UNIVERSITY OF EDUCATION, WINNEBA

IMPROVING THE PERFORMANCE OF STUDENTS IN INTEGRATED SCIENCE: A CASE STUDY

KINGSLEY ABOAGYE GHUNNEY

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A DISSERTATION IN THE DEPARTMENT OF SCIENCE EDUCATION, FACULTY OF SCIENCE EDUCATION SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES UNIVERSITY OF EDUCATION, WINNEBA, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF MASTER OF EDUCATION, IN SCIENCE EDUCATION.

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DECLARATION

RESEARCHER'S DECLARATION

I, **GHUNNEY, KINGSLEY ABOAGYE,** hereby declare that with the exception of references made to other people"s work which have been duly documented and acknowledged, this dissertation is the result of my own effort and that it has neither in whole nor in part been presented elsewhere.

Student Signature.....

Date.....

SUPERVISOR'S DECLARATION

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

Supervisor's Signature: .....

Date: .....

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DEDICATION

I dedicate this project work to the Almighty God and my beloved mother, Millicent Botwe Aboagye.

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ABSTRACT

This research work sought to improve on the performance of students through the use of hands-on instructional approaches in integrated science. An Action Research was used in this study to improve students‟ performance in integrated science. Second Year General Art Students of Queen of Peace Senior High School numbering 57 was the sample used for the study. The research instruments used included observation, interview, questionnaires and tests. It was observed that these students believed that, integrated science is difficult and boring hence makes no attempt to excel in the subject. The students were engaged in activities, group work and constant use of teaching and learning materials to develop and sustain their interest in the subject.

At the pre-intervention stage, interviews and diagnostic practical tests were used to assess the magnitude of student‟s problems. Observations were made and student‟s marks recorded. It was deduced that lack of activities involving learners affected their interest and performance in integrated science. Duration of eight weeks‟ intervention plan was designed and implemented to assist students to improve their performance in integrated science

A number of recommendations have been made based on the findings of the research which include the need for teachers to always use varying teaching methods such as demonstration, practical activities, peer tutoring and discussions to make integrated science lessons interesting. Also, the performance of Form Two Art Two (2A2) students of Queen of peace Senior High School improved exceedingly when varying teaching methods, timely marking of students exercises and effective remedial lessons were conducted.

It is hoped that learners will be more engaged in the teaching and learning process so as to develop and sustain their interest in the subject.

CHAPTER ONE

INTRODUCTION TO THE STUDY

Overview

This introductory chapter gives a brief background to the study. It goes on to state the problem, the purpose and objectives of the study. The chapter also looks at the research questions, limitations; and finally the delimitation of the study.

Background to the Study

Science education in Ghana is designed to equip learners with skills and scientific principles (Anamuah-Mensah, Mereku & Asabere-Ameyaw, 2004). Science is the bedrock of technological development. Ogunleye, (2002) defined science as a dynamic human activity concerned with understanding the working of our world today. Countries all over the world are striving to improve their technological know-how and this can only be achieved through a solid foundation in science and technology studies. Having a solid foundation in sciences entails making students have keen interest in science (by extension Integrated Science) right from their Junior Secondary School level of education.

Many research findings have shown that Secondary School Students exhibit dwindling interest in science subjects (Esiobu, 2005). Afuwape and Olatoye (2004) cited by Oludipe (2011) reported that researches on the reasons for the lack of interest in science among students included: lack of qualified teachers, lack of practical works, insufficient allotment of time for Integrated Science on the school time-table and poor method of teaching, non/poor use of instructional materials etc. These he maintained were among

the major factors militating the successful implementation of the core curriculum in Integrated Science. In the teaching and learning of science, a clear understanding of the concepts taught is vital. Thus for students to understand the concepts well, the teaching methods must aim at facilitating intellectual understanding of science as a subject. Learning on the other hand, is concerned with positive changes in the learner‟s behaviour as a result of teaching experience.

However, the learning situation of students in Queen of Peace Senior High School (QUEENSEC) deviates from this.

Science as a subject has been considered abstract, due to the nature and manner of its presentation. UNESCO (1973), cited in Ngman-Wara (2008), defined integrated science as an approach to the teaching of science in which concepts and principles are presented so as to express the fundamental unity of scientific thought and avoid premature or undue stress on the distinction between the various scientific fields. In recent times, science and technology have been regarded as the key to national development and are the pillars for success in every nation. Although science has become an integral part of almost all public and private examinations, integrated science as a subject has become a rather unpleasant task for most students.

The study was based on Skinner‟s Motivational Theory of learning (Skinner, 1985), which postulates that student‟s motivation to undertake a task depends on expected reward. Efficient learning will take place when there is strong motivation of learner to learn by the teacher. This motivation may be aroused by either extrinsic or intrinsic stimuli both of which are important in directing and regulating the learner‟s behaviour

towards attainment of the desired goals. Students should therefore be motivated through various ways which may include advising them on career choices, providing the required physical facilities like laboratories and verbal encouragements. This would go a long way in improving the performance in the subject under study.

Obama (2004) asserts that parents have the primary responsibility of instilling an ethic of hard work and educational achievements in their children. He went further to say that if we are to make the investments required to revamp our schools, then we will need to rediscover our faith that every child can learn and none is neither stupid nor impossible but perhaps slow learners. Psacharopoulos and Loxley as cited by Lauglo and Maclean(2005), opined that education should develop moral aesthetic, physical and practical capacities not just cognitive knowledge organized in academic disciplines.

According to Anamuah-Mensah and Apafo (1987), many Senior High School (SHS) students perceive science as a difficult subject. The perceived difficulties associated with integrated science have had adverse effect on the performance and the attitudes of the students towards the subject. A study carried out by Anamuah-Mensah (1992) revealed that students in the first year in Ghanaian senior high schools have difficulties learning science. The study revealed that 66% of the respondents perceived science to be difficult and too abstract to understand. The point is whether it is difficult or not, the subject demands careful thought, creative minds and conscious thinking, which can be achieved by the use of the appropriate instructional methods and materials

It is now well understood that students are nature curious and eventually build upon their own repertoire of concepts in science when given the opportunities to interact freely with

interesting and challenging tasks in science (Anamuah-Mensah, 1992). For effective learning of science, processes of problem- solving skills must be employed. Such problem solving skills involve observation, classification, analysis, experimentation, measurement, inference, and prediction. An important aspect of the transmission of knowledge in schools is through teaching. Teachers are the primary agents of curriculum implementation. Regardless of how explicit the textbook is, or how well arranged the syllabi is, it is the actions of the teacher in the classroom that mostly affect students‟ understanding. Students are taught concepts without them actually understanding the basic principles of the concepts. The use of appropriate hands-on instructional approaches, relevant teaching methods, strategies and techniques in teaching would encourage students‟ active participation in the lessons.

In spite of the numerous efforts and attempts by science teachers to help in the development of concepts, ideas, knowledge and skills in science, students‟ participation during lesson are very

low. The poor performance of students is partly caused by the negative perceptions of students and the approaches used to teach the subject. Many researchers believe that, the use of innovative teaching strategies could be effective for the improvement of pupil‟s achievements and attitudes. It is however believed that, after intervention, students can appreciate and understand science if different strategies are adopted in the teaching and learning process.

Statement of the Problem

Careful analysis of the educational system in World indicates that, there has been inconsistency in the use of appropriate medium of instruction in the classroom (Thornberg, 2007). Although teachers are supposed to adopt and use various methods of imparting knowledge to students during teaching and learning, the demands of the integrated science syllabus make it impossible most of the time. This generates the problem of not using the appropriate methods in the teaching of science

It was observed that students exhibited lukewarm attitude towards their studies during the researcher‟s work at Queen of Peace Senior High School at Nadowli in Upper-west Region of Ghana. Only a few students attempted assignments given to them. In any case, the performance of the few was not good enough, an indication that they either did not research properly, they do not have interest or they did not understand the topic as it was taught. The contribution to lesson and body language further affirm this lukewarm attitude.

Moreover, in a preliminary study by the researcher and some series of observations made during integrated lessons by some permanent and temporary integrated science teachers in Queen of Peace Senior High School, it was noticed that the students had several misconceptions about integrated science. Students perceived integrated science as difficult and boring. This has resulted in lack of interest and low performance in their academic work. A discussion with the Vice Principal, who is also responsible for academic affairs, revealed that, students performed poorly in the external examinations for integrated science. The WASSCE results of the school from 2009 to 2012, also confirmed that over 50% of students presented for the examination failed.

It is the understanding of a concept that determines one‟s behaviour towards its learning. The researcher therefore found it necessary to provide an intervention through the use of techniques that would hopefully influence the attitudes of the students in their approach to the study of integrated science and improve on their performance.

Evidence of the Problem

The main problem identified was the careless attitude of the students during integrated science lessons and towards the study of the subject. An analysis of students‟ performance in the previous academic year also revealed poor performance among Form Two Art two (2A2). About 65% of the 57 students scored below 20% of the total mark in most of the class exercises and class tests that were administered. Out of the 57 students in Form 2A2 class who took the end of term examination, 35 of them representing more than half of the class scored below 50% of the total mark.

Purpose of the Study

The purpose of the study was to use instructional materials in teaching, to help change the students‟ negative perception towards the learning of integrated science. This involved the use of hands-on instructional approaches to improve on the students‟ performance and participation in integrated science and science courses in general at Queen of Peace Senior High School.

Objectives of the Study

The aim of this study was to change the negative perception of Form Two Art Two (2A2) students of Queen of Peace Senior High School of integrated science and to improve on

their performance and attitudes towards the learning of the subject. In order to achieve this goal, this study therefore sought to:

- Use varied hands-on instructional approaches to improve on the performance of second year business students in integrated science
- Improve the understanding of some concepts in integrated science by students, through the use of activity-based methods of teaching.

Research questions

The following questions guided the study

1. To what extent would the use of hands-on instructional approaches lead to meaningful discussions during integrated science lesson?
2. To what extent would the use of hands-on instructional approaches in teaching integrated science influence the students" understanding and improve their performance?

Significance of the study

It is hoped that, the findings in this study would;

- Enable students comprehend and appreciate the study of integrated science in Wa Senior High School.
- Help teachers to be oriented towards effective use of teaching and learning materials during lessons.

- Provide useful insights into the use of instructional materials in the teaching of science at Senior High Schools in Ghana.

- Enable policy makers and curriculum developers to use the findings to help make informed decisions about students‟ perception and strategies in teaching Science that can be employed to address the situation.

Limitations of the study

This research aimed to use hands-on instructional approaches to change the negative perception of students towards the learning of integrated science and to improve their performance in Queen of Peace Senior High School. It was limited to second year students only. This might not reveal the general picture of the students‟ performance in the subject and this puts a limit on the generalization of the findings.

Furthermore, the researcher took into consideration the home environment of the students and the cost involved in the collection of data.

This research work involved students. And it is also a requirement for the award of Masters in Science Education. Thus, the researcher needed to be fast enough to be able to finish it within the academic session of the programme he is pursuing.

Cooperation from students was very poor. Some students were very lazy to use the workbook provided as one of the instructional materials for the research. Also the academic calendar was interrupted several times by co-curricular activities such as sports,

staff meetings and mid-term holidays. These led to postponement of lessons and encouraged absenteeism among the students.

Delimitation

This study involved only Form Two General Art One students (2GA1) of Wa Senior High School because integrated science is a general subject which is taken by all students from the Junior High School level. The other students were excluded.

Organization of the Report

The research report is presented in five chapters. The first chapter presents the introduction to the study, statement of the problem, research objectives and questions, significance of the study as well as limitation and delimitation of the study. Chapter two reviews the relevant literature on the use of instructional methods and materials while chapter three gives a detailed analysis on the area of study and the methodology used in the study. It discusses the population, the sample and sampling techniques, data analysis and tools used in the study. In chapter four, the results, data collection and the data analyses are discussed in addition to the presentation on research questions. Finally, in chapter five, a summary of the major findings, conclusion and recommendations based on the interpretations and discussions of the data collected are presented.

CHAPTER TWO

LITERATURE REVIEW

Overview

This chapter is apportioned with examination of the different methods of teaching used in the classroom. It discusses the importance of the activity based methods and the use of teaching and learning materials. It also examines the attitude of students towards science and the impact group activities have on students.

Teaching Methods

Research on concept acquisition has revealed that children learn by active interaction initially with concrete objects and later with abstract entities. In addition, Piaget has suggested that cognitive development occurs through an active involvement, an interaction of the child with objects and phenomena that leads to cognitive conflicts and subsequently to equilibration or self-regulation (Piaget, 1964). Science as a way of knowing includes a set of unique procedures or processes which are regarded as „standard" or acceptable in generating new knowledge. This science is characterized and differentiated from other ways of knowing by the nature of its knowledge and the procedures by which new knowledge is generated. The importance of using a variety of learning modes in teaching science probably cannot be over emphasized from a psychological point of view. One of the principal causes of students" losing interest in science is the teacher"s use of one method of teaching to the exclusion of all the others. The science teacher should be acquainted with the use of a variety of methods and procedures of teaching science.

According to Atiku (2004), approaches or strategies which one uses to communicate to learners in the teaching and learning processes are referred to as teaching methods. Appropriate styles which one can present a lesson are also referred to as teaching methods or styles.

Teaching methods can otherwise be described as instructional methodology, which includes all special ways through which an instructor imparts or inculcates knowledge in the learner. Such instructional methods may vary from teacher to teacher and from subject to subject. Every instructional method aims at involving the learner in meaningful activities which will result into the successful attainment of learning objectives (Talabi, 2010).

Woods (1995) cited in Erinosho (2009) defined teaching method or style as the manner in which a teacher effectively and efficiently interacts within the classroom environment to bring about quality subject matter among students. According to Woods, there are three teaching methods identified. These are: discipline- centered, teacher-centered, and student-centered methods of teaching.

Discipline-centered method of teaching aims at the subject matter than what the teacher does. Contents of the syllabus or textbook must be covered regardless of what the student absorbs. This method is at times used in our schools as the content must be given to students before they write their final external examinations.

The teacher-centered method of teaching is also known as the „chalk" method of teaching. The teacher acts as an authoritative expert, the main source of knowledge and the centre point of every activity in the teaching and learning process. In this teaching arena,

students are passive and they merely regurgitate content. Teaching is to transmit information and help student to master facts for examination purposes. Teacher-centered methods of teaching include lectures, explanations and illustrations. This allows minimal teacher-student interactions though much information is given to students. The lecture method is mostly effective at the tertiary level of education and during introduction, demonstrations and summary of a lesson at the primary and secondary levels of education.

The learner –centered method is the most effective teaching method for creating a dynamic classroom environment. The prior concern of the teacher is how to engage student in activities so as to develop their own ideas, and share with others through collaborative work. Students are able to develop skills, have cognitive understanding of concepts. Classroom activities, instructional contents and teaching methods are selected to facilitate active learning, critical thinking, stimulate interest and promote positive attitude towards science. The teacher in this situation is a facilitator, hence he or she uses approaches that encourage flexibility and more student engagement. Learner –centered methods of teaching include, questioning, collaborative learning, cooperative learning, discussions and activity- based methods.

Many successful public speakers know that they need to tailor their message to resonate with their audience. Similarly, think about how marketers carefully research their audiences to learn more about the needs of consumers to better position their products. This process raises a series of related questions for college faculty: How well do we know what our students already know, what their interests are, what they want to learn, and what lessons they walk away with from our teaching (Ogle, 1986)?

The best way to learn the answers to these questions is to ask them often. Instructors who use the "K-W-L technique" ask their students to list what they know, what they want to know, and what they learned each class (Ogle, 1986). These data are exceptionally helpful in adjusting the content of lessons to ensure that you meet the needs of the greatest number of students. Other classroom assessment techniques that are easy to use include asking students how the material related to them or their interests, inquiring about what remains confusing, or allowing students to provide feedback to the instructor via clickers (Angelo & Cross, 1993). These methods complement the helpfulness of frequent quizzes and written assignments that regularly monitor students" performance.

Professors who use differentiated instruction (Gregory & Chapman, 2002) give students different options during class time (e.g., students form flexible groups that have complementary tasks centering around the topic of the lesson). Similarly, students have the opportunity to select from a range of options for evaluation (e.g., research paper, oral presentation, applied project, traditional exam). This approach builds on students" strengths and interests in learning science.

According to Dosoo (1996), it is important for teachers to know how students learn; this will enable teachers put what they want to teach in suitable ways for learning to occur easily and also to expose learners to the techniques that make learning easier. According to Mckeachie (1994), all teaching styles can stimulate learning if used appropriately, although the student- centered style leads to better retention, better problem solving, better application of knowledge and a better motivation for learning. Examples of teaching methods use in Ghanaian schools are discussion, discovery activity, lecture, brainstorming, project, demonstration, etc. The fact that learning to "explain ideas in

science" as well as to "evaluate arguments based on scientific evidence" is given little emphasis at all levels suggests that, students may be learning science without understanding of what they learn. It could also mean that science teachers are relying on teaching methods or strategies that are ineffective for promoting understanding of subject. Teaching of science in the basic and secondary schools can be made easy and interesting or difficult and boring depending upon the teacher"s approach towards teaching.

Activity-Based Method

Activity method is described as a marriage between the teacher-centered and the child-centered approaches to teaching and learning. Learning by doing appears to be the best way students learn. The learner has the capacity to learning through personal actions and experience and start developing their ideas about world. They interpret things according to their own thoughts and experiences. Activity based teaching method helps them to construct their knowledge. According to Rillero, 1994 "A child best learns to swim by getting into water; likewise, a child best learns science by doing science". Doing science is not only limited to reading or hearing but it holds students in laboratory work to test ideas and develop understanding (Ewers, 2001). Hence, science-teaching plan is incomplete without science experiences.

In the activity method the teacher explains, describes, demonstrates, distributes teaching aids and gives instructions to students. On the other hand, the students perform the following activities: answering questions orally or in writing, exploring teaching aids,

discussing charts or pictures, drawing and searching for information (Atiku, 2004). Teaching and learning can become more effective and easier when students learn by observing and doing an experiment. It has been explained that activity and experimentations are ideal means of getting students acquire facts, ideas and understanding of concepts (Dewey, 1985).

Dickinson (2003), states that, the understanding of every subject is developed through the engagement of activities. Activities are designed to provide direct experience of something. Activities include practical work, and group presentation.

The teacher, aside what have been said, should be vested in the totality of planning, organizing and counselling, geared towards helping his students and creating a favourable classroom climate, performing assiduously and assessing his/her work constantly. He should be the director of learning, a guide, facilitator, and motivator; full of creativity and innovative ideas. In the classroom, students ought to be doing a great deal more than just listening to the teacher. Maria Montessori (1966) found out that, the use of carefully designed play activities helped students to learn so well that, they actually excelled in public examinations. Students can be asked to design their own experiments as a means of helping them to develop positive attitudes towards the study of science.

Many students with disinterest in science leading to their low performance benefit from learning science through an activity oriented approach that reduces the reliance on textbooks, lectures, knowledge of vocabulary, and pencil and-paper tests (Mastropieri & Scruggs, 1994). This kind of approach seeks to promote learning by providing students with experiences that allow them to discover and experiment with science. Through

discovery and inquiry, teachers involve students in creating and expanding their knowledge and understanding about the content area being studied (Mastropieri & Scruggs, 1995).

When employing an activities-oriented approach, teachers offer students a variety of active educational experiences structured according to a learning cycle. This cycle consists of an instructional sequence that includes engagement, exploration, development, and extension (Guillaume, Yopp, & Yopp, 1996; Gurganus et al., 1995).

Relating science instruction to students' personal experiences and to general societal problems is an essential component of an activities-oriented approach. Relating science to practical, civic, professional, recreational, and cultural events that are familiar and relevant to students' backgrounds and experiences can promote science literacy, motivate students, and help them learn to value science. To aid students in seeing the relevance of science to their lives, teachers can present them with information, issues, and problems that relate to real-life situations and discuss with them the relevance of these problems to their lives and the situations in which this content can be applied. For example, students can investigate socially significant problems such as water supply, weather, pollution, nutrition, and solar energy.

Teachers can make connections between science and students' cultural backgrounds by using learning activities and instructional materials that;

• explore the different cultural origins of science,

• discuss scientific solutions and practices developed and used in all parts of the world,

• highlight the achievements of culturally and linguistically diverse scientists, and

• present a range of culturally diverse practical applications.

Connections to students' lives and cultures also can be established by having students

• conduct problem-solving activities that address community-based problems,

• use artifacts, buildings, geographical sites, museums, and other resources in their community, and

• interview community members.

These experiences will help illustrate and reinforce concepts, issues, phenomena, and events (Fradd & Lee, 1995; Taylor, Gutierrez, Whittaker, & Salend, 1995).

van der Linde (2005) contends that the lack of interest in science could be attributed to other factors including issues of poverty, resources and infrastructure of schools.

Many factors such school environment, past experience, age, teachers‟ personality and teaching style have been found to influence student‟s attitude and interest (Murphy, 1990; Ornstein, 2006).

Class field trips that are directly related to the curriculum can make learning more meaningful and real for students. They can also serve as the basis for developing instructional units. Trips to community and regional science museums and ecological sites can offer direct experiences and authentic tasks related to what students are learning. In addition, many field trips provide hands-on experiences that promote the learning not just of factual information, but also of processes. To help teachers and students benefit

from field trips, many museums provide teacher training programs, model curricula and teaching strategies, special tours, exhibits, and materials for school groups and traveling exhibits that prepare students for and build upon experiences at the museum. Field trips also can be enhanced by giving students a variety of pre-trip learning experiences to prepare them, explaining expectations regarding their behavior on the trip, giving them notepads on which to take notes and make sketches, eliciting and answering questions on the ride to the site, and discussing positive and negative aspects of the trip with them on the ride back to school (Roberts & Kellough, 1996).

In activities-oriented approaches, teachers focus on breadth of understanding rather than a broad coverage of science. Carnine (1995) proposed that educators structure instruction in science according to "big ideas," which he defined as important concepts or principles that help students organize, connect, and apply material so that they see a meaningful relationship between the material to be learned and their own lives.

The science performance of students can also be enhanced when teachers organize instruction around broad-based, common, and interdisciplinary theme concepts (Kataoka & Lock, 1995; Rutherford & Ahlgren, 1990). Interdisciplinary themes can link the various science disciplines (e.g., biology, chemistry, earth science, physics) as well as relate science themes to other subject areas (e.g., English, mathematics, social studies, foreign languages, art, music). For example, for an interdisciplinary thematic unit on weather, students would study the scientific principles undergirding various weather patterns as part of science class and the history of weather and its effects on lifestyles and cultural traditions in social studies class. This will therefore improve student performance not only in science but other subject as well.

In an activities-based approach, teachers often structure learning so that students work in cooperative learning groups (Gurganus et al., 1995). The use of such groups can encourage the establishment of scientific classroom communities where students work in groups to communicate about and experiment with solutions to scientific problems. Cooperatively structured learning lets students formulate and pose questions, share ideas, clarify thoughts, experiment, brainstorm, and present solutions with their classmates. Students can see multiple perspectives and solutions to scientific problems. For example, in a unit about flowers, students can be assigned to work in cooperative groups to design a flower garden for their school. The group can plan their garden by posing questions (What flowers grow best in the available soil and lighting conditions? What flowers and colors go together? What materials will be needed to maintain the garden?) and gathering data to address these questions. The group also can share a drawing of their proposed garden and the reasons that guided their design with the whole class.

Group work is a form of cooperative learning which aims to develop student‟s knowledge, generic skills (e.g. communication skills, collaborative skills, critical thinking skills), attitude and hence increase their performance. The ability to participate effectively in group work or team work is seen as a desirable employability skill and should be considered to be part of every learner‟s educational experience. Group work can be a means of acknowledging and utilizing an individual learner‟s additional strengths and expertise. Skills required for Group Work include; teamwork, communication, problem-solving, time management, negotiation, delegation, and co-operation. These and more will students acquire when involved in group activities. Group activities or work should be done involving learners of different ethnic groups, ability and

interest to solve common problems. According to Talabi (2010), group activities have the advantage of giving weak students the confidence to learn faster from colleagues than from the teacher. Students can be grouped in three ways. These are:

- Grouping students with similar ability; this is where learners are grouped according to their abilities in a particular subject.
- Grouping students with mixed ability; here learners are grouped according to their abilities in a particular subject.
- Interest grouping, which enable teachers to group learners grouped according to interest on the same topic or subject. This group can be changed from time to time.

Dickinson (2003) agreed with the view that, learners deepen and consolidate their understanding through their own performances in the teaching and learning process. As students work to make meaning for others, they make meaning for themselves too. Group work enables students to work as teams hence promote unity and appreciation of one another among them. Students with disinterest for a particular subject develop the interest for it, when they constantly work with others who have the interest for it.

Instructional technology and interactive multimedia provide students with access to learning environments that link text, sound, animation, video, and graphics to present content in a nonlinear and instantaneous fashion that can foster critical thinking skills and social interactions (The Cognition and Technology Group at Vanderbilt Learning Technology Center, 1993). These technologies also can be incorporated throughout the curriculum to adapt instruction to students' learning styles and provide them with experiences that allow them to control their learning. Instructional technology and

interactive multimedia such as computer software, hypertext/hypermedia, computer simulations, videocassettes, videodiscs, captioned television, liquid crystal display (LCD) computer projection panels, CD-ROM, virtual reality, and the the Internet can be used to introduce, review, and apply science concepts and have students experience events, places, and phenomena (Trowbridge & Bybee, 1996). For example, through virtual reality systems, students can experience Newton's law of gravity firsthand or through multimedia applications, they can perform complicated scientific experiments such as studying chemical reactions. In addition to providing students with an opportunity to obtain information about and interact with unique aspects of science, these instructional delivery systems can motivate them and stimulate their curiosity.

The Internet holds great promise as an instructional tool because it provides educators and students with access to the information superhighway and a variety of exploratory and discovery based learning and communication experiences (Peha, 1995). The Internet also can offer students greater control over the curriculum because it provides them with many choices related to what and how they learn. Specifically, students can learn science by having access to information, educational resources, pictorials, databases, problem-solving experiences, and communications with other students and professionals from throughout the world. For example, the National Geographic Society and the Technical Education Research Center sponsor the Kids Network, an international telecommunications-based curriculum to teach science and geography to elementary and middle school students (Bradsher & Hagan, 1995). Students work in small groups to pose questions concerning socially significant problems, conduct experiments, and collect and analyze data related to their questions. Through the network, students exchange

information and share their findings with peers worldwide. Listings and descriptions of computer networking resources for educators and students are available and can be obtained by contacting professional organizations, state education departments, and computer-based companies.

According to McDermott (1996), more competent teacher, who might be able to adopt lecture method, cannot be expected to follow the activity based instruction so rapidly. In reality, teacher‟s uncertainty, lack of resources, material management problems, discomfort, lack of time, limited backgrounds with experiential approaches to science teaching and dependency on textbooks are the causes of using hands-on/minds on activities oftenly than lecture and discussion (Lebuffe, 1994; Morey, 1990; Tilgner, 1990).

Activity-based learning (ABL) based on verity of activity based teaching methods. The prerequisite for this learning should be based on doing experiments or activities. If learner is provided the opportunity to think and solve the problems on their own, then the learning becomes long lasting. The important features of the activity-based teaching are that it is learner centered and it encourages self-learning. It also allows the learner to study according to his / her own ability and skills.

The use of Teaching and Learning Materials

Materials that are used to aid in the transference of information from one person to another are referred to as instructional materials or learning or teaching aids. Teaching materials (aids) may be described as the materials used in teaching for illustrative purpose. Its ultimate goal is to facilitate and demonstrate an understanding of a lesson.

Teaching and learning materials are also defined to include materials which can be seen or heard and contribute to the teaching and learning process. Learning is done through the use of the five senses. Any medium which gives learners the opportunity to use as many senses as possible is the best medium in learning (Atiku 2004).

According to Talabi (2010) there are some specific values for which teaching and learning materials should be involved in the teaching of integrated science in order to change students‟ perception towards the subject. He further stated that teaching and learning materials (TLM‟s) help to clarify and illustrate concepts, thus making abstract ideas more concrete. A good picture can illustrate the meaning of thousands of words.

Education is a fundamental human right (Wolfenson, 2000). The key to sustainable development, peace and stability within and among countries is the provision of education to the populace of such countries. Availability of teaching/learning resources enhances the effectiveness of schools as these are basic things that can bring about good academic performance in the students. Maicibi (2003) opined that all institutions or organization are made up of human beings (workers) and other non-human resources. He further asserts that when the right quantity and quality of human resources is brought together, it can manipulate other resources towards realizing institutional goals and objectives. Consequently, every institution should strive to attract and retain the best of human resource. The implication of these opinions is that well trained teachers in mathematics if well deployed to the secondary schools will bring about well rounded students who will perform academically well in integrated science.

Coombs (1995) is of the view that the failure or poor performance of some students in integrated science is as a result of lack of concrete teaching and learning materials in the integrated science lessons. He remarks that, no subject is taught in isolation and that, carefully selected teaching materials will link up with other subject areas, and show the relevance of the subject being taught to a much wider picture. Students who do not like, or are not particularly good, at a subject may respond with more interest and enthusiasm when the relevance of what they are being taught is brought to bear on them. The use of TLMs aid in the retention of factual knowledge. It brings variety, curiosity, and interest among learners which reinforce their interaction with the learning experience. Human minds approaches learning situation in practical terms. Confucius (551- 479 BC) said that learners learn best by doing thus he came out with a preamble: - "I hear, I forget; I see, I remember; I do, I understand" (Modgil & Modgil, 1985).

The use of teaching and learning materials in the teaching and learning process attract students" attention and arouse their interest in what is being taught, making understanding and remembering of concepts easy. No matter how well the lessons are prepared and delivered, the students soon become tired of having nothing to attend to or interest them except the teacher and themselves. TLMs make a refreshing change by keeping both the teacher and student busy. TLMs also create interest and save the teacher the trouble of explaining at length and also encouraging student to find out more on their own and thereby stimulating self-learning. They can effectively show the interrelationships among a complex whole. For example, a diagram showing parts of the excretory system of a mammal can be well made to show the interrelationship between the component parts, thus making it seem less complex to benefit both the teacher and the students.

Finally, one of the best ways to understand something is to get one‟s hand on it and actually experiment with it. Dickinson (2003) collaborates with the view that learners should be engaged in group activities during Integrated Science lessons, and the use of TLMs encourages group work amongst students, instilling positive attitudes in students can be achieved by giving students more opportunities to explore and to develop their creative skills through group activities.

Teachers must help students to develop high self-awareness, positive belief, learning goals, and positive expectations for success since these are the ingredients of intrinsic motivation of learning (Trowbridge, Bybee, & Powell (2004). The use of teaching and learning materials goes a long way in helping students develop interest towards the study of science.

CHAPTER THREE

METHODOLOGY

Overview

This chapter discusses the research design, population, the sample size, research instruments and the procedures which were adopted to effectively address the problems of negative perception and low performance of students. It includes pre-intervention activities, intervention design and implementation and the post- intervention activities. The chapter also examines the validity and reliability of the instruments and the methods of data analysis.

Research Design

The study was an action research employing the case study method. Mills (2003), cited in Avoke (2005) explained action research as any systematic inquiry conducted by teacher researchers to gather information about the ways that their particular schools operate, how they teach and how their students learn. It involved the diagnosis of a specific academic problem in a classroom situation. This design was therefore chosen because of it holistic and in- depth investigative approach, as it enabled more meaningful study into the problem of negative perception which caused low performance among some of the students of Queen of Peace Senior High School. It also provided the flexibility of developing an intervention in a sequential order within the context of the problem.

Population

The research was conducted in Queen of Peace Senior High School in the Nadowli-Kaleo District of the Upper West Region of Ghana. Queen of Peace Senior High School is a Catholic school located in Nadowli, which is one of the District capital of the Upper West Region.

Queen of Peace Senior High School offers four (4) different programmes namely, General Science, General Arts, Business and Home Economics. The population of the school at the time of the research comprised forty-six (46) teaching staff with three (3) interns and forty (40) non-teaching staff with a student population of eight hundred and twelve (812). Table 0 shows the breakdown of the student population in the school.

Table 0

Student Population in Queen of Peace Senior High School

FORM	TOTAL NUMBER OF CLASSES	BOYS	GIRLS	TOTAL
ONE	1	110	130	240
TWO	7	130	215	345
THREE	5	117	110	227
TOTAL	13	357	455	812

All the 812 students offer integrated science since it is a compulsory subject.

Sample and Sampling Technique

For the purpose of the study, Form Two Art 2 (2A2) students were selected in addition to one of the biology tutors, and the Vice Principal (Academic), as the research subjects. Form 2A2 students have a total number of 53 comprising of 15 girls and 38 boys. Sampling of students was done purposively. All students were selected because the intervention was initiated during the normal teaching periods.

Research instruments

These are testing devices for measuring a given phenomenon, such as paper and pencil test, a questionnaire, an interview, a research tool, or a set of guidelines for observation (Mosby‟s Medical Dictionary, 2009).

Observation, interview schedules, questionnaires and tests were the instruments used to gather data for the study.

Observation

Observation is a non- test technique which involves an action or process of closely observing or monitoring, or a comment based on something one has seen, heard or noticed (Eshun & Effrim, 2009). Students were observed during integrated science lessons as observation deals with an overt behaviour which can be seen and studied as students repeat it over a period of time.

Oral Interview

Interview is a conversation where questions are asked and answers are given. In common parlance, the word “interview” refers to one-on-one conversation with one person acting

in the role of the *interviewer* and the other in the role of the *interviewee*. The interviewer asks questions, the interviewee responds, with participants taking turns talking. (Kvale & Brinkman, 2008).

Three separate semi-structured interviews were conducted- one with the Vice Principal (Academics), one with the biology teacher, and the other with the students. The Vice Principal and the teacher were interviewed to find out the level of the student‟s performance towards the study of science. Interview was also employed to find out factors that contribute to the problems students face in the learning of integrated science. Thirty (30) students selected at random were interviewed one after the other, about their perception and attitudes during integrated science lessons.

Questionnaire

A questionnaire is a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Although they are often designed for statistical analysis of the responses, this is not always the case. Questionnaires can be used to examine the general characteristics of a population, to compare attitudes of different groups, and to test theories (Foddy, I994).

It was important to find out from the student‟s performance towards science and the approaches used in the teaching and learning of the subject. The questionnaire had ten structured items. This was used to solicit clear, unequivocal responses and to code responses quickly. The questionnaire was designed and distributed in such a way that the identification of the respondents was not disclosed to ensure their full cooperation and sincere responses. Form Two Business one student was chosen to respond to the

questionnaire before and during intervention. A sample of the questionnaire is presented in Appendix B.

Tests

Two test items, pre-intervention and post-intervention were conducted. The two tests were of the same difficulty level as they required similar skills to execute them. Both tests were criterion-referenced test. With the criterion-referenced test, scores of a student are not compared to those of other students but rather requires the student to fulfil a given set of criteria or a pre-established standard (Eshun & Effrim, 2009). This type of test was chosen to find out exactly what a student has learnt, i.e. what a student can and cannot do as an individual. The pre- intervention test was administered in the eighth week of the first term.

The post-intervention test was conducted after the intervention activities were implemented; this was in the sixth week of the second term. This was to find out the effectiveness of the intervention. The same items were repeated but with different numbers assigned. The test was made up of two parts; the first part asked for introductory information about the student‟s personal data such as number (i.e. students were given identification numbers for the purpose of the study instead of names to ensure confidentiality), class and date; and the second part consisted of five multiple-choice items and section B. Each multiple-choice item had a stem with four options: one correct answer and three possible distracters. The pass marks of all the tests were 15 out of 20 representing 60% of the total marks. The marks scored by students were recorded after both tests.

Data Collection

The researcher with the assistance of one of the biology teachers administered fifty-seven (57) questionnaires to students of form two General Art two class. The researcher took time to explain the items to students for the purpose of clarity to minimize ambiguity with regard to their responses. Students were assured of the anonymity and confidentiality of their responses, and therefore, students were asked not to write their names on the questionnaire but to write the identification numbers that were given to them. The questionnaire lasted for 40 minutes and was collected back. The biology teacher and the Vice Principal (Academics) were engaged in semi-structured interviews. Diary notes were taken to cover additional behaviours raised by students during classroom observations and interviews.

Pre- Intervention Activities

These included observations and interviews, response to questionnaire by students and a test conducted to find out the contributing factors to the negative perception and disinterest of Form 2A2 students towards the learning of integrated science in Queen of Peace Senior High School. The observations and analysis of Form 2A2 students‟ first term‟s class exercises, class tests and the end of term examination scripts revealed poor performance among these students. The students were engaged in an informal interview at the end of the first term to find out their impressions and difficulties about integrated science as a subject. This was done to identify the reality of the problem and how the students could be helped to overcome it. The test conducted was a pre-intervention criterion reference. The items used for the pre-test are presented in Appendix B.

Findings from the pre-intervention activities encouraged the design and implementation of interventions to help improve the performance of Form Two Art two (2A2) students in integrated science through the use of hand-on instructional approaches.

Intervention

This deals with action taken to address the problems of lack of interest and low performance of students in the teaching and learning of integrated science. It talks about the intervention design, equipment and materials used and the implementation of the intervention.

Intervention Design for the Study

The findings from the pre-intervention activities resulted from the following intervention strategies which were adopted to help change the negative perception of Form Two Art two (2A2) students. The interventions used were:

Using activity-based methods of teaching to improve on the performance of Form Two Art Two (2A2) students in integrated science.

The use of hands-on instructional approach in teaching to help students develop positive attitudes towards the study of integrated science.

The use of group activities to generate and sustain the interest of students in the study of integrated science.

Organizing recurrent Problem-Solving exercises and effective assessment of students work to keep them in tune with their performance.

Implementation of the Intervention Activities

Hands-on instructional approaches were the main teaching strategies used and the topics; reproductions in flowering plants, soil conservation, and respiration in plants and mammals were the main topics treated during the intervention to change the negative perception of students in order to help them understand, develop interest in integrated science and also perform marvelously in the subject. Hands-on instructional approach involves the use of teaching and learning materials (TLMs), group work or activities, presentation and practical works. TLMs used included diagrams, picture illustrations, models and concrete materials to clearly convey meaning in a way that look real. The materials were able to help demonstrate and better explain ideas and concepts which baffled the minds of the students. These were to help develop a positive attitude towards integrated science hence changed their opinion about the subject.

Group work or activity was used during the integrated science lessons. Students of different levels of learning ability were put in groups of two or more. They performed activities to find out things for themselves and for others. This helped them to share ideas through discussions for their own understanding. In this process, facilitating of activities offered guidance and the assistance to the various groups. Comments, opinions and views which were brought forth by their own colleagues were discussed.

Sometimes students were taken out of their classroom to the science laboratory or field trips to explore ideas for their own understanding. Seven practical activities were

conducted in which students were always involved. This ensured maximum participation by all students. They were given guide sheets containing instructions on how to carry out activities during practical or field lessons. Before the practical activities started, students had lessons on identification and use of laboratory equipment/apparatus.

Students were given topics to write short notes on. Students were called in turns by random sampling to the chalkboard to explain their findings, lead discussions, and also assist the group in finding solutions to the various problems or difficult concepts that they could not grasp. This was to help them access information on their own, and also explain the notes to the class with confidence during presentation.

The performance of Form Two Art two students in integrated science, improved when they were made to try their hands on many exercises in the textbooks and practical workbooks either in groups or individually in the form of projects, exercises or class tests. Students were given either class exercises or assignments after every lesson. Furthermore, class tests and project works were organized for them on regular basis within a given interval. These projects, exercises, assignments and class tests were marked on time with the provision of vital remarks so that students could witness their progress and appreciate suitable remedial lessons when necessary.

Marking schemes for various tests, exercises, projects, etc were constantly discussed with students to prepare them to answer examination questions.3

Post -Intervention Activities

After three weeks of intervention implementation, students were given the same questionnaire used during pre-intervention for their responses. This was done to compare

behaviours of Form Two Art two students after the intervention period. One week after the administration of the questionnaire, a post intervention test of the same standard as the pre intervention test (see Appendix B) which also lasted for 40 minutes was administered to students. This was done to compare the performance of the students before and after the intervention period to measure the efficiency of the intervention procedures. Two weeks after the test and communicating results to students, 15 students selected at random were interviewed to uncover their views and experiences about the intervention design implemented in their class.

Validity of the Main Research Instrument

The questionnaire underwent validation analysis. This was achieved by giving the instrument to colleagues to read through and offer their suggestions. Also the questionnaire was vetted by lecturers who had done in-depth research work in science education. Items in the entire questionnaire were similar for all the respondents and this enabled the researcher to cross-check some of the answers given.

Reliability of the Main Research Instrument

The reliability of the questionnaire was determined by carrying out a pilot testing, in Form two Art two (2A2) class. Fifty-seven students as well as two integrated science teachers were sample and use for the pilot-testing. Items in the questionnaire for the science were similar to those in the student‟s questionnaire. This was done to enable the researcher cross-check some of the answers given by the teachers and students alike.

Method of Data Analysis

Qualitative and quantitative methods of data analysis were used. The data from the questionnaire and tests were analyzed quantitatively whilst the data from the observation and interview sessions were analyzed qualitatively. The results obtained from the study were analyzed in two (2) phases.

Means, frequencies and percentages were used in the first phase to analyze the test scores (i.e. pre- intervention test and post- intervention test) and questionnaires On the other hand, qualitative analysis was done to find out students views and perceptions concerning the effectiveness of the intervention implemented. The interviews were audio-taped, transcribed, analyzed and noted after each interview session. In chapter four, details of analysis and findings of the study are given.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

Overview

This chapter discusses and analyzes the questionnaire, pre-test and post-test scores to determine whether there has been a significant difference in the performance of the students after the intervention. There is a presentation on the research questions that guided the study.

Analysis of Pre- Intervention Data

Observation

Observations before implementation of the intervention revealed that Form 2A2 students perceived integrated science as difficult and boring. Observation of students exposed their negative attitudes and lack of interest in the study of integrated science. It was noticed that, most students felt reluctant to answer questions in class as they were not ready for the lessons. Others had no interest in writing notes and doing class exercises. Although few students actively participated in the lessons others read books of their interest during integrated science lessons. Based on these behaviours of the students, it was deemed useful to initiate an interview to unveil their causes.

Interview

Pre-intervention interviews with the Vice Principal (Academics) and the biology tutor

The subjects above confirmed that, Form Two Art two (2A2) students in Queen of Peace Senior High School performed poorly in integrated science. The teacher mentioned that Form 2A2 students, regardless of their reading perceive science as boring and difficult to comprehend. A discussion with the vice principal, Academics, also revealed that, General Art students in Queen of Peace Senior High School generally performed poorly in both internal and external examinations for integrated science.

Students‟ Responses from the Interview Schedule

Students‟ interview provided the means for the modification of views depending on the responses to meet the desired goals. It also helped getting more information from the students. During interview sections, majority of the students complained that, they did not understand what was being taught in class. Some also said that, they have no interest in the subject as it is full of theories. Others complained that test books for integrated science were boring and difficult to read on their own before coming to class. Others also said, the teaching of the subject was abstract as they want to be involved in the process.

Questionnaire

Questionnaire administered to Form 2A2 students at the pre- intervention stage was used to find out their attitudes towards the study of integrated science. Based on their responses it was revealed, that most of these students perceived integrated science as boring and difficult. Table 1 shows their responses and percentages related to each item in the questionnaire.

Table: 1

Pre- Intervention Response to „YES" or „NO" Questionnaire

Item number	Area	Number of Reponses				Number of respondents
		YES	%	NO	%	
1	Were you taught integrated science in JHS?	57	100	___	___	57
2	Is science a difficult subject?	39	68.4	18	31.6	57
3	Do you like studying integrated science?	7	12.3	40	70.2	57
4	Do you read other books in integrated science class?	23	40.4	34	59.6	57
5	Does the teacher organize activities for you?	__	__	38	66.7	38
6	Does the teacher use teaching and learning materials in teaching (TLMs)?	20	35.1	37	64.9	57
7	Do you pay attention in integrated science class because a lot of TLMs are	15	26.3	42	73.7	57

	used?					
8	Has the use of TLMs sustained your interest in integrated science?	__	___	57	100	57
9	Does the teacher involve the class in the teaching process?	11	19.3	46	80.7	57
10	Are you grouped to perform various tasks during science lessons?	___	0	57	100	57

From Table 1 above, it can be deduced that, student had no interest in the study of integrated science as they perceive the subject to be difficult and boring. It can also be deduced that, students mere neither engaged in activities nor group work or project.

Pre-intervention test

The scores of the students during pre- intervention test have been analysed. Table 2 shows distribution of marks obtained by Form two Art two students of Queen of Peace Senior High School during the pre-intervention test.

Table 2

Grouped frequency distribution of marks for the pre-intervention test

Scores	Number of students(f)	Class mid-point(x)	Fx	Percentage score (%)
0-2	5	1	5	8.8
3-5	13	4	52	22.8
6-8	17	7	119	29.8
9-11	8	10	80	14.0
12-14	9	13	117	15.8
15-17	3	16	32	5.3
18-20	2	19	38	3.5
	f =57		fx=443	100

Mean (x) $= \frac{fx}{f} = \frac{443}{57} = 7.77 = 7.8$

Statistical analysis of Table: 2 above shows that 35 students, representing 61% of the total number of students scored below 10 out of 20 marks. 22 students, representing 38.5% scored half and above the total possible mark. The table 1 indicates that, out of 57 students who took the test only 5 students representing 8.7% scored the pass mark (15) and above. Again, the modal class is 6-8 and a mean score of 7.8 shows that the performance of the students in the pre-intervention was generally poor.

Analysis of the Post-intervention data

Observation

After implementation of intervention procedures, Form Two Art two (2A2) students‟ interest towards the study of integrated science improved tremendously as observed. Students were mostly punctual to class and prepared for lessons, and actively involved in the teaching and learning of the subject. It was also noticed that, students developed keen interest in the study of the subject hence performed well in the post intervention test.

Interview

Post-intervention interviews with the Vice Principal (Academics) and the Biology tutor

The two subjects above agreed that Form Two Art Two (2A2) students showed positive attitude towards the study of integrated science. Students were also seen creating teaching and learning materials (TLMs) from the environment either to be used by the teacher or to add to what they had in their group projects works. Methods of teaching were different and involved students, this led to better understanding of concepts hence improved on their performance than the lecture method which covers wide range of topics but yields poor result. It was agreed that using hands-on instructional approach of teaching had great influence on students‟ performance; it generates curiosity, positive perception and sustains the interest of learners.

Students‟ Responses from Interview Schedule

Students selected for the post intervention interview confessed that the designed was effective as they have developed interest in the study of the subject. Students disclosed that activities and project works given were useful since it enables them to discover

things for themselves. They agreed that, teaching of the subject using a variety of methods that require students‟ participation would help develop and sustain their interest in learning the subject. Students also said they were comfortable, less tensed to learn from their colleagues; hence grouping of students is a good way of learning integrated science. Students also revealed that, class exercises after every lesson enabled them to assess their learning outcomes.

Questionnaire

After implementation of intervention design, the same questionnaire administered at the pre intervention stage was given to Form 2A2 students for responses. This was done to find out their interest for the subject and performance in the subject. Students‟ responses at this stage were positive and very encouraging.

Table 3

Post- Intervention Response to „YES" or „NO" Questionnaire

ITEMS	RESPONSE (YES)		RESPONSE (NO)		TOTAL NO. OF RESPONDENTS
	NO.	%	NO.	%	
1.	57	100	0	0	57
2.	11	19.3	46	80.7	57
3.	7	12.3	50	87.3	57
4.	0	0	100	100	57
5.	57	100	0	0	57
6.	57	100	0	0	57
7.	57	100	0	0	57
8.	57	100	0	0	57
9.	57	100	0	0	57
10.	57	100	0	0	57

All items with the exception of 2, 3 and 4 in Table 3 had 100% „Yes". Item 4 was 100%, „No" which revealed that, Form 2A2 students do not read other books during integrated science lessons. Item 2 had 46 students responding No, meaning out 57 students in the

class, only 11 representing 19.3% perceive integrated science as difficult. Item 3 revealed that 7 students representing 12.3% do not like studying integrated science.

Careful analysis of students‟ response from the questionnaire reveals that, Form 2A2 students of Queen of Peace Senior High School have their interest in integrated science being aroused and sustained.

Post- Intervention Test

Marks obtained by students during post- intervention test have been analysed. Table 4 shows distribution of marks obtained by Form Two Art students of Queen of Peace Senior High School during the post-intervention test.

Table 4

Grouped frequency distribution of marks for the post-intervention

Scores	Number of students(f)	Class mid-point(x)	Fx	Percentage scores (%)
0-2	0	1	0	0.0
3-5	2	4	8	3.5
6-8	7	7	49	12.3
9-11	13	10	130	22.8
12-14	6	13	78	10.5
15-17	18	16	288	31.6
18-20	11	19	209	19.3
Total:	f =57		fx=762	100

Mean (x) = $\frac{fx}{f} = \frac{762}{57} = 13.37 = 13.4$

From Table: 4 above, the mean score is 13.37 and the modal class is 15-17. Out of the 57 students who took the test, 29 students representing 50.88% scored greater than or equal to the pass mark of 15. This indicates that the performance of students in the post-test has generally improved.

Comparison of Pre-Intervention and the Post-Intervention Test Results

The purpose of the Post- intervention was to verify the effectiveness of the intervention on students. Table 4 below shows a comparison between the pre intervention test analysis and the post intervention test analysis.

Table 5

Comparison of Pre-intervention and Post-intervention test results

	Pre-intervention	Post-intervention
Mean	7.77	13.37
Percentage (%)	8.7	50.88
Modal class	6-8	15-17

The percentage of students who performed well in the pre-intervention test by scoring 15 and above is 8.7% and those who did well by scoring the pass mark and above in the post-intervention test represents 50.88%. This shows that there has been a tremendous change in Form 2A2 students" performance in integrated science.

Comparing the mean score of the pre-test (7.77) to that of the post-test (13.37), shows that there has been a significant increase of (5.6), hence the performance of students in learning and understanding aspects of integrated science has improved.

Discussion of the Results

The results analysed indicate that the performance of Form Two Art Two (2A2) students of Queen of Peace Senior High School in integrated science has improved hence there is change of attitudes toward the study of the subject. This is reflected in their performance in the post- intervention test. Even though only 29 students scored the pass mark and above, the improvement was substantial, since the mean score of the post-test (13.37) is greater than that of the pre-test (7.77).

In particular, for the teaching of biology, students need to explore the environment to arouse their interest, develop positive attitudes toward the subject and other related science courses. Teaching should involve the use of instructional methods (activity-based) and instructional materials (teaching and learning materials) to help arouse and sustain the interest of the students.

Presentation of the Analysed Data by Research Questions

Research question 1: To what extent would the use of hands-on instructional approaches lead to meaningful discussions during integrated science lessons?

TLMs were used during the teaching and learning process to arouse the curiosity, and to sustain the interest of the learners. The TLMs influenced discussions meaningfully as abstract ideas were made concrete. The students developed keen interest in the materials and began to question the teacher based on their previous ideas and opinions. In teaching the respiratory system of humans, a lot of TLMs in addition to models were used for the explanation of concepts. Students were given group work to prepare TLMs on the topic

before discussion in class. This enabled them to prepare before coming to class, hence they were actively involved in the teaching and learning process.

The researcher found out that students show much interest when they interact with teaching and learning materials than when they are not working with them.

This study also observed that students of different age groups perform better when they are taught with instructional materials. Instructional materials stimulate the various senses of the body. And thus, help students to learn better.

Research question 2: To what extent would the use of hands-on instructional approaches in teaching integrated science influence the students‟ understanding and improve their performance?

Dickinson (2003) believed that, the understanding of every subject is developed through the engagement of the learners in activities. Group activities, the use of TLMs and other forms of activities influence students‟ interest. Students were highly motivated to learn the subject. This was evident from their questions and answers. A variety of instructional methods coupled with positive reinforcement is an important approach in influencing students to study integrated science. The use of the activity method of teaching during the intervention helped to improve the performance of the Form Two Art (2A2) students in integrated science (refer to Table 4, which shows a comparison between students‟ performance before and after the intervention).

The researcher found out that students are able understand some concept in science much easier when they interact with their peers in their own environment. Also, their understanding of certain concept in science is developed through their engagement with

their own colleagues since they feel much comfortable interacting with themselves than with a teacher.

It therefore obvious from the findings of this study that there is statistical significant difference in the educational performance of students when they are taught with hands-on instructional approach than when they are not taught with them.

CHAPTER FIVE

SUMMARY, CONCLUSION, RECOMMENDATIONS AND SUGGESTIONS

Overview

This chapter gives the summary of the findings and conclusion to the study. It also includes the recommendations and suggestions on the problem of the study for any further research.

The Main Findings of the Study are as follows:

1. The performance of Form Two Art Two (2A2) students of Queen of Peace Senior High School improved exceedingly when varying teaching methods, timely marking of students exercises and effective remedial lessons were conducted.
2. The understanding of the students increased greatly when they engaged in practical activities.
3. Enhanced participation and performance in science were noticeable when the students were grouped to perform activities and projects. This technique enabled the students to express themselves unreservedly, share ideas, develop the spirit of team work and also learned from one another. Students developed self - confidence and freely expressed their opinions during lessons.
4. The use of varied teaching methods such as demonstrations, practical activities, peer tutoring, discussions etc, made lessons interesting. This improved the students‟ performance in integrated science.

Conclusion

The purpose of the research was to change the negative perception and improve the performance of S.H.S students in aspects of integrated science using hands-on instructional approaches.

The performance and interest of students in integrated science can be greatly improved by involving them in teaching and learning process through the use of TLMs and activities. Interventions reveal that students learn better when they are involved in the teaching and learning process. They can also be put into groups to perform activities and discuss findings among themselves. These techniques would help arouse and hopefully sustain their interest in integrated science.

Although few students of Form 2A2 still perceive integrated science as difficult and boring, it hoped that constant implementation of appropriate interventions would gradually help them develop positive attitudes towards the study of the subject.

Recommendations

Based on the findings of this study, the following recommendations are made so that timely measures are adopted to ensure efficient teaching and learning of integrated science in our schools and to promote science education in the country.

- Students should actively participate in science activities to enhance their understanding of the subject. One‟s opinion and perception have a great effect on our ways of understanding and doing things, hence students are encouraged to be positive about life to enable them succeed in their endeavours

- Students should be encouraged under the effective guidance of the teacher to explore new learning strategies that can go a long way to improve their interest in science learning. The teacher should also avoid the use of abusive language and scolding of students in class, so as to build good and positive students-teacher relation.
- Integrated science teachers must use different methods of teaching so as to make the learning easier, attractive and interesting to students and this would go a long way to arouse and sustain their interest in the subject.
- Teaching methods used in the teaching of integrated science should be flexible enough to accommodate diversity among the students. Appropriate teaching and learning materials should be used when teaching science. Grouping students making use of mixed ability groups should be encouraged to build positive student-student relation.

Suggestions for Further Research

This study focused on the use of hands-on instructional approaches to arouse and sustain the interest of S.H.S students in aspects of integrated science in Queen of Peace Senior High School in order to help improve their performance. However, further research could do to solve this problem by using different approaches such as;

- Peer-tutoring techniques, integrating ICT, inquiry and demonstration methods of teaching.
- It is also suggested that the study be carried out in other schools to uncover other causes of the negative perceptions of students of integrated science.

- The study may be replicated in other schools using larger samples than that used in this study.
- Changes in students‟ perceptions of integrated science could also be determined in identical settings elsewhere.

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APPENDIX A

Pre-intervention activities

Observational guide

1. Are students ready for integrated science lessons?
2. Are students fully involved throughout the lesson?
3. How do students answer questions in class?
4. How do students behave during lessons?
5. Are students punctual to integrated science classes?

Interview guide

Semi-structured interview schedule for Vice Principal (Academics) and a biology tutor

1. Please tell me a little, about yourself and the subject you teach.
2. What was your area of specialization at the university?
3. What group of students perform poorly in the WASSCE examinations?
4. What are the causes of the poor performance?
5. How can it be improved?
6. Do you think the use of different methods of teaching, would help improve the performance of these students?

Semi-structured interview scheduled for students

1. What is your name?

2. How old are you?
3. What are your favourite subject(s) and why?
4. Do you like integrated science and other science subjects?
5. Do you like the way science teachers teach integrated science and why?
6. How many class exercises, class test, and project do you do in a week?
7. Do your science teachers use activities in teaching?
8. What are the interest of Art students towards integrated science and it related courses?
9. What changes would you like to have in your integrated science lessons?

APPENDIX B

Questionnaire for General Art students in Queen of Peace Senior High School

This questionnaire is strictly for academic purposes. Please do not write your name on the questionnaire. The purpose of this study is to change the negative perception of students towards the study of integrated science. Please give candid answers to the questions. Thank you for your cooperation.

Section A

Data of students

Please tick (√) your preferred answer

Sex: Male [ ] Female [ ]

Age: 12 – 14 [ ] 15 – 17 [ ] 18 and above [ ]

Section B

Attitude towards Integrated Science

Please answer the following questions by ticking the appropriate option.

1. Were you taught integrated science at JHS?

Yes [ ] No [ ]

2. Is integrated science a difficult subject?

Yes [ ] No [ ]

3. Do you like studying integrated science?

Yes [ ] No [ ]

4. Do you read other books in integrated science class?

Yes [ ] No [ ]

5. Does the teacher organize activities for you?

Yes [ ] No [ ]

6. Does the teacher use teaching learning materials (TLMs) in teaching?

Yes [ ] No [ ]

7. Do you pay attention in integrated science class because a lot of TLMs are used?

Yes [ ] No [ ]

8. Has the use of teaching learning materials sustained your interest in integrated science?

Yes [ ] No [ ]

9. Does the teacher involve the class in the teaching process?

Yes [ ] No [ ]

10. Are you grouped to perform various tasks during integrated science lessons?

Yes [ ] No [ ]

APPENDIX C

Pre intervention test on some selected topics in Integrated Science (Biological Science)

Number: ..... Class: ..... Date: .....Time: 40minutes

Instructions: This test consists of two parts; section A (multiple choice) and section B. (essay type) Answer all questions on this paper.

SECTION A

1. The following are all practical measures to maintain and improve soil fertility except,
    a. crop rotation
    b. mulching
    c. mixed farming
    d. deforestation
2. Which of the following is a major nutrient?
    a. boron
    b. manganese
    c. fluorine
    d. magnesium
3. Applying fertilizers by spraying on the leaves of the plant is called:
    a. ring method
    b. foliar method
    c. shooting

d. shaking method

4. During inhalation, the ……

   a. external intercostal muscles contract

   b. external intercostal muscles relax

   c. internal intercostal muscles contract

   d. diaphragm relaxes and assumes dome-shape

5. How many types of respiration do we have?

   a. one

   b. two

   c. three

   d. four

SECTION B

Show all workings on this sheet. Credit will be given for correct and clarity of responses to questions.

6. What is soil conservation? [2marks]

.....

.....

.....

.....

.....

.....

.....

7. Name three organisms that help in the production of organic matter in the soil. [3marks]

.....

.....

.....

.....

.....

.....

.....

.....

8. Briefly define the term Respiration. [2marks]

.....

.....

.....

.....

9. Give four importance of respiration. [4marks]

……

……..

……

……

……

……

……

……

10. (a) What is a fertile soil? [2marks]

.....

.....

.....

.....

(b)State two methods of maintaining soil fertility. [2marks]

.....

.....

.....

.....

APPENDIX D

Post-Intervention Interview Items

Semi-structured interview schedule for the Vice Principal (Academics) and a biology tutor

1. What is the interest of the second year Art students this second term in relation to first term towards the study of integrated science?
2. What is their performance of this second term compared to the first term?
3. Do you agree to the assertion that using diverse methods of teaching and engaging students in activities would improve the performance of students in integrated science, especially Art students?
4. What recommendation(s) would you give to teachers who teach science at the various levels of education?

Semi-structured interview schedule for students

1. What are some of the importance of integrated science?
2. What are your opinions about integrated science this second term, is it interesting/boring/easy/difficult?
3. Do you think the use of activities and projects would help sustain your interest in integrated science?
4. Do you think learning from your peers would help improve your participation and performance in integrated science?

APPENDIX E

A sample of students exercises for post intervention test

Class Test

1a. A group of petals are known as …….

b. List the parts of the carpel

c. State two adaptations for each; i. cross pollination ii. Self-pollination

2.a. Give the class and an example for each class for the types of fruits below

i. Dry dehiscent ii. Dry indehiscent iii. Succulent

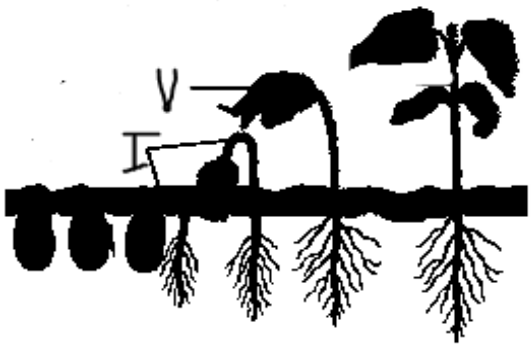
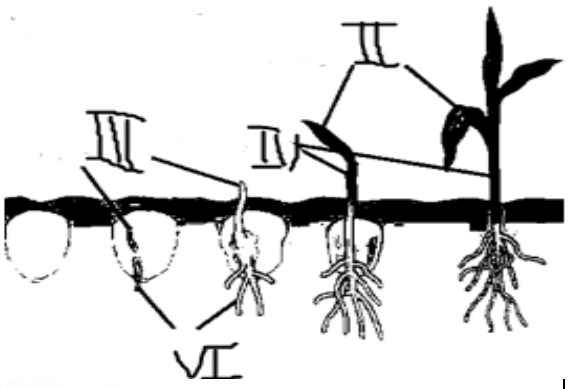
3.a) State three differences between Anemophily and Entomophily

b) Distinguish between a fruit and a seed

c) Give an example of plant propagated by;

i. Corm ii. Rhizome iii. Sucker iv. Runner

4, Study the diagram below and answer the questions that follows;

A.	B.
	

a) Name the parts labelled i, ii, iii, iv and v respective

b) Identify the type of germination in A and B

c) A short sliver layer of stem used for budding and grafting is called …….

5. a. Distinguish between budding and grafting

b. state the three parts of an embryo

c. Define the following terms

i) Cleistogamy ii) Heterostyly

ALHASSAN ABDUL KAHIM

CLASS TEST

(a) It is called corolla

(b) They are stigma, style and ovary which contains ovules

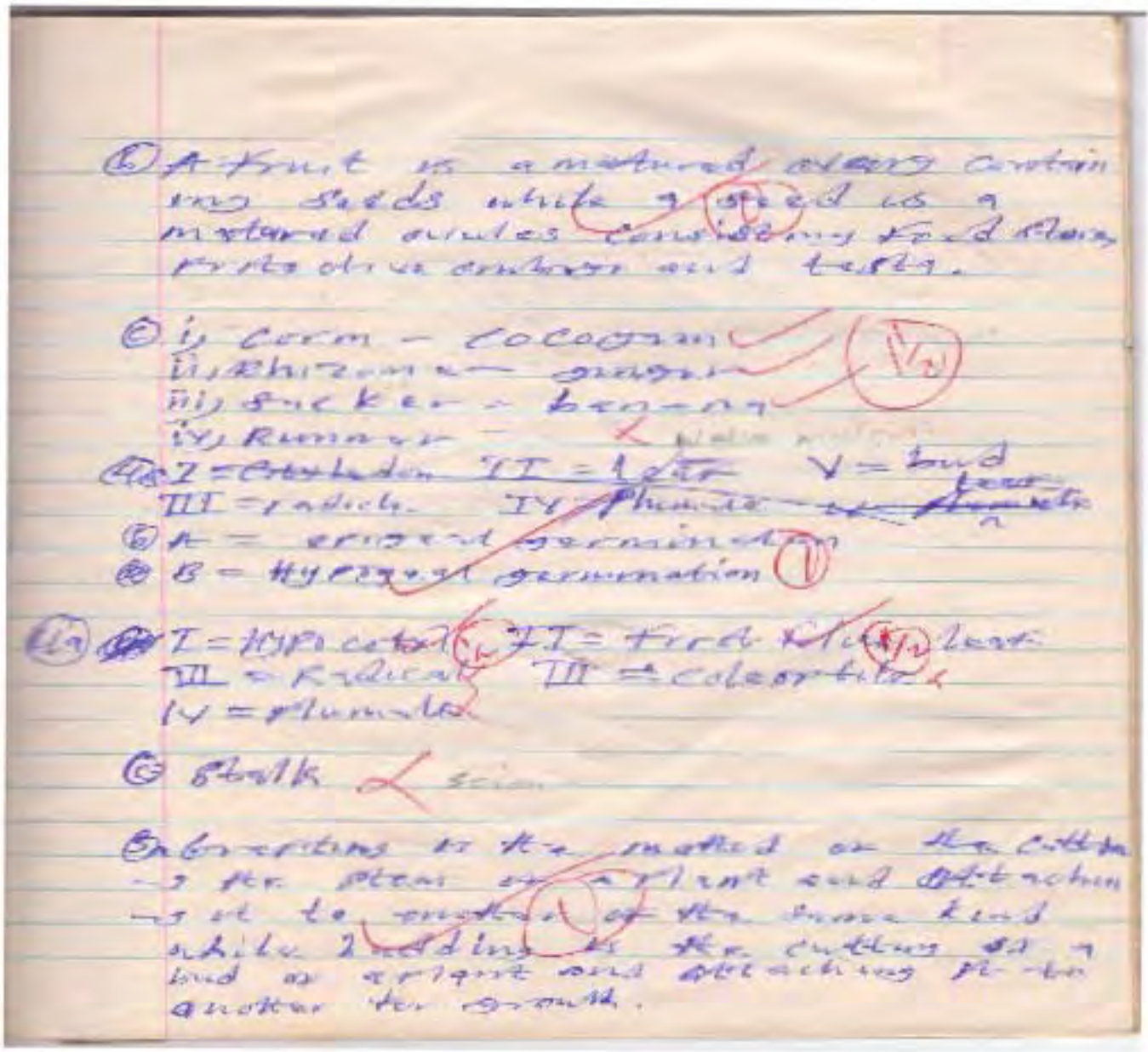
(c) Cross pollination
It is monoecious
It is diecious
~~It is heterostyly~~

Self pollination
(i) It is bisexual
(ii) It ~~is heterostyly~~ means auto pollination.

(d)
i) Dry dehiscent - legumes
ii) Dry dehiscent - nuts
iii) Succulent - Mango

(e)

Anemophily	Entomophily
nectar is absent	nectar present
flowers small and inconspicuous	flowers large and conspicuous
dull in colour	brightly coloured



(b) A fruit is a matured ovary containing seeds while a seed is a matured ovules containing food stores to give embryo and baby.

(c) i) corm - cocoyam
ii) Rhizome - ginger
iii) sucker - banana
iv) Runner - Water pennywort

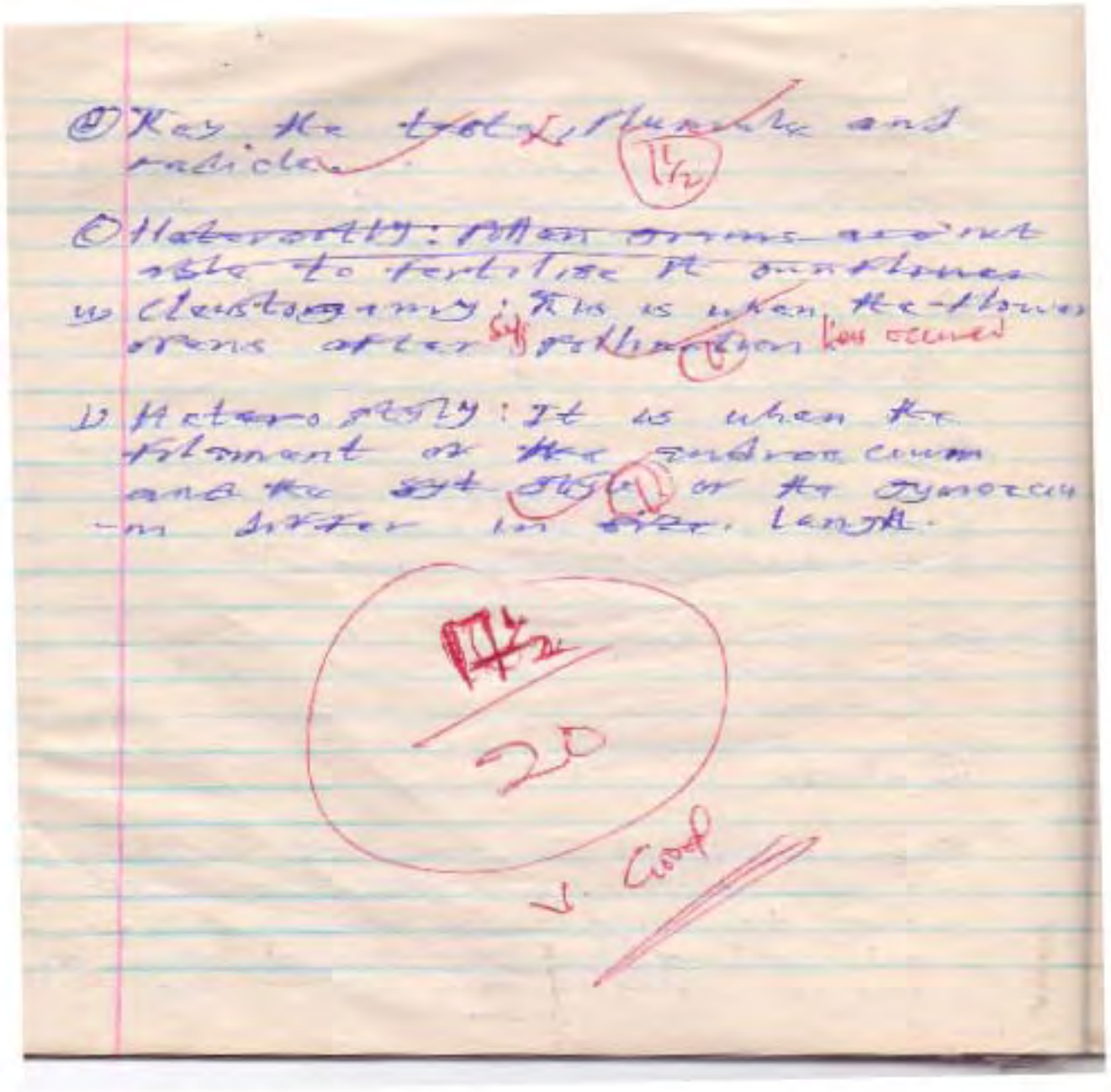
(d) I = Cotyledon II = Leaf V = bud
III = radicle IV = Plumule

(e) A = epigeal germination
B = Hypogeal germination

(f) I = Hypocotyl II = first foliage leaf
III = Radicle III = Cotyledon
IV = plumule

(g) Stalk / scion

(h) Grafting is the method of the cutting of the plant and attaching it to another of the same kind while budding is the cutting of a bud as a plant and attaching it to another for growth.



Bobrnuo Elijah.

Class Test.

1(a) Corolla (iv)

(b) The parts of Carpels:

(i) Stigma (ii)

(ii) Style (3)

(iii) Ovary

(iv) ovule

1c Adaptation of Cross pollination

(i) The anther is hanged outside the (iv) flower

(ii) The flower is dichogamous (3)

C Adaptation of Self pollination.

(i) The flower is homogamous (4)

(ii) The anther is found inside the (iv) flower.

(2) (i) Dry dehiscent: True and Simple fruit ~~Pride of barbados~~. Teloma. (i)

(ii) Dry Indehiscent: True and Simple fr

e.g Pride of barbados

(iii) Succulent = True and Compound fruit of Berry. Pawpaw. (ii)

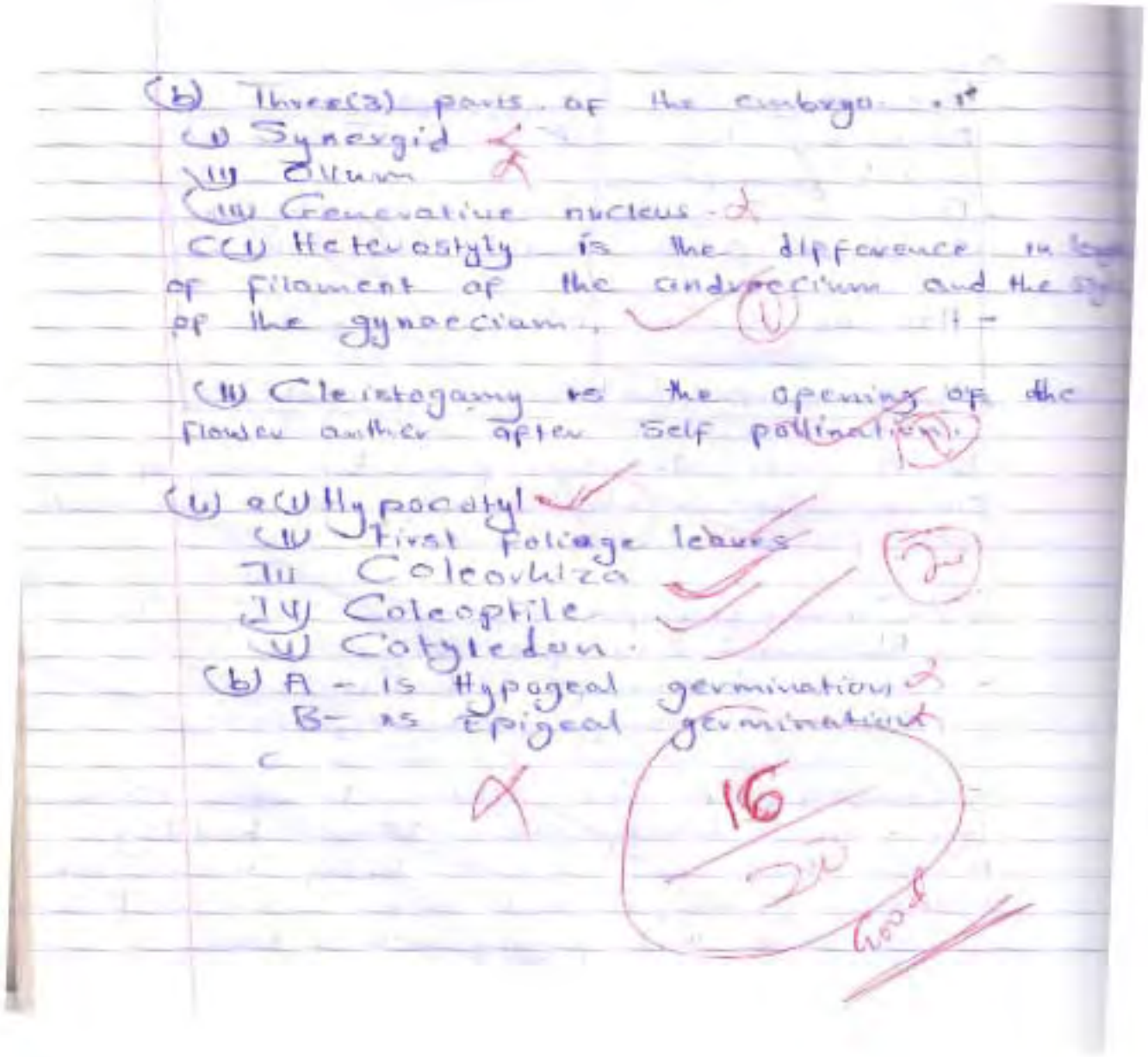
(a)

Anemophily	Entomophily
Petals are large and brightly coloured	
Petals are dull and small in size	- Petals are larger and brightly coloured.
Has no scent	- Has scent
Absence of nectar	Present of nectar

(b) A fruit develops from the ovary of a flower while a seed develops from the ovule of a flower.

(c) Corm ÷ Example Cocoyam
Rhizome ÷ Example Ginger
Sucker ÷ Example Banana
Runner ÷ Example Sweet potato.

(5) Grafting is the union between cambial layers of a woody stem while budding is the buds of varieties being removed by a sharp penknife and insert into a T-shape stock and pegged with a wax.



(b) Three(3) parts of the embryo
(i) Synergid
(ii) Ovum
(iii) Generative nucleus
(c) (i) Heterostyly is the difference in length of filament of the androecium and the style of the gynaecium.

(ii) Cleistogamy is the opening of the flower anther after self pollination.

(b) a (i) Hypocotyl
(ii) First foliage leaves
(iii) Coleorhiza
(iv) Coleoptile
(v) Cotyledon.
(b) A - is Hypogeal germination
B - is Epigeal germination

C

16

~~BAKAZE~~ 10/11/16.

BAKALEN B. TIMOTHY

1a. ~~ETO~~ corolla (½)

b- Stigma. (½)
- Style.
- Ovary
- Ovule.

c. Cross pollination
- Unisexual flower should be present.
- Dioecious flower should be present.

(ii) Self pollination.
- Flower is monoeci
- Stigma and anther should mature at the same time on the same plant.

3.

Anemophily	Entomophily
1. Dull in color.	Brightly colored.
~~ii. Large and conspicuous~~	~~Small and inconspicuous~~
ii. Small and inconspicuous	Large and conspicuous.
iii. Has no nectary	Has nectary.

(b) Fruit is a fertilized ovary containing seed while seed is a fertilized and developed ovule.

(c) i. ~~Cocoyam~~ Cocoyam ✓
ii. Ginger ✓
iii. Banana. ✓
iv. Cassava. ✓
1½

(d) i. ~~True~~ False fruit example, Cowpea ✓
ii. False fruit example, Maize ✓
iii. True fruits example, Mango ✓
1½

(e) a. i — Hypocotyl. ✓
ii — First foliar ~~leaves~~ ✓
iii — Radical ✓
iv — Coleoptile ✓
v — ~~to Cotyledon~~ ✗
1½

(f) A — Hypogeal germination. ✗
B — Epigeal germination ✓

P. T. O.

c. Stock ½

5. Grafting is the joining of scion and stock together while budding is the joining of the foliar plant and stocks

(b) i. Embryotic shoot (plumule) (1)
ii. Embryotic shoot (radicle).
iii. Enzymes. ½

(c) i. Cleitogamy is when ~~fertilization~~ flower opens after pollination has taken place. (1)

(d) Heterostyly is where the filament the androecium of the style are different in size. (1)

15½
Good

APPENDIX F

Marking scheme of students exercises for post intervention test (20 marks)

1. a. corolla ½ mark

   b.i. Stigma ii. Ovary iii. Style 1.5marks

   c. a.i. Flowers are dioecious a.ii. Flowers are unisexual 1mark

   c. b. i. Flowers are bisexual b. ii. Flowers are cleistogamous 1 mark

   2. i) dry dehiscent-legume example cowpea and *Crotolaria* 1 mark

   ii) dry indehiscent-Archene example sunflower 1 mark

   iii) Succulent-Berry example orange 1 mark

2. Differences between Anemophily and Entomophily 3 marks

	Anemophily	Entomophily
	Small and inconspicuous	Large and conspicuous
	Petals are dull in colour	Possess brightly coloured petals
	Absence of nectar	Presence of nectar

3.b) A fruit is a matured ovary with one scar whiles a seed is a matured ovule with two scars 1mark

3.c) i. corm-example cocoyam ii. Rhizome- example ginger

iii. Sucker-example banana iv. Runner- example sweet potato 2 marks (each ½ mark)

4. A. i) Hypocotyl ii) first foliage leaves iii. Coleorhiza iv. Coleoptile v. Cotyledon 2.5 marks

b. The type of germination of A is Epigeal germination and B is Hypogeal germination 1 mark

c. Scion ½ mark

5. a) In budding, a small bud is used as a scion whiles in grafting, part of stem or branch is used as the scion. 1 mark

b) i. radicle ii. Cotyledon iii. Plumule 1.5 mark

c) i. Cleistogamy is an adaptation of a flower where by the flower opens after self-pollination has taken place. 1mark

ii. Heterostyly is an adaptation of a flower where the filament of the androecium and the style of the gynoecium differ in length. 1 mark