

**UNIVERSITY OF EDUCATION, WINNEBA**

**IMPROVING THE PERFORMANCE OF S.H.S 2 BIOLOGY STUDENTS OF  
ADEISO SENIOR HIGH SCHOOL IN THE TEACHING OF PHOTOSYNTHESIS  
THROUGH THE USE OF ACTIVITY METHOD OF TEACHING**



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**2016**

**UNIVERSITY OF EDUCATION, WINNEBA**

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**A DISSERTATION IN THE DEPARTMENT OF SCIENCE EDUCATION,  
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PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD  
OF THE MASTER OF SCIENCE IN EDUCATION DEGREE**

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## DECLARATION

### Candidate's Declaration

I, Victor Kwasi Owusu, hereby declare that this dissertation, with the exception of quotations and references contained in published works which have all to the best of my knowledge, been identified and acknowledged, is entirely my own original work, and that it has not been submitted, either in part or whole to any institution anywhere for the award of another degree.

**Signature:**.....

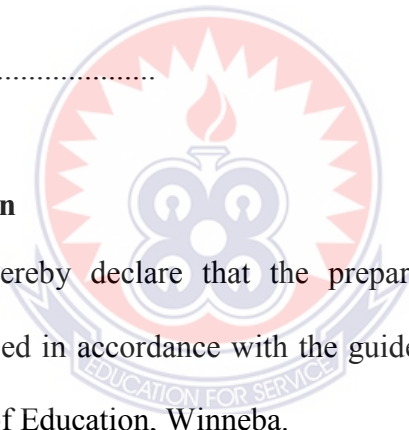
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### Supervisors' Declaration

I, Dr. Victor Antwi, hereby declare that the preparation and presentation of this dissertation was supervised in accordance with the guidelines set for dissertation as laid down by the University of Education, Winneba.

**Signature:**.....

**Date**.....



## **ACKNOWLEDGEMENT**

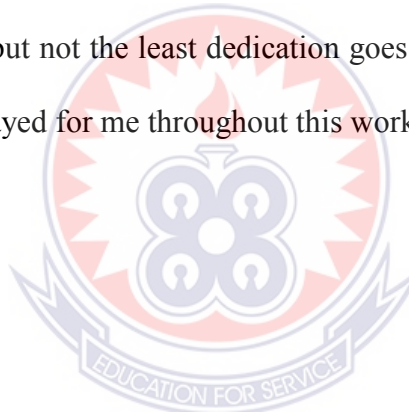
I acknowledge the untiring support and advise and furthermore the spot on corrections made by my supervisor Dr. Victor Antwi, without whose help this work wouldn't have been possible. To you, I say God bless you in all your endeavours. I will also acknowledge Dr. Kojo Donkor Taale, who also helped me as an individual to during the course of study not forgetting Dr. Nana Annan.



## DEDICATION

First dedicate this work to God Almighty, without whose strength, I wisdom and well-being, this work would have been impossible. My second dedication goes to my dear wife Mrs. Cynthia Owusu, my children Joshua Payin Owusu, Japhet Kakra Owusu, Stephen Asiedu Owusu.

I also dedicate this work to my loving sister Abena Odamea and sweet mum Rose Asiedu and Seth Denkyi my father, without whose encouragement, this work would not have been possible. The last but not the least dedication goes to my in-laws Auntie Aggie and Elder C. K. who also prayed for me throughout this work. God bless you all.



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## ABSTRACT

The study aimed at enhancing the performance of S.H.S 2 Biology students of Adeiso Presbyterian Secondary School at Adeiso in the Eastern Region of Ghana in photosynthesis. During the study two classes were taken, with one class numbering up to 52 students comprising of 36 boys and 16 girls and the other class numbering 47 with 21 boys and 26 girls. The total sample size of the two classes was 99. In the selection of the sample for the research, random sampling was used by the researcher. The activity methods of demonstration and grouping methods were used in the collection of data. The data collected were analyzed. The study revealed that teaching students with demonstration and grouping methods enhances the performance of students. Other methods like seminars and science clubs plays important roles in enhancing or improving students' performance. The kind of activity used during the demonstration was based on the constructivism theory, which work was started by Jean Piaget. This theory describes learning as actively constructed by one's own knowledge. The theory lays emphasis on learning and knowledge as interactive and dynamic. In carrying out the demonstration based on the constructivism theory researcher used, experimentation, Research projects, films and class discussion, fieldtrips and debates and quizzes.

In assessing the students, the tools used were the pre-intervention class test was used after which the researcher compared students performance on the pre-intervention and post intervention to see whether students performance was actually enhanced. For instance in the pre-intervention test conducted by the researcher, 27 students out of 99 representing 27.3% scored marks within 1-5. After the intervention was carried out, the percentage

reduced from 27.3% to 4%. Marks within the range of 28-30 numbered 7 when the pre-intervention test was carried out. After intervention was carried out, the number of students who scored marks in that range increased from 7 students to 28 students. These results shows that the intervention carried out by researcher yielded the desired results.



## **CHAPTER ONE**

### **INTRODUCTION**

#### **Overview**

This chapter comprises the background of the study and general concepts, statement of the problem, purpose and objectives, research questions, significance of the study and organization of work. It also talks about the delimitation and some limitations of the study.

#### **Background of the Study**

The 2008 West African Senior School Certificate Examination (WASSCE) chief examiner's report in Elective Biology, stated that there is lack of activity-based method of teaching in some senior high schools (2008). He was of the view that there is the need for teachers in Science, Biology especially, to develop new scientific ways of teaching various topics in Science. Activity-based instructional approach which will allow students to focus their minds on real-life situations should always be adopted.

President J.A. Kuffour in his speech on the eve of independence in 2003, 6<sup>th</sup> March anniversary parade in Accra stated that Ghana and its counterpart Malaysia gained independence in the same year but Malaysia has advanced tremendously in Science 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, 8<sup>th</sup> March, 2003). Urgent steps would have

to be taken by government and through the Ghana Education Service to actualize the former president's wish to rekindle the interest of pre-university learner in Science.

The use of activity method to improve upon students' performance in Science and for that matter Biology is one of the major methods in the teaching and learning of Science that improves the performance of students but rarely used in Adeiso Presbyterian Senior High School in the Eastern Region.

Academic requirements into any institution of higher learning or job placement, like the medical field, requires an aspect of Science. For one to be a medical student, in Ghana and the world over requires an in-depth knowledge and expertise in the Sciences, like Biology, Physics and Chemistry. Science cannot be taught in abstract, as such there is the need for students to be taught through practical activities or demonstrations which would go a long way to improve their performance. These demonstration and activity methods are not frequently used in Adeiso Senior High School. Rather, most colleagues teach the science subject using the traditional lecture approach. This Lecture approach has made most Science students and in particular Biology students to lack the conceptual knowledge development in the subject. This has made the students to harbor the perception that Biology is a difficult subject and the same can be said about the other Science subjects.

Government realizing this scenario and state of affairs in that Ghanaian Senior High Schools has provided equipment, teaching and learning materials, incentives and

improvised materials to support the teaching of Biology in Adeiso Senior High school and other schools around the country (daily graphic, 2003).

### **Statement of the Problem**

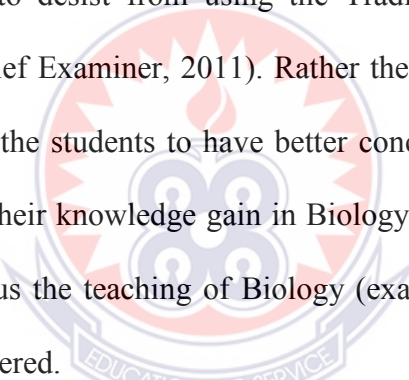
Science is one of the fundamental subjects which has been designed to offer a body of knowledge and skills to most of the requirements of everyday living and to help solve problems in our socioeconomic activities. It also provides adequate opportunities to further education and training in Science and Science related vocations like Medicine, Biology and others (ACT Dirac, 2001/2002). The teaching of Biology in our schools is beset with a lot of problems which affect the students understanding of concepts in Biology. This also in turn affects students' performance, both in school internal examinations and students' final external examination (Chief Examiner, 2008).

Due to the complex nature of the Science subjects, how the subject should be handled by teachers to enhance the understanding and performance of students in the subject has been spelt out clearly in the syllabus (Curriculum Research Development Division, 2007). The research carried out two class Tests and scored it. Most of the questions were based on students previous lessons that has been treated in class. The results from those test indicated that, most of the student were lacking a lot of things including the explanation of simple concepts in Biology. The researcher realized, this problem was the case, because of the usage the traditional lecture method of teaching. The following measures were used to ascertain the performance of students in elective Biology in Adeiso Presbyterian Senior High School.



1. Analysis of previous West African Senior School Certificate Examination (WASSCE) results of Adeiso Senior High School.
2. Comments from other colleague teachers
3. Oral questioning, observations and interviews conducted on Biology students

The Ministry of Education under the auspices of the Government of Ghana has been organizing various in-service and educational training for the teachers in Ghana in various levels of our educational ladder on the modern way of teaching Science (Chief Examiner, 2007). Chief Examiner of West African Examination Council (WAEC) has been advising teachers to desist from using the Traditional Lecture approach in the teaching of Biology (Chief Examiner, 2011). Rather they relate the concepts in Biology to real life activities for the students to have better conceptual understanding. This will allow students to apply their knowledge gain in Biology to solve real life problems with regard to questions. Thus the teaching of Biology (example Photosynthesis) should be practical and learner centered.



It is in this vein that this controversial issue makes this topic relevant to find the influence of the use of activity method in the teaching of photosynthesis on Adeiso SHS Two Biology students' performance. Hence the main problem of the study is to investigate the use of activity method in the teaching of photosynthesis on Adeiso SHS Two Biology students' performance at Adeiso in the Eastern Region of Ghana.

### **Purpose of the Study**

The purpose of the study was to find out the effect of the use of activity method on S.H.S 2 Biology students' performance at Adeiso Senior High School in photosynthesis.

### **Specific Objectives**

The study aimed at achieving the following objectives:

1. To investigate whether instructional strategies such as frequent class exercises, class tests and prompt feedback to students can bring about improvement in students' performance in photosynthesis in Biology.
2. To find out whether the use of activity based methods in teaching Biology can help improve the performance of the students.
3. To determine if increased female participation in practical activities can cause them to develop interest in the learning of Biology.
4. To find out if field trips, debates and quizzes can bring about improvement in the performance of students in the teaching of photosynthesis.

### **Research Questions**

The following research questions were posed to guide the study;

1. How will the use of instructional strategies such as frequent class exercises, class tests and prompt feedback help improve SHS Two Biology students' performance in Photosynthesis?

2. What effect will the use of activity-based methods in teaching Biology can have on the performance of SHS Two Biology students in the teaching of photosynthesis?
3. To what extent will the use of female participation in practical activities can cause them to develop interest in Biology and improve their performance?
4. How will the use of field trips, debates and quizzes help to bring about improvement in the performance of SHS Two Biology students in the teaching of photosynthesis

### **Significance of the Study**

It is hoped that the findings of the study when it is made accessible would:

- Benefit the S.H.S 2 Biology students of Adeiso Senior High School on how to learn Biology topics, especially photosynthesis using activity-based approach.
- Sensitize Biology teachers to gain insight into other teaching methods such as activity-based instructional approach, aside the usual lecture method. It would help the teachers to be aware and apply appropriate teaching methods in teaching of Biology which will enable students to appreciate science concepts without much difficulty.
- Serve as a reference material or add to the existing literature for other researchers who will want to do further research in the teaching and learning of photosynthesis.

### **Delimitations**

This project should have focused on all Biology students of Adeiso Senior High School, since they all offer Biology as an elective subject. However, due to time constraints the study was limited to SHS Two Biology students of Adeiso Senior High School.

### **Operational Definition of Terms**

**WASSCE:** West African Senior School Certificate Examination

**WAEC:** West African Examination Council

**Activity-based method of teaching:** Is a type of teaching whereby teaching materials is interspersed with demonstrations, dramatization, role play etc. to make teaching and learning understandable to learners.

### **Organization of Chapters**

The study is organized in five chapters. The first chapter looks at the background of the study, the statement of the problem, purpose of the study the Chapter two discusses the review of the literature related to this research. Chapter three concerns with the methodology and data collection. These are the research design, population of the study, sampling and sampling procedures, instrumentation, data collection procedure and data analysis procedure. Chapter four talks about the presentation and analysis of data collected while the chapter comprises the summary of the research findings, conclusions, limitations and recommendations.

## 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 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 derive the country's agricultural and industrialization in order to raise the country to a middle income status 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 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 Glaserfeld, 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 schema. All learning is filtered through pre-existing schemata, constructivism suggest that learning is no 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 boarder 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 experience (Piaget, 1985).

## **Constructivist Activities**

In the constructivists' classroom, learning and knowledge generation are learning and knowledge generation is 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 textbook. Some activities encouraged in constructivist classroom 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 discussed in class in a real-world context. Field trips are usually followed by class discussions.
- **Films:** These provide 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.

The constructivist theory of learning can also be used in online learning. Under blogs, discussion forums can enable learners to actively construct knowledge.

Existing knowledge schemata are explicitly acknowledgeable as a starting point for new learning, constructivist approaches tend to validate individual and cultural difference and diversity. In the constructivist classroom, the teacher's role is to prompt and facilitate discussion. This, 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 cannot 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 behaviorism, is at odds with the constructivist theory of Vygotsky, a more holistic view of the learner-environment relationship emerges from the synthesis 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 discovery can take place everywhere and 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 and Brooks, (1993) as cited in the North Central Region Education Laboratory (NCREL, 1993) reported that a new version



of science is emerging, one that calls for instructional conceptualizations. The new trend for learner science emphasizes engagement and meaning in ways that are not consistent with past practices. The anticipated outcomes of this new approach of teaching of a higher level to student's achievement in 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 Students Learn**

Students do not necessarily learn by a teacher explaining to them concepts, or how to solve a problem. It is heart-breaking and heart-wrenching, to find out that, after explaining a concept or taking your students through the steps to solve a problem, one would only find out the later that, all the explanation and steps that students were taken through, did not lead to mastery of the concepts. Only a few of the students would master the concept learning most of the students not achieving any learning.

Many learning theories guide teaching approaches. Some of the learning theories are the behaviorist theory of learning and cognitive theory of learning. These theories inform and guise teaching and learning and the basis of instruction and how conclusions can be drawn (Romberg and Carpenter, 1986) what happens in a particular course can be viewed

as an interaction between the teacher's goal for what students should learn, viewed of students, characteristics and abilities, theory of how students should be taught. This is the guiding theory for much research and reform in ICT education. The constructivists view students as bringing to the classroom their own ideas, rather than receiving materials in class as it is given, students restructure the view 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 methods 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 I an internal us in particular directions and keeps us engaging in certain activities'. This means that a person who feels no impetus or inspiration to acct is thus characterized as unmotivated, where as 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 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 learner's attitudes and beliefs towards subject matter, especially science and mathematics, are important as achievement (Cognition and Technology Group at Vanderbilt) (CTGV). 1992; Sedighian and 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 and mathematics related courses (Gal and Ginsburg, 1994; Sedighian and Sedighian, 1996). Performance in mathematical solving is also related to beliefs about mathematics and science (Schoenfeld, 1985) and attitude towards 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 consideration in learning science and for that matter the learning of Biology. 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 affect 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 principals 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 rests on science and technology and its application irrespective of goods. In his address to the British Association and Advancement of Science (BASS), in Duke of Argyll Stated among other things that, what is expected of teachers is that they should teach the young ones to appreciate science and that they should not so much on the results. There is the need to start the teaching and learning of science at early stages of every individual life and by the objective 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’s drive to draw more student’s to science, especially at the second cycle level more students mainly, females keeps running away from it. The importance of female education was under second by one of Ghana’s eminent and illustrious educationist in the person of Dr. Kwegyir Aggrey that when a

woman is educated, it means a whole society has received education, as against when a man is educated. 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's education institutions shows that women dominate the teaching profession. It is an undeniable fact, that one's 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 in our socio economic lives cannot be underestimated. This fact has been demonstrated by successive governments in Ghana. This importance is exhibited by the various universities in the country, working with a policy that urges them to organize special entrance exams, for students who do not meet entry requirements of the various universities, but have the ability to pursue, science related courses. As such, pre-entry classes are organized for such students to prepare them for the task ahead of them.

Furthermore, government has from time to time, been organizing special clinics in particular, so as to whip up the interest of girls in Science, and also to improve the participation of females, in science education. Records available at the Ministry of education, indicates that, the government of Ghana is moving heaven and earth to improve the study of science among females. This fact is exemplified by the following individuals.

Dadzie (2006), a former Western Regional Director of Education Speaks of 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. The theme for that (STME) clinic was: STME, the engine for Growth of the Nation. A former Central Regional minister under the administration of former president John Agyekum Kuffour, Mr. Edumadzi, opening an (STME) clinic reiterated that education contributes immensely to poverty eradication, produces better health outcome, empowers an individual and also the average of individual's life. He noted among other things that, the people continue to live in abject poverty because of the simple reason that, they lack scientific based technology to be able to apply to the abundant rich resources that the nation is endowed with, to turn their lives around. Poverty and ignorance are some of the problems our people face as a result of low scientific and technological knowledge and its application. This state of affairs has made the divine duty of every nation to ensure that, its citizenry are lifted from the shackles of ignorance into the scientific and technological era. There cannot be development without the study of science. Awuni (2009) also makes a call in this same vein, by calling on all who matter in policy formation and for that matter, stakeholders to ensure that the STME clinic for girls is successful when it was organized.

She made the call at an STME for girls from selected schools in the Upper East Region of Ghana. She understood the fact that, Ghana needs young people with the requisite knowledge and skills in the application of science and technology to enable the county to exploit its natural resources, it is not only in Ghana, where the importance of the study

of science is thought of, but all over the world, including even the United States where development is advanced, the importance of science education is not left to chance.

The American Association for the advancement of science (1990) as cited by Geoffrey (2004); a scientifically literate person has the ability to hold a scientific world view, engage in scientific inquiry and appreciate the scientific enterprise.

As scientific world 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. A scientific inquiry is a process of making sense of the world and developing explanations 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 in a biology class, or an earth science 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**

According to (FEMSA, 2009). The importance of girls' formal education has been stressed in this study. The study has it that, governments in many parts of Africa are

aware of the benefits of female education and the rippling effect their education have, on the socio-economic lives of our people and the development of the country as a whole. Their lack of cut down has been linked to low birth rate, poor health had 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. 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 government 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 subject, especially Mathematics and Science subjects. Many factors which are home, community and school based, continue to restrict developments in female education (Torto, 2009). 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 caner in these disciplines more attention should be given to building confidence in their abilities early in their education (Founad, 2003). Fouad’s research aimed at identifying support and barriers that steer girls towards 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).

Kim (2000) is also of the view that members of organization like the National Research council should think about how to reverse the rapidly declining numbers of women in Science, Technology, Engineering and mathematics (STEM) careers. Many young students, particularly girls, perceive 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 NSE 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 they, mathematics and science cannot be lumped together when designing interventions because the barriers and supported for each discipline are not the same.

### **Teacher – Students' Interaction and Gender**

Research on gender perceptions found significant difference in the perceptions of female and male in the scale of the QTI. QTI is a structured questionnaire that was developed in

Australia. Kline and Fisher (2011) 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 admonishing behaviours compared to their female counterparts. Fisher and Rickard (1998) reported on Australia high school students and found that seven scales of the QTI had significant difference in the perceptions of students between genders. Kline 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 outcomes scores and positive students attitudes are associated with leadership, helping friendly and understanding teacher behaviours while strict or controlling behaviours are associated with higher cognitive outcomes and 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 effectively (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 student learning process. This role is manifested in

the kind of science classroom he/she 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 lifelong learners. A learner – centered environment refers to an environment that pays attention to the knowledge, skills, attitudes and beliefs the pupil bring to the educational setting. Science teachers who are learner – centered recognizing the importance of building on the conceptual and cultural knowledge that pupils bring with them to the science classroom (Branford, brown & Cocking, 1999). According to Weiner (2002), learner centered instruction is a system of instruction based on a students, 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 foundational tent 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 interest and practices, the instructional methods suggested in the science syllabus (CRDD, 2007) a scribe to this and it behaves 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 sense used or involved in the learning process, the better the understanding of concepts and learners retain what they have been taught for a long time (Hansen, 2002). For example, in a science class, when students are given the opportunity to touch, smell, hear and see what they are being taught, it influences their understanding and high retention of the new concepts (Hansen, 2002; Solberg, 2002). In other words, when students are made to handle equipments and work with them in the laboratory or interact with them, it influences or facilitates their understanding and high retention of the new concepts. The importance of science education is therefore to help individuals apply the scientific skills, knowledge and principles in their daily activities; such as farming activities, production of gadgets, soap making, brewery, baking and many more.

Teaching methods are many and individual teachers have their own way of arriving at their set goals and objectives. Teaching methods are the various ways teachers use to impart knowledge to students. Teaching science and for that matter biology depends on the methods teacher employs and the best method is usually the one that is student-centered and sustain their interest throughout the lesson. Teaching methods discussed include demonstration, activity method of teaching, debate and quizzes and field trips. Due to the above, the biology 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 help to compensate for each other's limitation.

## CHAPTER THREE

### METHODOLOGY

#### Overview

This chapter is about the methodology used to carry out the study. It focuses on the research design, the population of the study, the sample as well as the sampling procedure used in the study. It also discusses the research instrument used, their validity and reliability, scoring data collection procedure and method of the data analysis.

#### 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 solve it, see how successful their efforts were, and if not satisfied, try again (McMillan, John and Schumacher). 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 do every day. A succinct definition of action research aims at contributing both practical concerns of people in an immediate problematic situation and to further the goals of social science simultaneously (Bandura, A. 1977). 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(Bandura, A. 1977).

According to McMillan Schumacher (1997), research design refers to the plan and structure of the investigation used to obtain evidence to answer research questions. 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 group, treatments or programmes and methods of assignments, work together to address the research questions.

The study is aimed at using the activity method to improve upon the performance of Adeiso Senior High School Form Two Biology students in the Eastern Region of Ghana.

### **Population**

The population target was all students of Adeiso Senior High School in the Eastern Region. The accessible population was Biology students of the SHS Two class of Adeiso Senior High School. The main reason why this group of students was selected was based on the assumption that the researcher was very conversant with these students, because the researcher had taught these very students in the past year when they were in SHS One. The number of students offering Biology was ninety-nine (99), 79 boys and 20 girls.

### **Sample and Sampling Procedure**

Overall, the class was made up of ninety-nine (99) students comprising 20 girls and 79 boys. A sample is a small part of anything which is intended to stand for or represent the whole (Wellington, 2006). So that in an experiment, a sample view or result, is used to stand for the view of the whole larger group. There is therefore the need to have nearly representative of the entire population as possible. Sampling helps to select a

representation sample. Sampling means selecting a given number of subjects from a defined population as representative of that population (Borg & Gall, 1983). The type of sampling used in the study was purposive sampling. This was used to select the school and the class. The purpose for selecting the school and the class was that the researcher teaches in the school and knows the class (SHS Two Biology class of Adeiso Senior High School) and over ninety percent of the girls in that class have poor attitudes towards the study of Biology. These attitudes towards the study of Biology have contributed to the poor performance of students in the subject.

### **Instrumentation**

The instruments used for collecting data for the research comprised tests, interviews and observation. The researcher used three tests which were in two forms. The first test was a diagnostic test which is also the pre-intervention test, out of which the researcher had the clear picture of students' strengths and weaknesses on some concepts in the study of Biology. The other two tests were used to measure the strengths and weaknesses of the methods (interventions) used and to determine the extent to which students understood concepts taught. The mid-intervention test was conducted after intervention (activity 1), while the post-intervention test was conducted after intervention (activity 2 and 3) to know the students performance when those interventions were given. These activities were all conducted under the supervision and instruction of the researcher.

## **Interview**

An interview method was used in this study to obtain more information from the students. The role of the interview, as used in this study was used as a form of triangulation. Triangulation actually is used to trap answers from about three or more sources to ensure that answers that one has obtained, are correct. This is because, where a quantitative study has been carried out, qualitative data can be used to authenticate particular measures. Also to clarify and illustrate the meaning of the findings, and see whether their experiences concur with the ratings on the measure (King, 1994). This was primarily the reason why the researcher used the interview method. Also, it was used to determine whether the respondents' (students) expressed views were consistent with their test items and finally to assist in interpreting and explaining the findings using the interview data. The students' interview was semi-structured type of. The interview formed the secondary source of data to supplement that of the primary source, which is the test. The interview was made up of ten (10) items.

## **Observation**

This technique was also used to determine whether the respondents expressed views on both test and interview were in conformity with what the researcher observed. The researcher's observation was on areas such as their behaviors towards science lessons in class, whether they have interest in participating in it or not, their responses to questions asked by their teacher. Keen interest in observing a sample of students' work and notes in their exercise books were not part of the teacher's routine activities.



### **Validity and Reliability of the Instruments Used**

Validity is the extent to which a concept, conclusion or measurement is well-founded and corresponds accurately to the real world. (<https://enWikipedia.org/Wiki>.) This was realized because the researcher conducted the research in a nearby Senior High School. The researcher took permission from the head of the School and carried out the research in one form of that School which was a Elective Biology Class. The result obtained from that School was consistent to with my Schools result and the goal for which the research was carried out was achieved. Reliability refers to the repeatability of findings. If the study were to be done a second time, would it yield the same results. The instruments used were quizzes, debates, exercises, tests fieldtrips and others. The results obtained from these instruments were also checked and tested by other Biology teachers in the School, and a Senior High School nearby. They gave the same results.

### **Pre-Intervention Activities**

The following activities were carried out to help the researcher, identify the problems associated with the performance of students in Biology. These were unstructured interviews, observation of previous exercises and administration of class test. These were done to help the researcher have a clear picture about the students' problems and some factors that lead to the poor performance of students in SHS Two Biology lessons. This was done so that the researcher could design the right intervention to solve the students' poor performance in Biology.

### **Pre-Intervention Findings**

Responses obtained from students in the pre-test showed that students have problems with concepts in Biology and this is a contributory factor to their poor performance. Responses from students as to the causes of their poor performance in Biology during the interview revealed the following.

- Lessons are 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 practical lessons.
- Lack of students' involvement during activities.
- Teacher's 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 minimize or still solve the problem. Based on the pre-intervention findings, some interventions were implemented to help SHS Two Biology students to enhance or improve their performance, and develop the students' interest in Biology. Topics that were used for the intervention included a 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 exercises.

### **Implementation Design**

#### **Activity 1 (carrying out practical work with mixed groups)**

The following were taken into consideration for the groupings:

Two boys were mixed up with eight to nine girls. The number selected for the activity had nothing to do with the number of girls and boys that fall within my class or jurisdiction. They were purely based on teacher's discretion. There were ten groups in all, made up of ten students and the last group containing nine members. Instruction for the experiment were printed and distributed to the individual group leaders, who were selected by their own colleagues to lead them in the activity.

#### **Practical Activity 1**

**Topic:** Test for starch in green plants

**Duration:** 90minutes

**Class:** SHS 2 Biology

**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 24-28 hours)
- v. White tile
- vi. Forceps
- vii. Beaker of cold water

**Safety:** students were asked to make sure that the ethanol is kept away from naked flames. Students were also told by the researcher to seek protection by wearing protective gloves when working with ethanol or iodine solution.

**Procedure:**

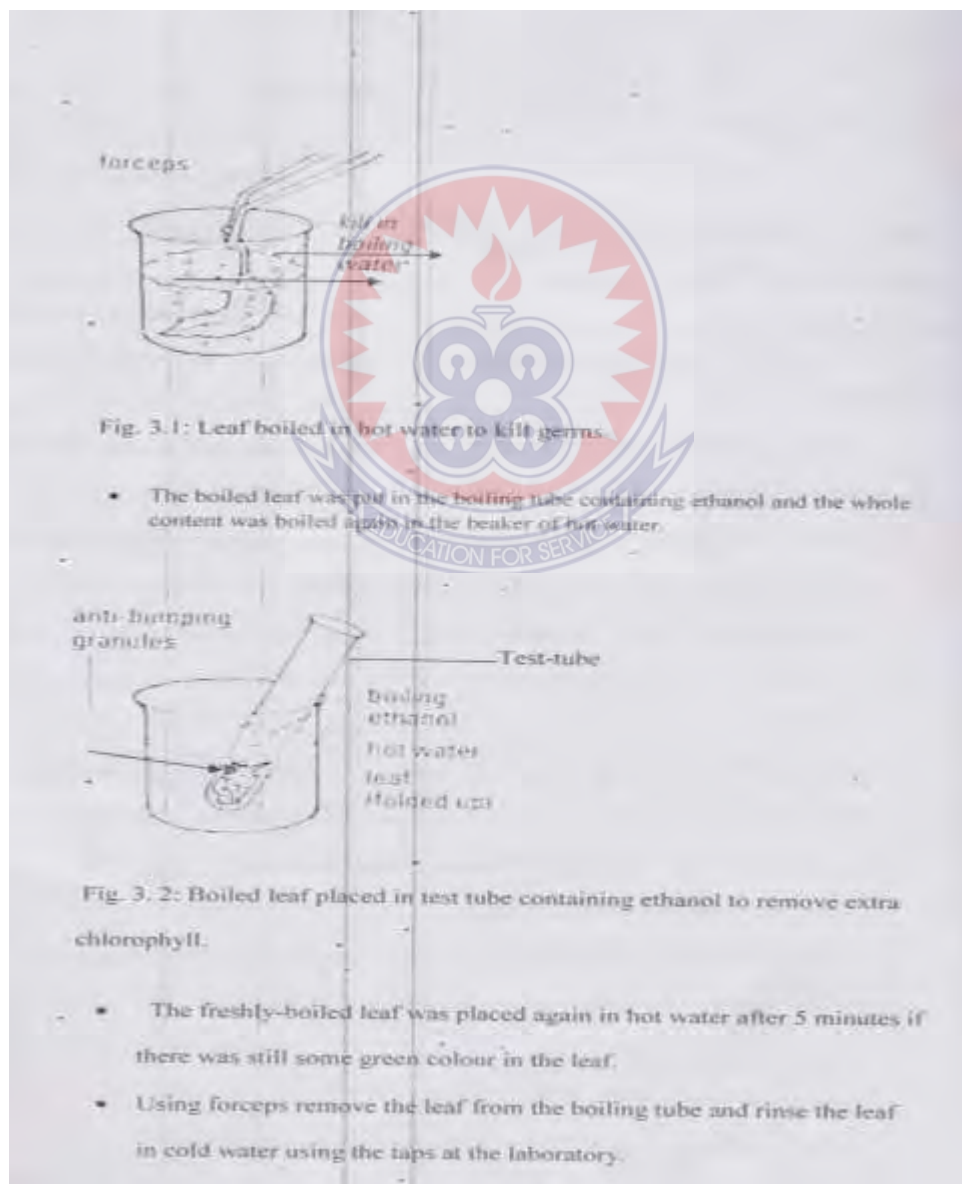
- Researcher took time to review students' relevant previous knowledge on test for starch. This was done through questions and answers and activities for the day were introduced to them.
- Teaching and learning materials for the various groups were distributed by the assistants.
- Students performed the activities by following the instructions on the work sheet while the researcher went round to give a hand of help to students, where it was needed.
- Leaders and recorders for each group were selected and were asked to discuss their observation to the whole class after which the researcher summarized the main points on the chalkboard for further discussion with the students.

- Students were asked to submit the report. Students were then asked to answer some few questions orally, clear the apparatus and prepare for the next lesson.

### Expected outcome

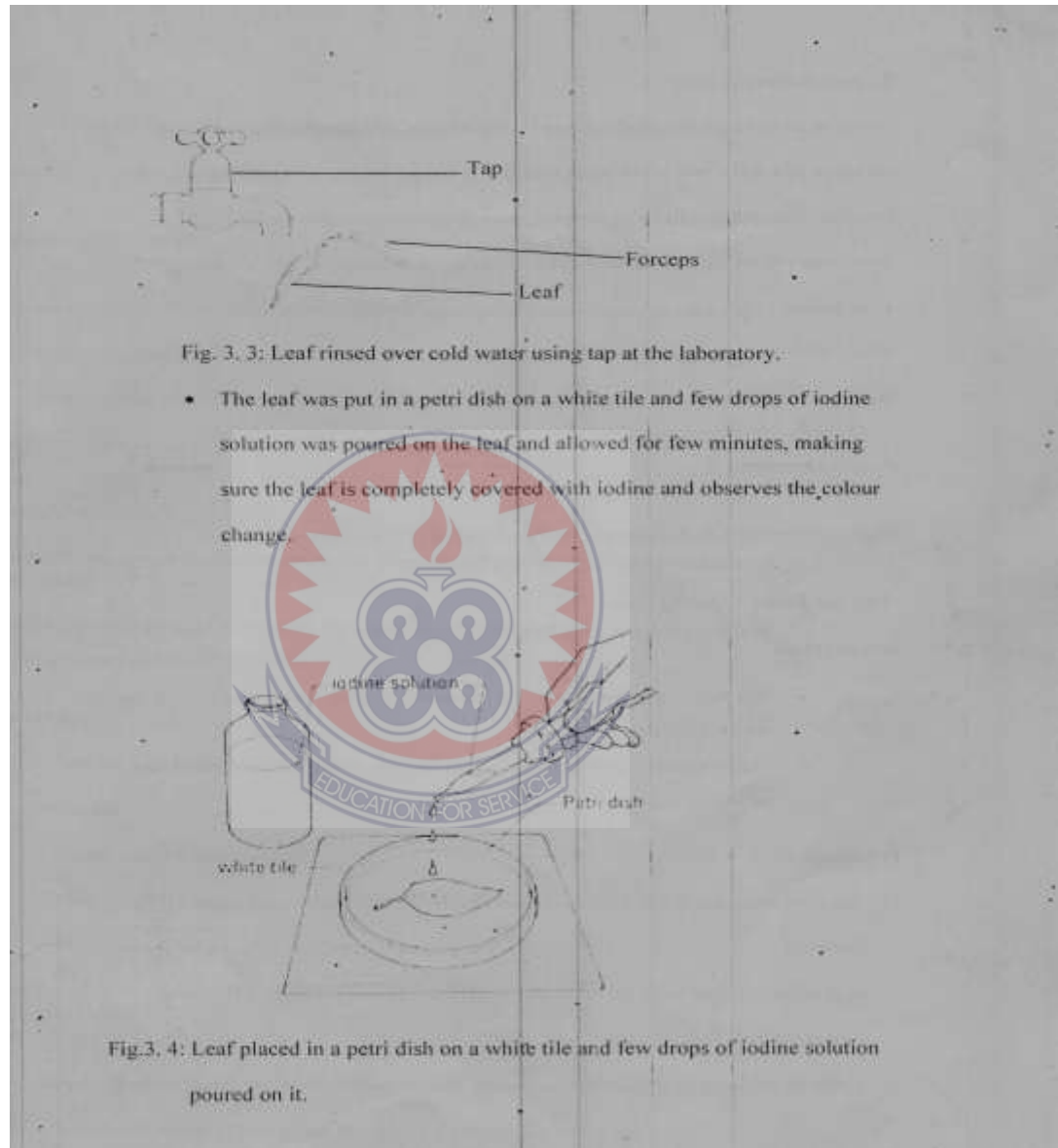
The leaf in the beaker of water was boiled for five minutes and the colour of the water obtained was noted.

Fig 3.1



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

### Diagram



Boiled leaf placed in test tube containing ethanol to remove extra chlorophyll.

- The freshly-boiled leaf was placed again in hot water after five minutes if there was still some green color 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.

Figure 3.3: The leaf is 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 a few minutes, making sure it was completely covered with iodine and observed the color change.

Figure 3.4: The leaf placed in a Petri dish on a white tile and few drops of iodine solution poured on it.



### **Expected Observation**

Starch is presented 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 the protective structures and disrupts the cell membranes to let the chlorophyll out and the iodine solution in.

### **Conclusion**

When the iodine solution was poured on the leaf, blue-black coloration 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 students' relevant 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 work sheets 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 shaken 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 their conclusions into their exercise books. Questions were asked about the practical 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 leader.

#### **Materials**

- i. Text tube or small beakers
- ii. Marker
- iii. Biuret reagent and dipper
- 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 shaken to mix.
4. Students were asked to record their observations.

### **Expected Observation**

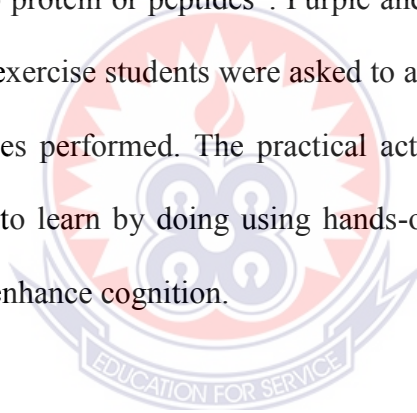
Proteins turned the solution pink or purple when biuret reagent was added. The copper atom of the biuret solution reacts with the peptide bonds to cause the color change.

### **Conclusions**

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

### **Color Indications:**

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. The 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. Active involvement

allowed them to participate fully in all activities and accumulate their findings effectively.

### **Practical Activity 5**

#### **Debates and Quizzes**

Debates and quizzes were also organized periodically among the students in the class on 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, “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 act as an incentive to them to learn and also to entice the rest of the students to come out to participate in subsequent competitions.

### **Practical Activity 6**

#### **Fieldtrips**

The researcher took the students on a fieldtrip to visit some ecological places around the school compound. Some of the ecological places include uninhabited areas such as a sand dune around the school compound, cleared forest or burnt \*parch\*\*\* of soil and microtomes 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**

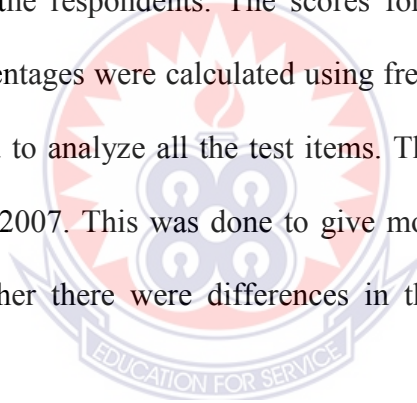
Due to the poor performance in science, the researcher was able to revive the Science Club, as an intervention to whip up students' interests in science and more specifically in Biology. The Club was revived so as to serve as a motivation and also a spring board to arouse students' curiosity and to erase the erroneous impression that science subjects are difficult. This was done through several modules like inviting locals in the community who had Science background and have achieved a lot in the field of science to talk and interact with students. Simple Science projects were also rolled out. This was done in such a way that, students were given tasks to use simple discarded materials like plastic bottles to manufacture things in the laboratory like funnel, beaker and so on, through the help of a resource person, who was well versed in the field. Sightseeing was also used by the researcher to arouse students' interest. Another module which the researcher used to motivate students to develop interest in Science and for that matter Biology as a subject was the use of multimedia. Students were trained in the use of their phones and laptops to access information from YouTube on simple phenomena like digestion of food, dissection of rabbit and so on. Researcher made students aware of the fact that most of the things they do at home have scientific basis and explanation, and also those in the environment.

### **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 performance of the students before and after the intervention.

### **Data Analysis**

The data collected were analyzed for consistency and accuracy by reading through all the responses provided by the respondents. The scores for the pre-test and posttest were tabulated and their percentages were 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 performance of the students before the intervention.



## CHAPTER FOUR

### DATA PRESENTATION, ANALYSIS AND DISCUSSION

#### Overview

This chapter seeks to present the findings from both the pre and post – intervention class tests conducted, using bar charts based on the result from the tests and interviews. It further discusses the discussion of findings on progress of students’ performance in relation to the research questions.

#### Presentation of Pre – Intervention Test Result

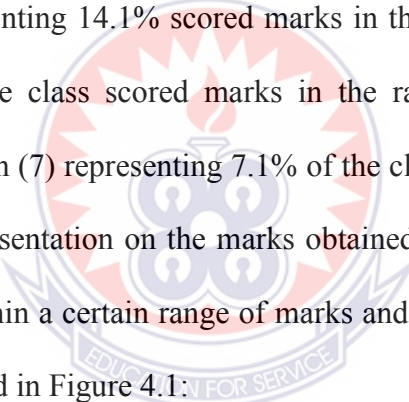
The data collected on 99 students after the pre – intervention test is presented in Table 4.1.

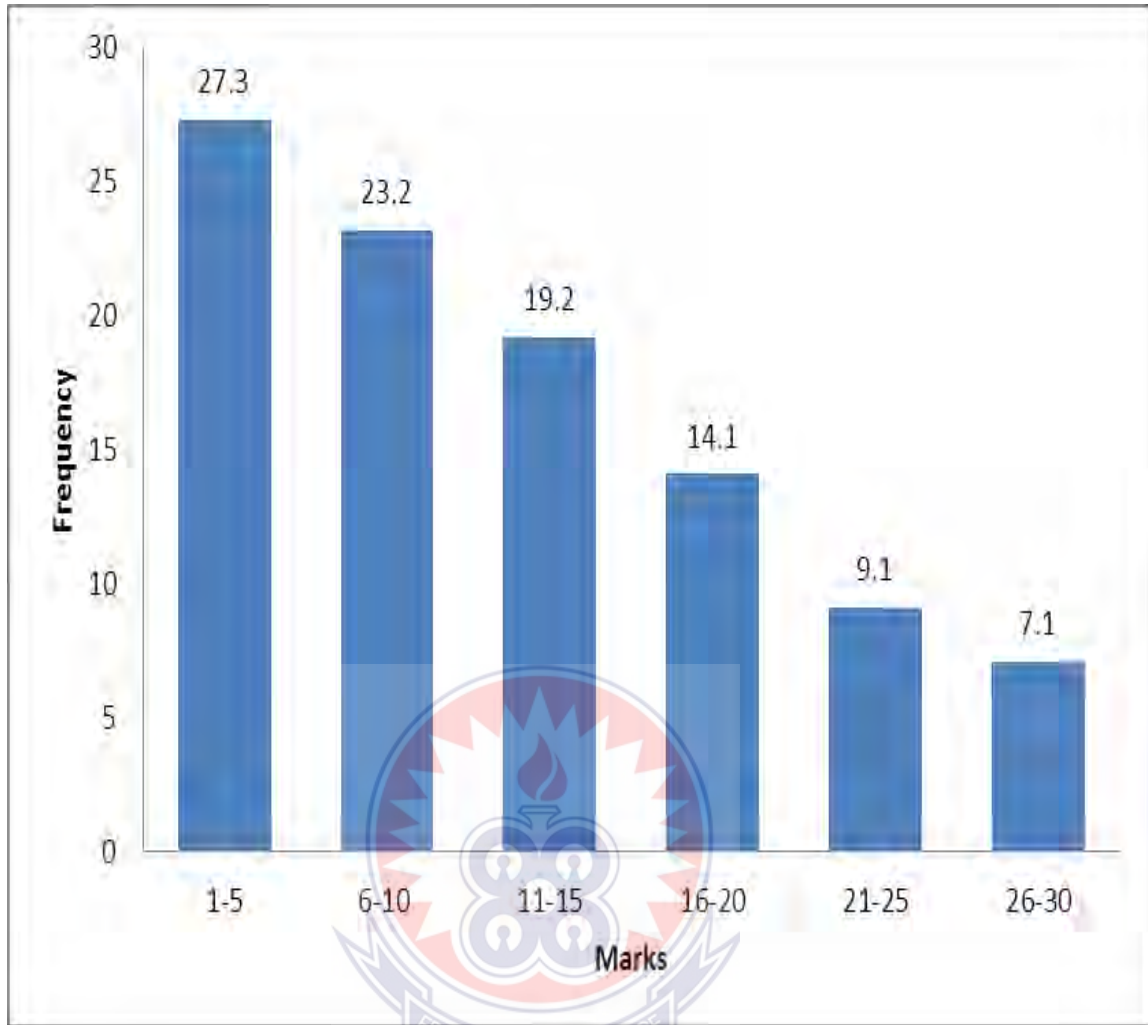
**Table 4.1: Pre – Intervention test scores obtained from 99 students**

<b>Marks/30</b>	<b>Frequency/Number of Student</b>	<b>Percentage (%)</b>
1-5	27	27.3
6-10	23	23.2
11-15	19	19.2
16-20	14	14.1
21-25	9	9.1
26-30	7	7.1
<b>Total</b>	<b>99</b>	<b>100</b>

### **Analysis of Pre – Intervention Test Result**

Findings from the pre – intervention test conducted on 99 students are presented as follows. A total of ninety – nine students took the test and the test was scored over thirty (30) marks. The first column represents marks, the second column shows the number of students who scored a range of marks out of a total of 99 students and the third column represents the percentage of students in the class. From Table 4.1, twenty – seven (27) students representing 27.3% of the class scored marks between 1-5. Twenty-three (23) students representing 23.2% of the total class scored marks between 6-10. Nineteen (19) students representing 19.2% of the class scored marks in the range of 11-15. Also fourteen students representing 14.1% scored marks in the range of 16-20. Nine students representing 9.1% of the class scored marks in the range of 21-25 and finally, few students numbering seven (7) representing 7.1% of the class scored marks in the range of 26-30. A graphical representation on the marks obtained by students, the number of the students who scored within a certain range of marks and the percentage that those marks represents are represented in Figure 4.1:





**Figure 4.1: Scores of 99 students in pre-intervention class test**

### **Discussion of Findings**

The marks obtained by students who took the pre – intervention class test showed the poor performance of the students. These poor performances by students are the reason why certain interventions were lined up to improve the performance of students.



**Research Question 1:**

**How will the use of activity method of teaching enhance students understanding of concept?**

Activity 1, which was an activity lesson was undertaken to find out, how an intervention would answer research question one.

**Presentation of Mid- Intervention Test Results**

The results of the 99 students in the mid – intervention class test is represented in Table 4.2.

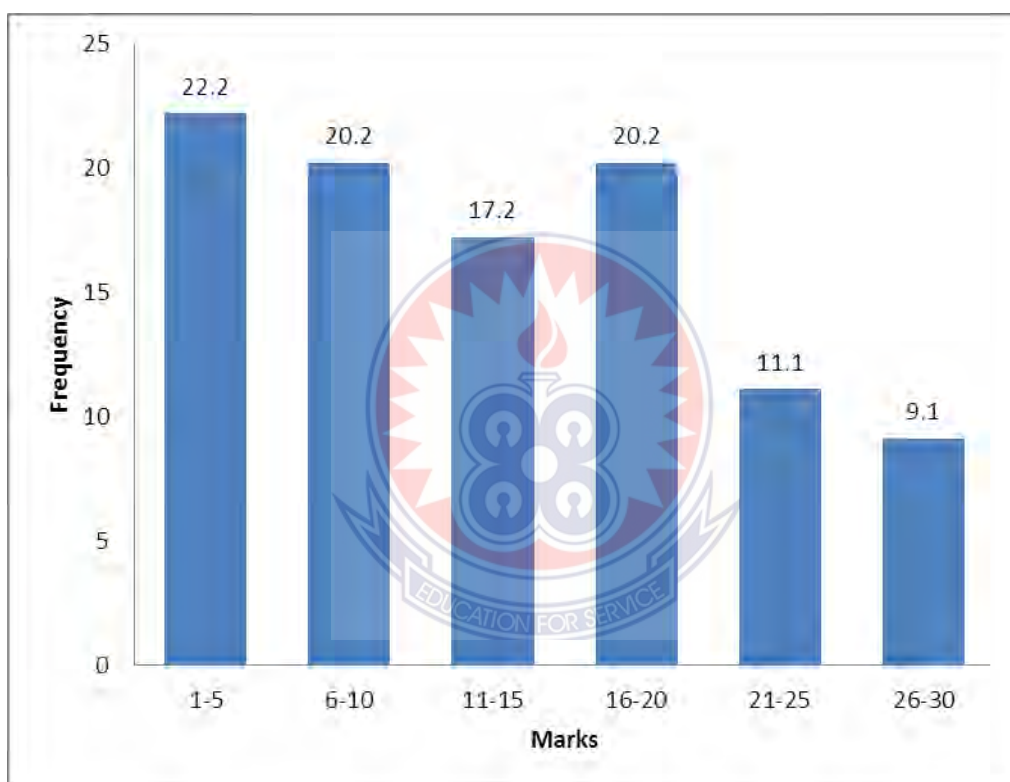
**Table 4.2: Mid- Intervention test scores obtained from 99 students**

<b>Marks/30</b>	<b>Frequency/Number of Students</b>	<b>Percentage (%)</b>
1-5	22	22.2%
6-10	20	20.2%
11-15	17	17.2%
16-20	20	20.2%
21-25	11	11.1%
26-30	9	9.1%
<b>Total</b>	<b>99</b>	<b>100%</b>

**Analysis of the Mid – Intervention Test Results**

Table 4.2 shows the range of marks obtained by students and the percentages they obtained when the mid – intervention test was carried out. Ninety-nine (99) students took the test. The analysis of results is as follows: twenty – two (22) students representing 22.2% scored in the range of 1-5, twenty (20) students representing 20.2% scored marks in the range of 6-10, seventeen (17) students representing 17.2% scored marks in the range of 11-15, and twenty (20) students representing 20.2% scored marks in the range of

16-20. Eleven students representing 11.1% scored marks between the range of 11-25 and the last group of nine (9) students representing 9.1% scored marks in the range of 26-30. A close look at the performances of the 99 students, showed a marked improvement in students' performance and the positive effect of the mid – intervention, which was the usage of the activity method of teaching. The information on the analysis of the results is presented in a graph form in Figure 4.2:



**Figure 4.2: The marks of 99 students in a mid – intervention Test**

### **Discussion of Results**

Results churned out from the mid – intervention test was better than those from the pre – intervention test. The marked improvement in the students' performance was due to the mid – intervention activity 1. With the activity 1, students did a test for starch in green

leaves. They also performed a test for lipids and also protein. Students watched teacher perform the activity 1, and they in turn also did same. This raised their interest in the lesson so high. The student's involvement in the activity was massive and each student had a feel of the activity at least once. This was the reason why there was an improvement in their mid – intervention results. It showed their understanding of the concept.

### **Research Question 2**

**How 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 use of girls as laboratory assistants was a good one, because it made them understand science as a way of life, not far away, but used in our everyday life.

In all the activities, the researcher acted as 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 problems, the researcher comes to their aid to help them out of their problems, and put them on the right track. Each member from each group's points were summarised on the chalkboard. Having put the weak students with the brilliant students, helped the weak students to learn from the brilliant students.

### 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 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 Results

The results of the 99 students in the post – intervention test is presented in Table 4.3.

**Table 4.3: Post – Intervention Test Results for the 99 Students**

Marks/30	Frequency	Percentage (%)
1-5	4	4
6-10	8	8.1
11-15	15	15.2
16-20	20	20.2
21-25	24	24.2
23-30	28	28.3
<b>Total</b>	<b>99</b>	<b>100.0</b>

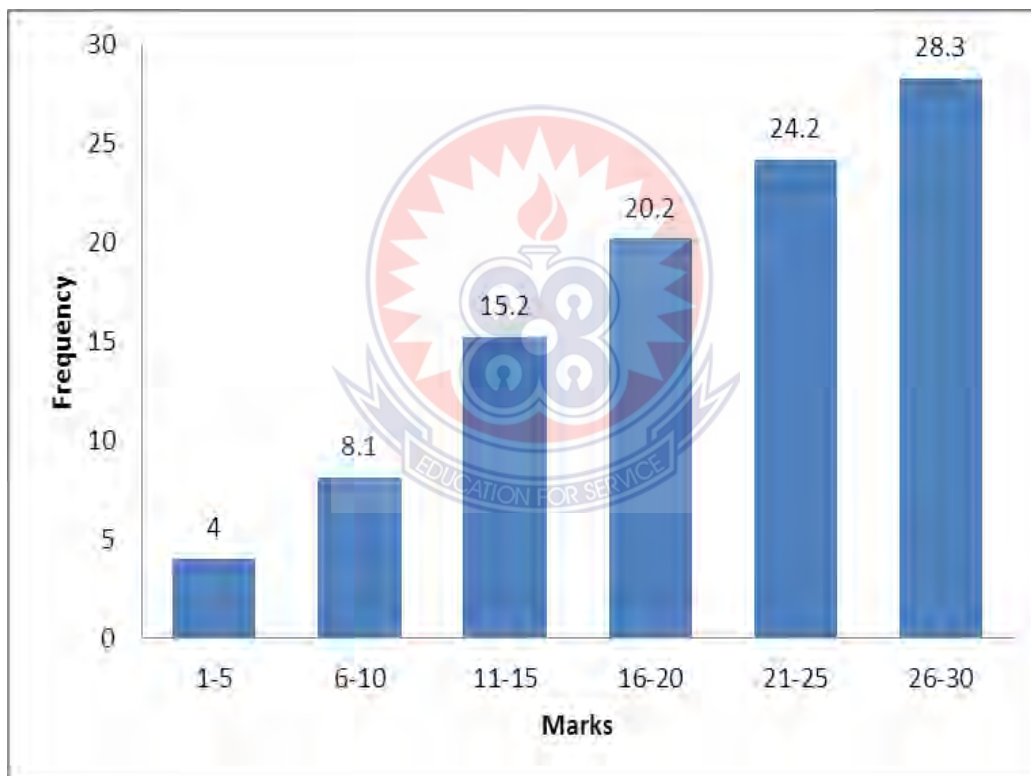
### Analysis of the Post – intervention Test Results

Table 4.3 represents marks obtained by 99 students, the number of students who obtained a certain range of marks and their corresponding percentages.

From the Table 4.3, four (4) students obtained marks in the range of 1-5 which represents 4% of the total marks, eight (8) students obtained marks in the range of 6-10 which represents 8.1% of the total marks. Furthermore, fifteen (15) students obtained marks in

the range of 11-15 which also represents 15.2% of the total marks, twenty (20) students obtained marks in the range of 16-20 which represents 20.2%, twenty-four (24) students scored marks in the range of 21-25 which also represents 24.2% of the total marks and finally, twenty-eight (28) students obtained marks in the range of 26-30 which represents 28.3% of the total marks of 30.

The information obtained from Table 4.3 has also been presented graphically in the Figure 4.3



**Figure 4.3: Post-intervention class test**

Discussion from performance of the students in the post – intervention test as compared to the pre – intervention test and mid – intervention class test. The test was conducted after intervention activities 2 (mixed ability groupings for practical activities) and 3

(debates and quizzes) were introduced. The remarkable performance put up by the students showed that the two activities had great effect on the students understanding of the topics they were taken through. The activity 2 gave the student the opportunity to interact with each other, and showed that, the two activities had effect on students understanding of the topics they were taken through. Activity 2 gave room for students to interact with their colleagues and the materials provided; activity 3 enabled the students to exhibit their mental capabilities and how to argue out their cases when questions were asked by the researcher. This also gave room for the participants representing each of the groups 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 scored and showed the remarkable improvement in their performance.

In activity 4, students were selected on the real feel of things outside the 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 different learning styles helping students to succeed whether they are visual, audio or kinesthetic learners. The reports and exercise which were written by the students were based on what were discussed also showed improvements in their assessment because the students were able to answer almost all the questions.

In activity 5, this had to do with the formation of science clubs in the school. There was an increase in students willing to take part in the project, and the bringing on board a female scientist who was an old student who had pursued science to the highest level and

other old students. These interactions with these old students and also the female scientist created a platform to erase the erroneous impression about the study of science and helped students to realize that, with determination and the little effort they put in their studies the sky will be their limit. The questions the students posed to these personalities and the able manner that, those questions were answered, had influence on the students' attitude towards the learning of science and also helped to arouse their interest in science. One aspect that helped the students in the interactions they had with the resource persons was that of the way they portrayed science in every aspect of our lives and also how to create simple apparatus like funnel and other things, out of the very things we throw around and label them as waste.

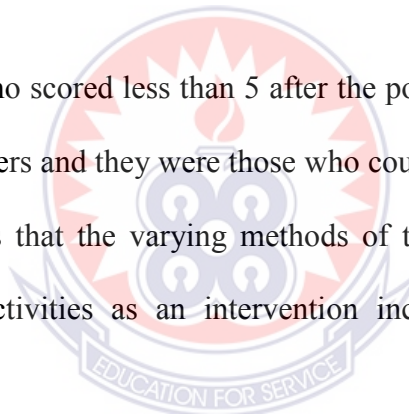
### **Analysis and Discussion of the Pre – Intervention Interview Results**

Findings from the interview conducted on the 99 students, indicated that, most of the students did not understand most of the science concepts taught by their science teachers. The interview the researcher had with the girls in the science class portrayed that they were not involved in practical activities, the researcher also found out that the use of teaching learning materials in the teaching of the science subject, Biology, was virtually absent, and this was one of the factors, if not the major factor, that made the students lose interest in the subject. Researcher saw with could say that the teaching and learning of Biology was mostly done in abstract by the use of the traditional lecture method.

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

When the pre – intervention results and the post – intervention results were compared, it was realised that 27 out of the 99 students scored less than 5 of the total marks in the pre –intervention tests while 4 students scored less than 5 out of 99 students in the 99 students post – intervention test. Seven (7) students out of 99 students scored 26 -30 (85-100%) marks in the pre – intervention test while 24 students out of 99 students scored in the range of 26-30 marks (85-100%). A quick glance of the overall performance of the students in both tests indicates a rapid increase in the performance of the students after the intervention was administered.

The four (4) students who scored less than 5 after the post intervention was administered were perhaps slow learners and they were those who could not express their ideas in even mere writing. It implies 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

The graphical presentation of the frequency of students with their corresponding marks is presented in Figure 4.4:

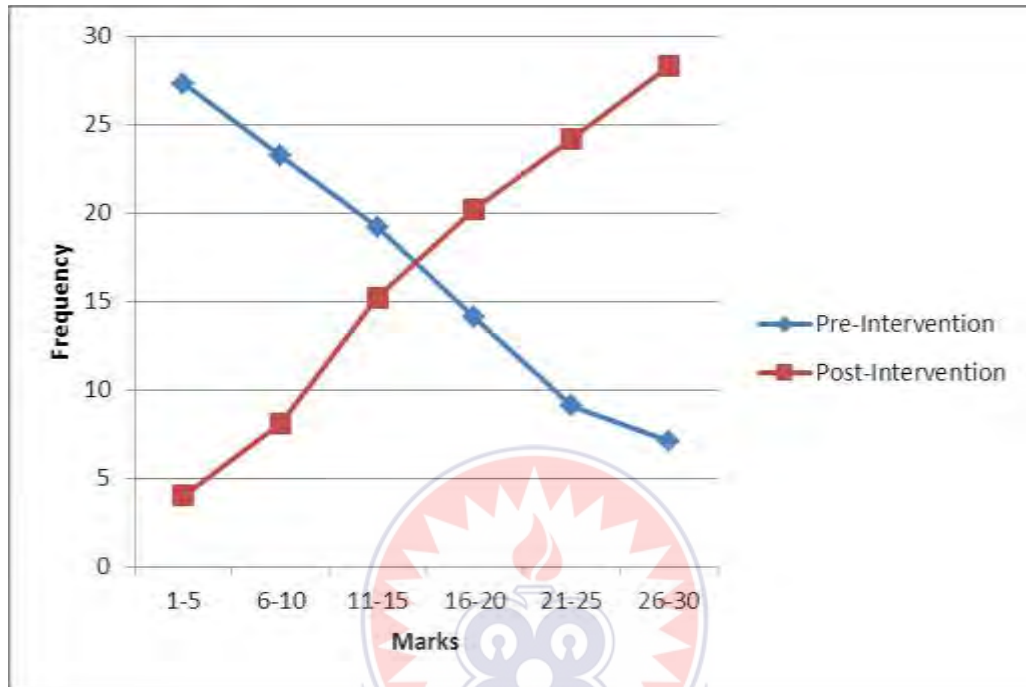


Figure 4.4: Pre and post intervention test scores

### Analysis and Discussion of the Pre and Post Intervention Interviewed Results with the intervention of the 99 students

The results Pre Intervention Interview indicated that most of the students did not understand most of the concepts taught by their science teacher. It was observed that anytime the researcher entered the class for lessons to begin, some of the students either sleep or disturb in the class indicating lack of interest in the subject. It was evident 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 lose 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, were better than that of the pre – intervention interview. It was deduced from responses that, almost all of students 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 Figure 4.4 shows that students improved upon their performance as shown in the post – intervention class test.



## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

#### Overview

This chapter gives an overview of the main findings of the research with emphasis on conclusion and some recommendations in relation to the findings.

#### Summary of Findings

The main purpose of this research was to improve students' performance through the use of different or varied methods of teaching, coupled with appropriate teaching learning materials at Adeiso Senior High Secondary School at Adeiso in the Eastern Region of Ghana. The researcher, first of all sought to find out the main causes of the poor performance of the students in Biology and based on the findings from the causes of the poor performance, put in the right interventions to correct the situation. The researcher found out through pre – intervention activities that students were mainly taught by the traditional lecture method. Also, tutors did not give students enough exercises and also did not have enough interest in the subject, because of the way it was taught; without the use of teaching learning materials.

A total of 99 (ninety – nine) students were taken through an intervention to assist them overcome their problems. From the intervention, the researcher realized 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, test for lipids and proteins better. When the 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.

When the students were grouped, the brilliant students had the opportunity to pull along the weak ones. It was also realized that, when students were grouped for debates and quizzes, it motivated them to gain interest in Biology, even to the extent that introverts could express themselves well, the students were excited to move from their normal classroom setting to the natural environment setting to view things in their natural state. Again, when students were on the field; their attitudes were different as compared to their attitudes when they were in the normal classroom. The fieldtrip exposure offered the students the opportunity to ask questions and express themselves.

When the female scientist and old students were invited to the school, it brought about a lot of changes in the school after which students showed a lot of interest in the Biology subject and also their curiosity about Biology and Science in general that it is a difficult subject was erased, because they saw in those women that what they have achieved they could also achieve. From the outcome of the post- intervention test, most of the students had no problem answering questions. Observation of the students during practical activities revealed that, students got excited due to the fact that the method used was to their level of understanding. The method had positive effects on student's contributions in the class and improved their performance remarkably.

## **Conclusion**

A close look at the research findings showed that effective teaching and learning will take place when the teaching method or strategy suits the level of understanding of the student. Students' interest is aroused and sustained throughout the period of teaching. When teaching and learning materials are used to attract learner's attention, it arouses their interest and it invokes co-operation, supplement description and explain concepts (Walkling, 1982). It is good for Biology teachers to use different teaching methods, appropriate teaching and learning materials, and also Biology or Science teachers should try as much as possible to give students frequent exercises and also try as much as possible to mark them and discuss their mistakes with them as a form of feedback for the students. Students should from time to time as tutors deem fit, be sent outside the classroom, to observe things in their natural phenomena. It is also worth mentioning that, old students who are science biased could be invited to come and share their experiences with the students through the organizations of symposia.

## **Recommendations**

Looking at the study, the different teaching and learning materials used during the research helped improved upon the hitherto poor performance of the students in Biology and other science related subjects.

From the research, the researcher realized that, the performance of students can be improved, if the following recommendations are adopted and implemented.

- Biology and Science teachers should as much as possible use different teaching strategies in their teaching. 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.

- Exercises given to students and also assignments should be marked in time to give students immediate or prompt feedback for them to assess their progress as well as grouping students (mixed ability) for practical activities.
- Authorities responsible for the supervision of Biology should as a matter of urgency, organize in – service training for teachers from time to time to brief teachers on new methods of teaching and should also make it a point to involve female students in the planning and implementation of practical activities in science teaching and learning. 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 and they should be organized to keep students on their toes.
- Lastly, science is a human construct, which encourages students to interact with the environment for them to learn and also find out things for themselves. This is to say that, science should not only be learnt in the classroom, but also on the field, by taking students on field trips or excursion for them to learn by themselves.

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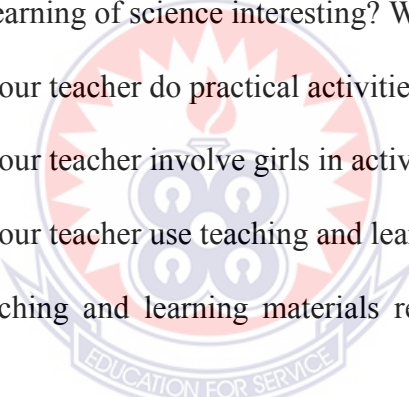


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## **APPENDICES**

### **APPENDIX I**

#### **PRE – INTERVENTION INTERVIEW QUESTIONS**

1. In what ways does your Biology teacher present his or her lesson?
  2. What 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. Is the use of teaching and learning materials relevant in science teaching and learning?
- 
- The logo of the University of Education, Winneba, is a circular emblem. It features a central sunburst design with a lamp of knowledge in the center. Below the emblem is a banner with the motto "EDUCATION FOR SERVICE".

## APPENDIX II

### PRE – INTERVENTION TEST ITEMS

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

1. In photosynthesis in green plants \_\_\_\_\_ is a by product.

A. Oxygen                      B. Oxygen                      C. Carbon dioxide

D. Carbon monoxide

2. In an experiment to test for starch, which of the following reagent is suitable for the test?

A. Fehling's solution                      B. Million's reagent                      C. Iodine solution

D. Ammonia solution

3. Which of the following is wrongly matched?

A. Protein.....meat

B. Carbohydrate.....bread

C. Vitamin.....lemon juice

D. Fat.....sweet potato

4. The end product of protein digestion is.....

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

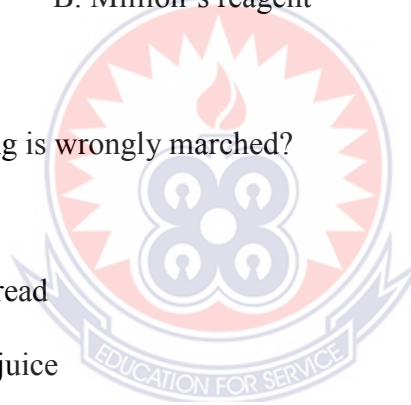
5. Lack of proteins causes.....

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

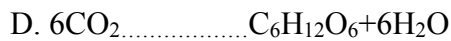
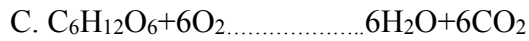
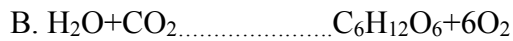
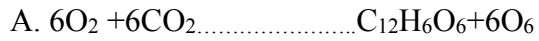
C. Formation of bones.                      D. Gives energy to organisms



7. Which of the following is raw materials for photosynthesis?

- A. oxygen                      B. Glucose                      C. Carbohydrate                      D. Water

8. The formula to represent photosynthesis?



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

- A. Million 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

