materials needed:

i. Ethanol

ii. Hot water

iii. Iodine solution

iv. Variegated plant (ensure that the plant had been well illuminated for 24-48 hours)

v. White tile

vi. Forceps

vii. Beaker of cold water

Safety: The researcher advised students to ensure that the ethanol is kept away from naked flames. Students were asked to seek protection by wearing protective gloves when working with ethanol or iodine solution.

Procedure:

- Student's previous knowledge on test for starch was reviewed through oral questions and the activities for the day were introduced.
- Teaching and learning materials for the various groups were distributed by the assistants.
- Students performed the activities by following the instructions on the worksheet while the researcher went round to give assistance where necessary.
- Leaders and recorders of each group were asked to discuss their observation to the whole class after which the researcher summarized the main points on the chalk board for further discussion with the students.
- Discuss and explain your observation
- Submit your report. Students were then asked to answer some few questions orally, clean the apparatus and prepare for the next lesson.

Expected outcome

The leaf in the beaker of water was boiled for five minutes and the colour of the water obtained was noted.

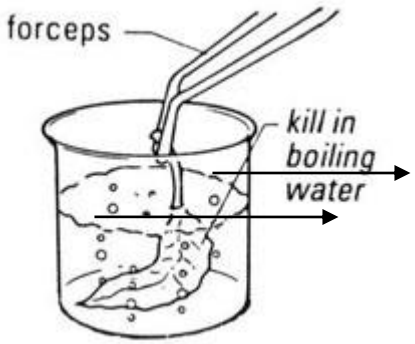

Fig. 3.1: Leaf boiled in hot water to kill germs.

- The boiled leaf was put in the boiling tube containing ethanol and the whole content was boiled again in the beaker of hot water.

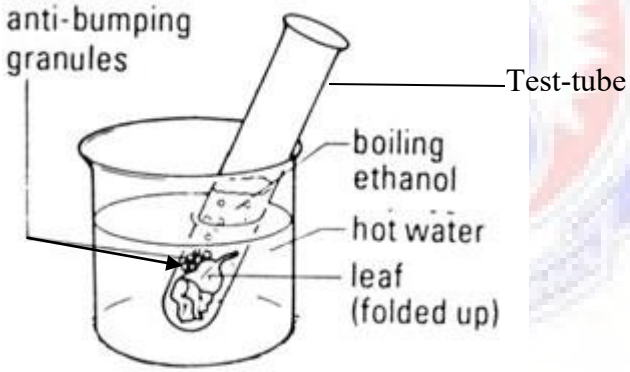

Fig. 3. 2: Boiled leaf placed in test tube containing ethanol to remove extra chlorophyll.

- The freshly-boiled leaf was placed again in hot water after 5 minutes if there was still some green colour in the leaf.
- Using forceps remove the leaf from the boiling tube and rinse the leaf in cold water using the taps at the laboratory.

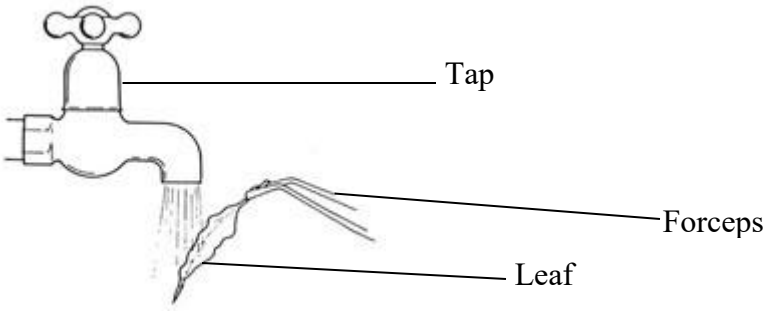

Fig. 3. 3: Leaf rinsed over cold water using tap at the laboratory.

- The leaf was put in a petri dish on a white tile and few drops of iodine solution was poured on the leaf and allowed for few minutes, making sure the leaf is completely covered with iodine and observes the colour change.

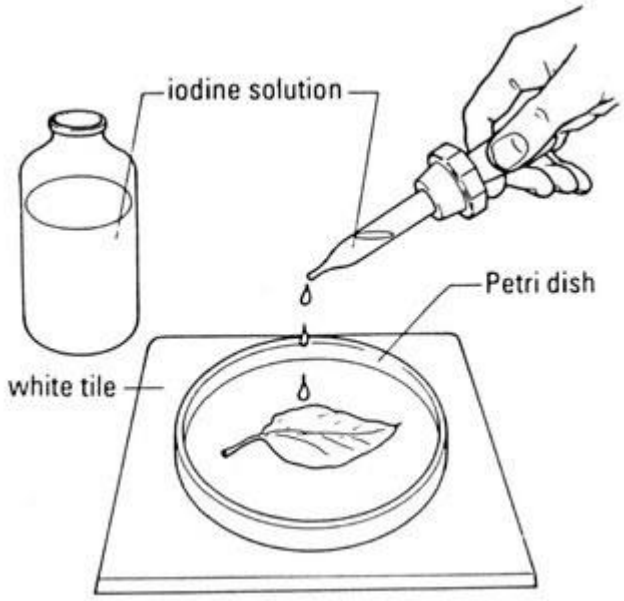

Fig.3. 4: Leaf placed in a petri dish on a white tile and few drops of iodine solution poured on it.

Expected observation:

Starch is within the cells, the cells are surrounded by cell membranes and tough cellulose cell walls and again some leaves also have a protective waxy cuticle. The hot water treatment softens up the protective structures, and disrupts the cell membranes to let the chlorophyll out and the iodine solution in.

Conclusion:

When iodine solution was poured on the leaf, blue-black colour appeared indicating the presence of starch.

Practical Activity 2

Topic: Experiment to demonstrate the presence of lipids and proteins

Test for Fats - Sudan III stain

Introduction

- The lesson was introduced by reviewing student's previous knowledge about lipids and proteins.
- Teaching and learning materials for the lesson were distributed to the various groups.

Procedure

1. Students were provided with worksheets outlining the instructions to be followed.
2. In groups, students were asked to add equal parts of test liquid and fill the test tube about half full.
3. Students were asked to label each test tube if testing more than one liquid.

4. Few drops of Sudan III stains are added to each test tube and gently shake to mix.

Expected observation:

Students were asked to wait for a while after few drops of Sudan III was added and record their observation down. Each group member submitted their report and was discussed in class. Students recorded down their conclusions into their exercise. Questions were asked about the practicals and marks awarded.

Practical Activity 3

Topic: Experiment to demonstrate the presence of protein in food substance - Biuret test.

Biuret solution was used to identify the presence of protein. Again, teaching and learning materials were distributed to the various groups by the leaders.

Materials:

i. Test tube or small beakers
ii. Marker
iii. Biuret reagent and dropper
iv. Milk, yoghurt, egg
v. Juice from food samples in containers

Procedure

1. Instructions were given to the various group members and followed accordingly. Students were asked to add small amount of food sample into a test tube.
2. Each test tube was labeled with a marker if students are testing more than one liquid.

3. Few drops of Biuret reagent solution were added to each test tube and gently shake to mix.
4. Students were asked to record their observations

Expected observation:

Proteins turned the solution pink or purple when Biuret reagent was added. The copper atom of the biuret solution reacts with the peptide bonds to cause the colour change.

Conclusion:

The purple colour indicated the presence of proteins and pink colour indicated the presence of short chains of polypeptides.

Colour Indication:

Light blue indicated “No protein or peptides”. Purple and Pink indicated Peptides.

At the end of this intervention exercise students were asked to answer oral questions and written exercises on the activities performed. These practical activities were aimed at providing experiences to students to learn by doing using hands on practical activity to stimulate interest of students and enhance cognition.

Practical Activity 4

Involving some girls as laboratory assistants

The researcher involved some of the students especially, the girls in the teaching and learning process. During the lesson, the researcher instructed the girls (laboratory assistants) to distribute the relevant teaching and learning materials for the activity, they were also appointed as leaders representing each group where roles such as recording, drawing, measuring, observing and analyzing were assigned to them. Their active involvement allowed them to participate fully in all the activities and communicated their findings effectively.

Practical Activity 5

Debates and quizzes

Debates and quizzes were also organized periodically among the students in the class at inter house basis since all the students belong to a house. This was to build some kind of competition among students to urge them always to understand the topic better. Students were asked to debate on the topic, 'All animals depend on photosynthesis'. A member representing each house was asked to ballot either for or against the motion. The questions were based on what had been taught and discussed in class. Some students were appointed from each group to act as time keeper and recorder. Marks were awarded and formed part of their continuous assessment scores. Participating students were also given prizes to motivate them to learn and also to entice the rest of the students to come out to participate in subsequent competition.

Practical Activity 6

Fieldtrips

The researcher took the students on field trip to visit some ecological places around the school compound. Some of the ecological places include; uninhabited area such as a sand dune around the school compound, cleared forest or burnt patch of soil and macrotermes mound to observe the various castes of termites such as the queen, king, worker and winged reproductive. After the trip, the researcher organized a time within the day for the students to present their findings to the class. Students presented their reports which were marked and marks awarded.

Practical Activity 7

Formation of science clubs:

Due to the poor performance of students in science, the researcher was able to revive the science club; as an intervention to enable students have interest in the science subjects. The science club was not made for only the Home Economic students but also all students since they all offer Integrated Science as a core subject. This was established to motivate students and to arouse their curiosity that science is difficult so that they could be able to appreciate nature. A time within the day was set aside where the researcher invited a female science activist in the person of madam Sabina Buabeng in the Shama Ahanta District to give a talk on the topic,' The importance of science in the economy – the female student'. She emphasized on some of the careers that one can obtain in science, which include: Veterinary officer, medical nurse, biochemist, dentistry, mechanical engineering etc. and encouraged the female students to take science to the highest level they could. Also, some old students who

offered science at the tertiary level were also invited to give talk in order to serve as a role model for them to enumerate.

Data Collection Procedure

The scores for the (pre – test and post test) were tabulated and their percentages calculated. The results from these two were analyzed and compared using frequency tables and bar charts. This was done to give more meaning to the research and also to determine whether there were differences in the performances of the students before and after intervention.

Data Analysis

The data collected was examined for consistency and accuracy by reading through all the responses provided by the respondents. The scores for the pre -test and post - test were tabulated and their percentages calculated using frequency tables in the form of bar graphs which were used to analyze all the test items. The bar graphs were drawn using Microsoft Office Excel 2007. This was done to give more meaning to the research and also to determine whether there were differences in the performances of the students before and after intervention.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Overview

In solving the poor performance of S. H. S. 2 Home Economics students in Integrated Science at Diabene Senior High School, intervention was put in place to help solve the problem. This chapter seeks to present the results from both pre and post-intervention class tests using bar charts based on the results obtained from tests and interviews. The discussion of findings was done to determine the extent of progress on students' performance in relation to the research questions.

Presentation of Pre - intervention Test Results

The data collected on 105 students after pre – intervention test has been presented as Table 1

Table 1: Pre – intervention test scores for 105 students

Marks /30	Frequency / Number of students	Percentage (%)
1—5	28	26.7
6—10	24	22.9
11—15	20	19
16—20	16	15.2
21—25	10	9.5
26—30	7	6.7
Total	105	100

Analysis of Pre-intervention Test Result

Table 1 shows the results of 105 students in a pre- intervention class test. The total marks for the test was 30. The first column shows the range of marks, the second column shows the number of students out of the 105 that scored a particular range of marks while the third column shows the percentage of the students in the class. From Table 4.1, twenty-eight (28) students representing 26.7 % of the class scored 1 – 5 marks. Twenty-five (25) students representing 23.8 % of the total class scored 6 – 10 marks. Twenty (20) students representing 19 % of the class scored 11 - 15 marks. Sixteen (16) students representing 15.2 % of the class scored 16 – 20 marks. Ten (10) students representing 9.5 % of the class scored 21 – 25 marks and lastly six (6) students representing 5.7% of the class scored 26 – 30 marks.

The information obtained from Table 1 has been presented graphically in Figure 1.

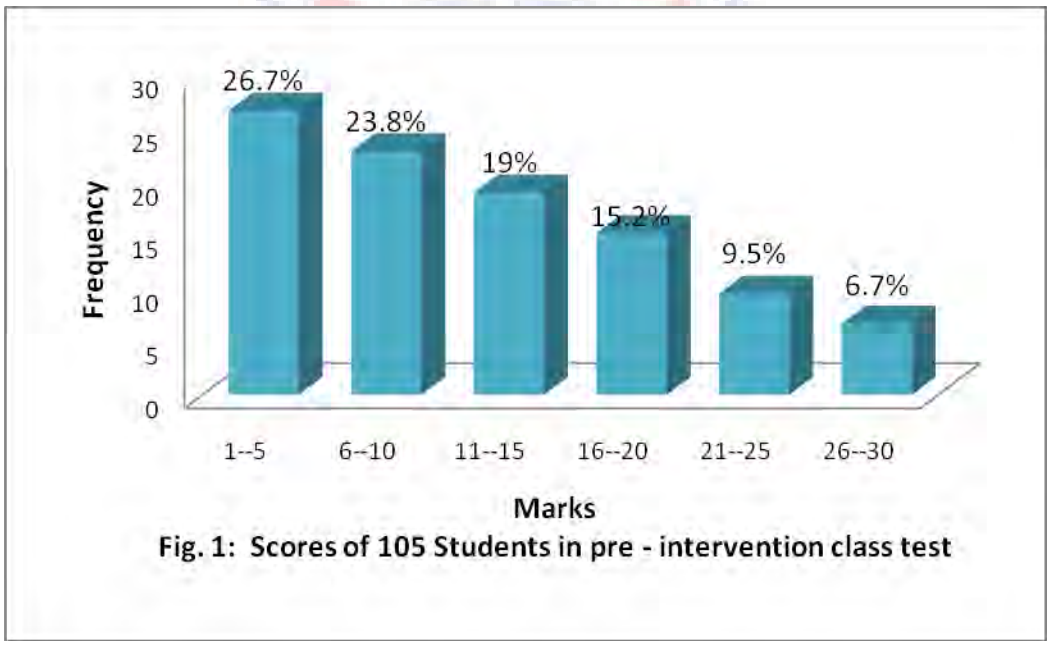

Fig. 1: Scores of 105 Students in pre - intervention class test

Discussion of Findings

The results obtained from the test showed an overall poor performance of the students which is a justification for the introduction of intervention activities in order to improve their performance.

Research question 1: Will the use of activity method of teaching enhance students' understanding of concepts? Activity 1 which was an activity lesson was undertaken to find how an intervention would answer research question one.

Presentation of Mid – intervention Test Results

The results of the 105 students in the mid – intervention class test have been represented on Table 2.

Marks/30	Frequency / Number of Students	Percentage (%)
1--5	23	21.9
6--10	19	18.1
11--15	15	14.3
16--20	18	17.1
21--25	17	16.2
26--30	13	12.4
Total	105	100

Analysis of the Mid – intervention Test Results

Table 2 shows the range of marks, the number of students who scored a certain range of marks and the percentage of the students in the class of 105 students in a mid-intervention class test. In Table 2, twenty – three (23) students constituting 21.9% of the class scored 1-5 marks. Nineteen (19) students constituting 18.1% of the class scored 6-10 marks. Fifteen (15) students representing 14.3% of the class scored 11-15 marks. Eighteen (18) students representing 17.1% of the class scored 16-20 marks while seventeen (17) students representing 16.2% of the class scored 21-25 marks and lastly, thirteen (13) students representing 12.3% of the class scored 26-30 marks.

The combined effect of all the activities performed show improvement in student's performance.

The information obtained from Table 2 has been presented graphically in Figure 2.

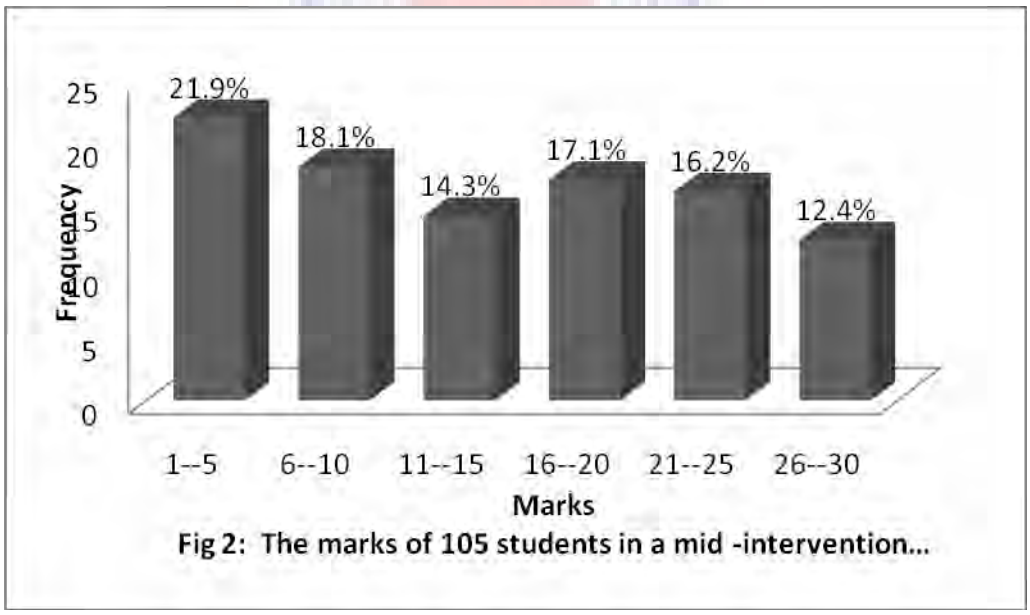

Fig 2: The marks of 105 students in a mid -intervention...

Discussion of Findings

It was observed from the results that students' performance was better than the results obtained during the pre- intervention class test. The increase in performance was most likely due to the intervention activity 1 where students had a demonstration lesson on test for starch in green leaves as well as test for lipids and protein. During the lesson, students paid attention, they were able to handle the materials very well, and their interests were raised. They really got involved in the lesson, observed and contributed throughout the lesson. The results in Table 2 and Fig. 2 showed some level of understanding of the concepts taught.

Research Question 2: Will the use of mixed ability groupings, using some of the girls as laboratory assistants help bridge the gap between brilliant students and weak students?

The involvement of the girls as laboratory assistants really made them to understand that science is not something which is far away from them but part and parcel of human nature.

In all the activities, the researcher acted as a coach, a facilitator or a guide and sometimes collects data, see and hence, give immediate feedback and praise for working together. If a group is having problem, the researcher intervenes to help them to put them on the right track. Each member from each group discussed their findings and the main points were summarized on the chalkboard.

Research Question 3: Will the use of activity method of teaching backed by teaching and learning materials improve students' performance?

An intervention Activity 2 (mixed ability groupings for practical activities) and an intervention activity 3 (debates and quizzes on the topic, 'how do plants prepare their food') were implemented to find out if they could answer the two research questions.

Presentation of post – intervention Test Result

The results of the 105 students in the post – intervention test have been presented as Table 3.

Table 3: Post – intervention test scores for the 105 students

Marks/30	Frequency	Percentage (%)
1--5	6	5.7
6-- 10	9	8.6
11-- 15	10	9.5
16--20	13	12.4
21--25	22	21.0
26-- 30	45	42.8
Total	105	100

Analysis of the Post – intervention Test Results

Table 3 shows the distribution of marks scored by the 105 students respectively. From Table 3, only six (6) students constituting 5.7% of the class scored 1-5 marks. Nine (9) students representing 8.6% of the class scored 6-10 marks. Ten (10) students constituting 9.5% of the class scored 11-15 marks. Thirteen (13) students

constituting 12.4% of the class scored 16-20 marks while twenty- one (21) students representing 21 % of the class scored 21-25 marks and finally, forty-five (45) students representing 42.9% of the class scored 26-30 marks.

This information obtained from Table 3 has also been presented graphically in Table 3.

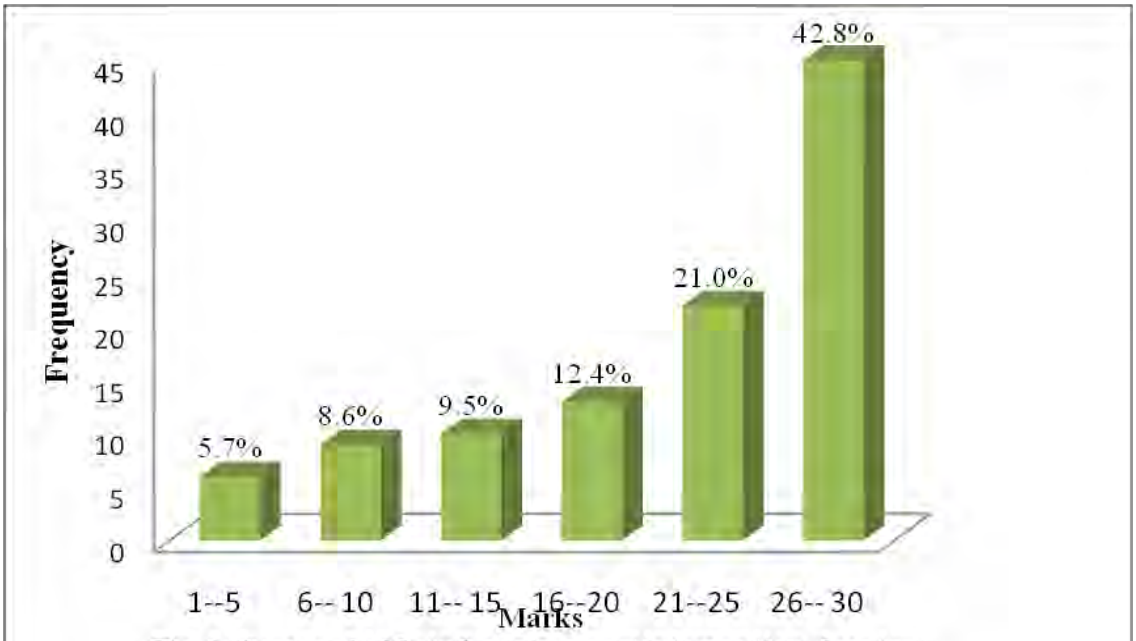

Fig. 3: Scores of 105 students in a post intervention class test.

Discussion of Findings

The general performance of the students in the post – intervention test was far better compared to both pre and mid intervention class tests. The test was conducted after intervention activities 2 (mixed ability groupings for practical activities) and 3 (debates and quizzes) were introduced. The high performance of the students depicted that the two activities really had effect on their understanding of the topics

treated. Activity 2 gave room for students to interact with each other, and the materials provided whiles activity 3 allowed students to show their intellectual abilities, and how to defend themselves when questions were asked by the quiz master. This also gave room for the participants representing each group to build upon their vocabulary as well as their interest for delivering in public. The marks awarded to them formed part of their continuous assessment scores and showed some kind of improvement in their performance.

In activity 4, students were fascinated upon the real things outside the normal classroom. It gave students the opportunity to be exposed to 'real' world experience. This also helped the students to appreciate the need to learn in assorted ways which could appeal to varied learning styles, helping students to succeed whether they are visual, audio or kinesthetic learners. The reports and exercises which were written by the students based on what was discussed also showed improvement in their assessment because the students were able to answer almost all the questions.

In activity 5, this concerned students in the formation of science clubs in the school. There was an increase in students willing to undertake project and the invitation of the female activist as well as an old student who had pursued science to the highest level. These also had positive effect on the students. The questions asked had influence on their attitude towards learning, and again helped to arouse their interest in science.

Analysis and Discussion of the Pre- intervention Interview Results

Based on the interview of the 105 students, the results indicated that majority of the students did not understand most of the concepts taught by their science teacher. From the interview, it was also clear that there were no involvement of the girls in practical activities and also the use of teaching and learning materials in the teaching of science which made the students loose interest in the subject. It was therefore deduced that the teaching and learning of science was mostly done in abstraction or by the lecture method.

Comparison of the Pre and Post – intervention Test Results after the interview

In comparing these results, it was observed that 28 out of the 105 students scored less than 5 (45%) of the total marks in the pre- intervention test while only 6 out of the 105 students scored the same marks in the post intervention test. From the pre-intervention test, only 7 out of the 105 students scored 26-30 (85 -100%) marks while 45 students scored the same marks in the post intervention test. Looking at the over all performance in both tests, there was a drastic increase in performance after the intervention. The 6 students who scored less than 5 marks in the post intervention test were perhaps slow learners and could also not express their ideas in writing. It is therefore clear that the varying methods of teaching and the involvement of students in practical activities as an intervention increased the performance of the students.

Comparing Pre and Post Intervention Test Interviewed Results.

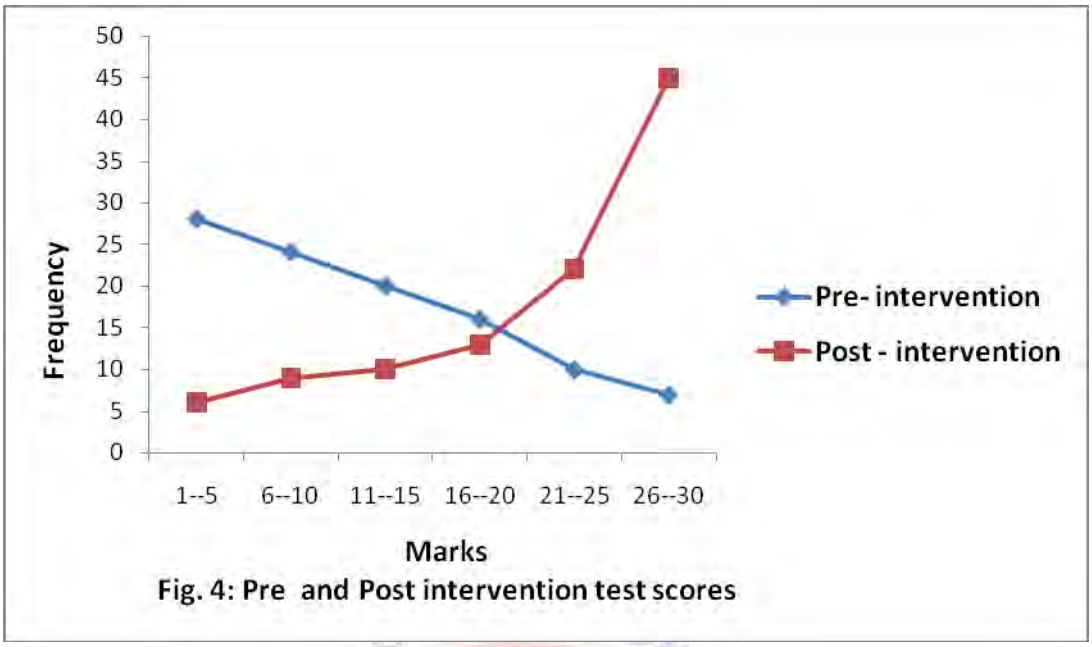

Fig. 4: Pre and Post intervention test scores

Analysis and Discussion of the Pre and Post Intervention Interviewed Results

Based on the interview of the 105 students (Appendix D), the results indicated that majority of the students did not understand most of the concepts taught by their science teacher. It was observed that anytime the researcher enters the class for lessons to begin, some of the students either sleep or disturb in the class indicating lack of interest in the subject. From the interview, it was also clear that there were no involvement of the girls in lesson presentation and also the use of teaching and learning materials in science, and therefore, learning was lacking which made the students loose interest in the subject. It was therefore deduced that the teaching and learning of science was mostly done in abstract.

The results from the post – intervention interview based on the questions (Appendix E), were better than that of the pre- intervention interview. It was deduced from

responses that, almost all of them were happy with the use of demonstration activities and the inclusion of teaching and learning materials that got them involved in the lessons. The results in Fig. 4 shows that students improved upon their performance as shown in the post intervention class test.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Overview

This chapter reflects on the main findings of the results of the research with emphasis on conclusions drawn and some recommendations in respect to the findings.

Summary of Findings

The study aimed at improving students' performance through the use of multiple teaching methods backed by appropriate teaching and learning materials at D.S.T.S.Takoradi in the Western Region. In order to put in the right intervention, the study investigated the causes of the problem which was the poor performance of the students in Integrated Science. It was realized through pre – intervention activities that students were taught mainly by lecture method, students did not have enough exercises and also lacked interest in Integrated Science as lessons seemed bored due to the lack of the use of teaching and learning materials.

A class of 105 students were taken through an intervention to assist them overcome the problem. From the intervention, it was noticed that the use of the demonstration method to introduce the presence of starch, lipids and proteins was appropriate. When the test was conducted thereafter, it was realized that most of the students understood the concept of testing for starch in green plants, tests for lipids and proteins better. Again, when students were grouped to perform the activities using the teaching and learning materials provided, their interest aroused because they could converse with each other, and could also perform the activities by following

instructions on the worksheet. Also, the brilliant students were able to assist the weak ones. It was also realized that when students were grouped for debates and quizzes, it motivated them to have interest in science even to the extent that introverts could express themselves well without any body. On the issue of field trips / excursion, the students were excited to move from the normal classroom setting to the natural environment setting to view things in their natural state. It was also realized that any time students were on field; their attitudes were different as compared to that of the normal classroom settings. Students were able to express themselves even to the extent that the introverts were able to express themselves and able to ask questions.

Again, when female activists and the old students were invited to the school, it brought about a lot of changes in the school after which students showed much concern in all the science subjects and also their curiosity about science that it is a difficult subject was erased. From the outcome of the post intervention test, it was realized that, most of the students had no problem answering the questions even where there were problems, it was minimal. Observation of the students during practical activities revealed that, students got excited because the method matched their level of understanding. The method had positive effects on students' contributions in the class and increased their performance.

Conclusion

A critical look at the research findings portrayed that effective teaching and learning will take place when the teaching method or strategy suits the level of understanding of the students. Students' interest is also retained when teaching and learning materials are used to attract learners' attention, arouse their interest, invoke co-

operation, supplement description and explain concepts (Walklin, 1982). It is therefore, good for science teachers to use varying teaching methods, appropriate teaching and learning materials, give frequent exercises and marked, send students out of classroom to observe things in their natural phenomena. Sometimes, it is good to invite old students to come and give talk or symposium should be organized in schools and under close supervision to improve the performance of the students in Integrated Science.

Recommendations

From the study, the multiple teaching and learning materials adopted helped improve the performance of the students in Integrated Science and other science related subjects.

The performance of students can therefore be increased if the following recommendations are seriously considered:

- Science teachers should as much as possible use varying teaching strategies. For example, demonstration, discussion and other hands-on activities and the use of appropriate teaching and learning materials, where materials are inadequate, they should be improvised.
- Regular exercises and assignments must be marked promptly to assess the progress of students as well as grouping students (mixed ability) for practical activities.
- Authorities responsible for the supervision of Integrated Science should organize in-service training at least at the beginning of the term to brief teachers on new methods of teaching and involve more female students in the planning and implementation of practical activities in science teaching

and learning, and also, school authorities should emphasize the importance of science clubs and fairs and encourage more students especially girls to participate in quizzes, debates and symposium periodically either at inter schools level or inter houses basis should be organized to keep students on their toes.

- Finally, since science cannot be learnt only in the classroom, science teachers should organize field trips or excursions so that students can explore by themselves to erase any doubt in their minds.

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Appendix A

Pre – intervention interview questions

1. In what ways does your integrated science teacher present his or her lesson?
2. Which method of teaching does your teacher use?
3. Does your teacher vary the method of teaching often?
4. Do you find it difficult to understand the concept?
5. If Yes, why and if No, why?
6. Do you find the learning of science interesting? What are your reasons?
7. How often does your teacher do practical activities?
8. How often does your teacher involve girls in activities?
9. How often does your teacher use teaching and learning materials?
10. Are the uses of teaching and learning materials relevant in science teaching and learning?

Appendix B

Pre – intervention test items

Circle or tick the correct answer A B C or D on the answer sheet provided.

1. During photosynthesis in green plants this gas is a by product…….

   A. Oxygen B. Hydrogen C. Carbon dioxide D. Carbon monoxide

2. A student performed an experiment to test for starch green plant. Which reagent was suitable for the test?

   A. Fehling's solution B. Millions reagent C. Iodine solution D. Ammonia solution

3. Which of the following is wrongly marched?

   A. Protein ……..meat

   B. Carbohydrate……bread

   C. Vitamin……..lemon juice

   D. Fat……sweet potato

4. The end product of protein digestion is ……

   A. Amino acids B. Glycerol C. Fatty acids D. Glycogen

5. Lack of proteins causes…….

   A. Kwashiorkor B. Beriberi C. Bleeding gum D. Sleeping sickness

6. Which of the following is a function of protein?

   A. Repair of damaged body tissues

   B. Protection against accident or shock

   C. Formation of bones.

   D. Gives energy to organisms

7. Which of the following is a raw material for photosynthesis?

   A. Oxygen

B. Glucose

C. Carbohydrate

D. Water

8. The formula to represent photosynthesis is?

A. $6O_2 + 6CO_2$.....$C_{12}H_6O_6 + 6O_6$

B. $H_2O + CO_2$.....$C_6H_{12}O_6 + 6O_2$

C. $C_6H_{12}O_6 + 6O_2$ .....$6H_2O + 6CO_2$

D. $6CO_2$.....$C_6H_{12}O_6 + 6H_2O$

9. Which of the following tests are applicable for testing proteins?

A. Millions test and iodine solution

B. Iodine solution and Fehling's solution

C. Emulsion test and Fehling's solution test

10. Which of the following is an example of monosaccharide?

A. Glycogen

B. Fructose

C. Sucrose

D. Lactose

Appendix C

Mid – intervention test items

1. State the equation for photosynthesis?
2. State two importance of photosynthesis?
3. What are the raw materials for photosynthesis?
4. Briefly describe the test for photosynthesis?
5. Name the types of food substances needed for body growth and maintenance?
6. Vitamin B is also known as ……?
7. Lack of Ascorbic acid can cause ……?
8. The by- product of photosynthesis is …….?
9. Calciferol is much obtained from which source?
10. The function of vitamin A is ……?

Appendix D

Post – intervention test items

1. What is photosynthesis?
2. State two structural adaptation of leaf for photosynthesis?
3. State two importance of photosynthesis?
4. How would you determine the presence of starch in green leaf?
5. Why do we boil the leaf in hot water?
6. Why do we put the leaf in alcohol?
7. What are lipids?
8. What are proteins?
9. How would you determine the presence of lipids?
10. How would you determine the presence of proteins?

Appendix E

Post – intervention interview questions

1. What changes have you observed in the teaching and learning of integrated science so far?
2. What were your views for using teaching and learning materials to demonstrate concepts in the science classroom?
3. What have you achieved from getting involved in practical activities?
4. How do you see the learning of science out side the normal classroom?
5. Do you find the learning of science interesting? What are your reasons?
6. Are science clubs important in the teaching and learning of science?
7. Do debates and quizzes improve upon the performance of students in the teaching and learning of science?

Appendix F

Worksheet for practical activity 1

1. Obtain a plant that has been in the sun for at least 24 hours.
2. Put the leaf in the beaker of water and boil for five minutes.
3. Note the colour of the water obtained.
4. Put the boiled leaf in the boiling tube containing ethanol and boil the whole content again in the beaker of hot water.
5. Replace with freshly boiled water after 5 minutes if there is still some green colour in the leaf.
6. Using forceps remove the leaf from boiling tube and rinse the leaf in cold water using the taps at the laboratory.
7. Put the leaf in the petri dish on a white tile.
8. Add few drops of iodine solution to the leaf and allow for few minutes to observe the colour change, making sure the leaf is completely covered with iodine.
9. Record your observation and conclusion.
10. Submit your report.

Precaution: Ensure that the ethanol is kept away from the naked flame.

Appendix G

Worksheet for practical activity 2

1. In group of ten, add equal part of test liquid (frytol cooking oil or soya bean oil) and half full, fill the test tube.
2. Label each test tube if testing more than one liquid.
3. Add few drops of Sudan III stains to each test tube.
4. Shake gently to mix and wait for a while.
5. Record your observation and write down your conclusions.
6. Submit your work.

Appendix H

Worksheet for practical activity 3

1. Add small amount of food sample into a test tube.
2. Label each test tube with marker if testing more than one liquid.
3. Add few drops of Biuret reagent solution to each test tube.
4. Shake gently to mix
5. Record your observation and write down your conclusion.