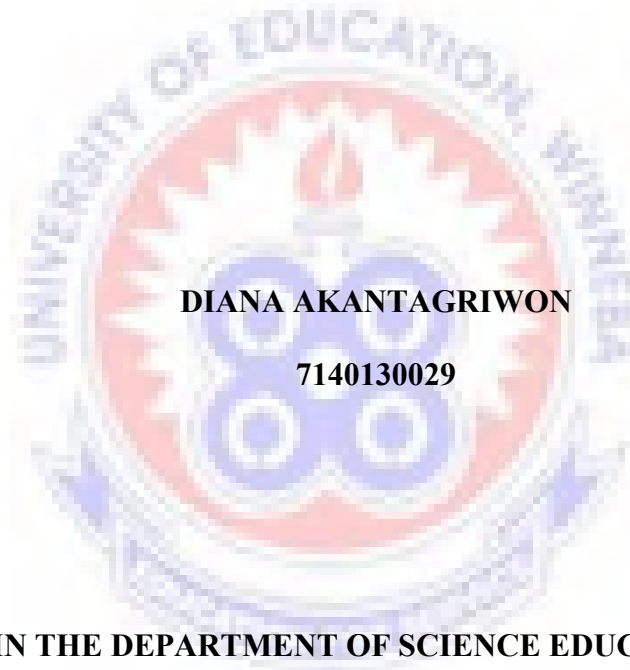


UNIVERSITY OF EDUCATION, WINNEBA

**ENHANCING THE PERFORMANCE AND INTEREST OF FORM TWO
STUDENTS OF CHEREPONI SENIOR HIGH SCHOOL ON SELECT TOPICS IN
BIOLOGY USING COMPUTER ASSISTED INSTRUCTION (CAI)**



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**A THESIS IN THE DEPARTMENT OF SCIENCE EDUCATION, FACULTY
OF SCIENCE EDUCATION, SUBMITTED TO THE SCHOOL OF
GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
OF THE MASTER OF EDUCATION IN SCIENCE DEGREE**

DECEMBER, 2016

DECLARATION

Candidate's declaration

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

Signature:

Date: December, 2016

Supervisor's declaration

I hereby declare that, the preparation and presentation of this MED thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the school Graduate Studies, UEW.

Name of Supervisor: Dr Victor Antwi

Signature:

Date:

DEDICATION

I dedicate this thesis to the Almighty God and to the Akantagriwon family.



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ABSTRACT

The study is sought to improve the performance and interest of form two students' of Chereponi senior high school in selected topics in biology using computer assisted instruction. The study was carried out in Chereponi in the northern region of Ghana. Action research design with mixed method approach was used in the study.

A purposive sampling technique was used to select a sample of 198 students from the total population of form two biology students in the northern region.

Questionnaire, test, observation schedule and interview protocol were the main instruments used for the data collection. A t-test was used to find out whether there was any significant difference when students were taught using computer assisted instruction. From the analysis it was found out that an average of 80% of the form two students of Chereponi senior high school who participated in the study perform creditably well in test 1,2, 3, and 4 in selected biology topics.

The results indicated a lot of improvement in the performance of the form two biology students of Chereponi senior high school when they were taught using computer assisted instruction. They also indicated positive interest towards learning and studying the selected biology topics. In line with these findings it was recommended that computer assisted instruction (CAI) should be used in teaching of selected biology topics in Chereponi senior high school.

CHAPTER ONE

INTRODUCTION

Overview

This chapter begins with the background to the study, statement of the problem, purpose of the study, the objectives concerning the research, research questions, and significance of the study, limitations, and delimitations to the study and finally, the definition of terms are all catered for in this chapter.

Background of Study

To empower teaching and learning through guided inquiry, both teachers and students must have access to instructional technologies in schools (Linns, 2000). Quality education is a global concern in virtually all societies. To achieve it, efficient and quality teaching needs to be employed. However, this may not occur without the use of instructional technologies. Instructional technologies play a vital role in teaching and learning process and have proved to have several inherent advantages when well utilized (Grabe & Grabe, 2005). Instructional technologies help to provide students with the necessary experiences, concrete or simulated and integrate prior experiences as well (Dale, 1969). Hence, a student who has an advantage of reacting to well-selected instructional technologies can learn more effectively than those who are provided largely through verbal information.

Instructional technologies can enrich learning settings by showing things that are far away, those that took place in the past, those that are minute to see, too large to bring to class, too complex to understand at first sight with explanations only, or things that cannot be seen, heard, or perceived by other channels. Due to rapid technological

changes, instructional technologies have become part and parcel of the teaching and learning process.

In recent times modern media is making it possible for students to use of their senses. Therefore, any instructional setting, or otherwise can become a classroom with the aid of and sometimes near total dependence upon instructional resources. Such media as tapes, records, films, transparencies, filmstrips and slides, have overtaken the chalkboard in the media becoming increasingly valuable.

Teachers nowadays find themselves with a lot of content to cover within a very short time. The use of instructional media can help reduce the length of time required for instruction leaving more time for practice of skills. Most instructional media are effective in the delivery of content and also helps sustain learners' interest. Moreover, the students can study details of instructional technologies at a time and place more convenient to them.

The main purpose of teaching is to impart knowledge, information, values and skills to the student. The use of instructional media also promotes sharing of ideas, thoughts, feelings and knowledge (Macharia, 2002). According to Betz (2000), visuals attract attention, which is paramount in learning. He further observes that many distractions compete for students' attention making it important to employ attention-catching devices to focus on the lesson.

Clearly, the importance of instructional media in the teaching-learning process cannot be exhausted. Teachers' awareness of these benefits can motivate them to appreciate, embrace acquire and use the technologies in their teaching. It can create one of the ingredients of developing a positive attitude by the teacher regarding the use of

instructional technologies. It was for this reason therefore this study sought to enhance students' performance in selected topics in science with the use of instructional media. Visualization of phenomena through instructional media techniques such as demonstrations, stimulations, models and videos is an important component of learning science and can contribute to students understanding of science concepts by attaching mental images to these concepts.

The strong economies in the world are powered by science and therefore needed much attention, since it is the source of knowledge which is highly utilized by technology in solving the numerous challenges facing society.

Technology should have been the first point of instruction delivery in Biology in classroom. Many a time the various instructional strategies adopted for teaching Biology has been one to promote rote memorization. Most learners, by virtue of their cognitive development, have difficulties in understanding science concepts taught in this manner. We have witnessed an incredible development of computer-assisted instruction in the last decades. Scientific problems that were previously abstract in nature can now be easily taught on standard PCs with the bonus of immediate visualization and retention of the results (Solna & Myre, 2000). It is necessary that the students understand that, the computer assisted programmes can help them to understand what is taught in abstract such as the digestive system. These students will have to become familiar to the computer as an assistive media tool as well as other instructional media that will aid them in increasing their knowledge in science concepts which are difficult to visualize in the mind. This has the important bonus of making the students aware of the applicability of the theory to real-life problems

Statement of the Problem

The assessment results from test questions, observations and interviews show that after the teaching of some selected topics in Biology taught at Chereponi Senior High School, the students do not understand the concept taught when the traditional ‘talk’ and ‘chalk’ method is used. There is therefore the need to put an intervention to arrest this situation.

Research reports (Njoku, 2004) on the status of integrated science in schools in Nigeria and that of Ghana (Anamuah-Mensah & Benneh, 2006) shows that science classroom activities are still dominated by teacher-centred methods, such as lecture and teacher demonstrations methods that place students in a passive rather than an active role, which hinders learning. These methods have been found to be ineffective in promoting science learning at the basic and senior high school levels of the Ghanaian educational ladder.

The resultant effect has been persistent poor performances in science at both internal and external examinations as has been recorded at Chereponi Senior High School.

Computer assisted instruction uses drills and practice approach to learning concepts or skills. The model acts as the stimulus and elicits a response from the user. It allows for self-paced instruction and it liberates teachers from direct instruction of all learners so as to focus on those learners with particular needs thereby whipping up their interest in science lessons which can improve the performance in the subject.

In schools where materials and apparatus for practice are either available or insufficient, the use of computer assisted instruction could be a welcoming solution. Hence the decision of the researcher to use computer assisted instruction with students

of Chereponi Senior High School to improve their understanding of Biology concepts and thereby improving their performance in the subject.

Purpose of the Study

This research work is aimed at enhancing the understanding of form two students of Chereponi senior high school of selected topics in Biology using types of instructional media to make teaching more real, dynamic and concrete instead of it being taught in abstract.

Objectives of the Study

The objectives of this research work are to:

1. Determine the extent to which CAI can improve the performance of second year students of Chereponi SHS students on selected topics in biology
2. Examine how the use of CAI will help affect the interest of students in selected topics in biology

Research Questions

The following research questions guided this study:

1. How will the use of CAI help improve the performance of learners at Chereponi senior high school in some selected topics in biology?
2. What is the effect of the use of CAI on student's interest in biology?

Null Hypothesis

This is the hypothesis which was tested in the study:

Ho: there is no any significant difference in the performance of students of Chereponi senior high school when they are taught selected topics in Biology using computer assisted instruction

Significance of the Study

- The results of this study will be useful to form two students of Chereponi Senior High School to become knowledgeable of how to improve their understanding in science concepts.
- Educators, curriculum planners and school authorities will be able to use the information from the results to plan activities for students in the development of the curriculum as well as to acquire computers and other instructional media for schools to aid the performance of students in the sciences. As well, teachers' in-service training and workshops will be able to add the use of computers as well as other instructional media when training teachers on classroom teaching and learning and classroom management.
- It is also envisaged that the study will change the teaching of Biology from the traditional instructional methods which include lectures, discussion, demonstration and illustration to an interactive mode of teaching and learning of Biology.

This may lead to the better improvement in the performance of second year students of Chereponi Senior High School in science. Equally the findings of this study will add up to the knowledge about the influence of computer assisted instruction on the performance in science.

- Finally, the Headmaster of Chereponi Senior High School will also have the evidence to back up any increase budgetary allocation for the procurement of the appropriate ICT programmes for science teaching in the school.

Delimitation of the study

The scope of the research was on all form biology students, however the research was restricted to form two students of Chereponi Senior High School due to limited time and resources.

Additionally the study was limited to some selected topics from the components of biology in the Senior High School science syllabus due to limited time and resources

Limitations

This research might not reveal the true assessment of the impact of instructional media in teaching and learning. Generalization of the findings from this study to the entire population of Senior High students in Ghana is not encouraged and must be done with utter caution. The lesson will be taught in English. Some of the setbacks that might have affected the findings of this research may be due to the commitment of second year students to learn selected topics with the use of computer assisted instruction. A positive interest is likely to produce good results. Another limitation was the selection of second year students of Chereponi Senior High school hence generalizations of findings would be limited to only the second year students of Chereponi Senior High School, Chereponi.

Definition of terms

The terms used in the study are defined below:

1. **Performance:** this refers to the cumulative assignment and test scores.
2. **Instructional media:** this refers to all the aids, such as devices and materials that are used by the teacher and students in the teaching and learning processes

3. **Technology:** this refers to the practical use of scientific knowledge in solving everyday problems.
4. **Audio visuals:** This refers to possessing both a sound and a visual component, such as slide-tape presentations, films, television programs, church services and live theater productions.
5. **CAI:** This refers to the use of the computer as a tool to facilitate and improve instruction. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding.

Organization of the study

This research work has been carefully organized into five chapters. Every chapter begins with a brief overview followed by the main part of the chapter.

The first chapter is devoted to the introduction which consists of the background to the study, the statement of the problem, the purpose of the study, objectives of the study, research questions, null hypothesis, and significance of the study, delimitations, limitations and organization of the study.

The second chapter treats the review of the related literature and summary of the reviewed literature indicating the foundation of the research work.

The third chapter covers the methodology of the study. This encompasses the research design, population of the study, sampling technique, and research instruments and data analysis plan.

The fourth chapter also looks at results, findings and discussion. The concluding chapter which is chapter five concentrated on summary findings, conclusions and recommendations.



CHAPTER TWO

LITERATURE REVIEW

Introduction

Over the years, the traditional role of the teacher in the classroom has changed. New technologies for learning have become available many of which have been designed for individual use. The vision for technology-supported reform-oriented classroom is one in which student groups work on long-term, multidisciplinary projects involving challenging content that is interesting and important to them with the support to instructional technology. Making this vision a reality poses many challenges such as providing adequate technology access, equalizing technology access involving a majority of teachers and providing technical support for technology use and maintenance . However, when instructional technologies are provided, the teacher becomes the facilitator of a learning experience. He/she must learn how to use technology as part of instructional technology not merely to enrich or supplement the present methods of instruction but giving high quality technologic experiences to students who would have less access to technology in their homes. Use of instructional technology, form a vital role in education.

Good teachers have been using instructional technology for centuries. To empower teaching and learning through guided inquiry, both teachers and students must have access to instructional technologies in schools.

The review of the related literature involves the systematic identification and analysis of documents including periodicals, reviews, research reports and books. Scientific principles, facts laws, theories can be effectively communicated through the use of instructional media as it channels through the content, stimulates directs attention and

direct the thinking ability of learning materials. Teaching and learning materials enables teachers and learners to jointly and individually explore different strategies for overcoming problems in the classroom.

Children at all levels learn better when exposed to what they see, touch, smell, taste or read during science lessons. This has been presented by Fontana (1981) as, I hear and I forget, I see and I remember, I do and I understand.

The review of literature also covers the concept of computer assisted instruction in science teaching, and the importance of computer assisted instruction in science.

Additionally, the literature also compasses computer assisted instruction on understanding the performance in science. In view of this, the literature review will cover the following as they apply to the study.

- Educationist view on the usage of instructional media
- Why Use computer assisted instruction to Enhance Teaching and Learning of Science
- Computer assisted instruction in science teaching, and the importance of computer assisted instruction in science
- The Meaning of Interest in Science Teaching And Learning
- The role of interest in learning

Educationist view on the usage of instructional media

Educational psychology provides knowledge into how man and animals learn and hence all new learning strategies should be based on the ones identified by educational psychologies. Various educational psychologists have done a great work

in identifying how man behaves in learning environment. Amongst them are cognitivist, behaviorists, and the developmental theory.

CAI as a modern approach to teaching and learning best fits into behaviorists learning theory. The behaviorists see learning as a change in behavior and emphasize the effects of external events on the individual. Ivan Pavlov, Burrhus, Frederick skinner, Edward Thorndike and Edwin Guthrie are some of the behavioral psychologist the world can boast of. Their contributions to educational psychology can never be quantified.

Learners at all levels learn better when exposed to what they see, touch, smell, taste or see during science instruction. This was supported by what Fontana (1981), says as “I hear and I forget, I see and I remember, I do and I understand.”

The aim of teaching science in schools according to the Ghana Education Service is for the learner to be equipped with the necessary skills and attitudes that provides strong foundation for further studies and improves the learner’s interest and inclination towards the pursuit of scientific instruction.

Learners at the same time acquire the basic scientific facts, skills and concepts which also help in the development to communicate scientific facts. With this, one cannot dispute the fact that when it comes to teaching a science lesson, an inspirational teacher usually makes use of several methods such as problem solving, discussions, demonstrations and the use of audio visual aids to develop cues and tones.

An educationist is not a scientist but they apply the power of experimental science in solving the mysteries of the natural world as stated by Bacon (2009). To him, nature freely produces secrets when subjected to experiments. It is therefore important for

teachers to make teaching and learning of science real and practical to students through experiments and the use of instructional media. Teaching and learning of science through the use of instructional and experimental materials helps to achieve the following among others which includes:

The Importance of Computer-Assisted Instruction in Biology

A number of science educators feel that computer assisted-instruction offer tremendous potential for the enhancement of the teaching and learning of science concept. Switzer and White (1984) and Akpan and Andre (1999) discuss the place of the computer assisted instruction in science classroom. According to these authors the computer assisted instruction as with any technology, the ultimate objective of its use in the classroom is to enhance learning. In addition, the stimulations ability is to provide opportunities for learners to develop skills in problem identification, seeking, organization, analysis evaluating and communicating information. Nakheh (1983), Switzer and white (1984) and Waugh (1984) all support the fact that it is in the area of simulations that computers have the potential to deal with higher learning outcomes in a way not previously possible inside the biology classroom.

The role of computer assisted instruction in teaching and learning is beyond dispute that its contributions in educational and instructional process are so significant. According to Doganay (2002), the advantages supplied by this method are as follows:

- i. It increases efficiency in education and instruction; it makes for the effectiveness of learning in the classroom.
- ii. It makes education and instruction interesting, enjoyable and attractive.
- iii. It motivates the students in the lesson by the help of the sound, pictures and music

- iv. It makes it easier to repeat complicated problems, concepts and processes many times
- v. It contributes to students intelligence development
- vi. It gives the students concrete experiences similar to real life
- vii. It causes the students to attain rich information sources
- viii. Mistakes in texts written can be corrected easily, and some additions and omissions can be inserted easily too.
- ix. It gives the students courage, ambition and excitement and in this way it makes the development and success of students easier too.
- x. It develops the student's self-confidence.

It can be deduced from the above that some of them play a major role in promoting the development of interest in form two biology students towards biology there enhancing their academic performance in biology.

In addition to these studies, other research studies examined the impact of CAI on academic performance and interest. Students who used CAI technology to contribute to already learn skills sets, improved their academic performance and interest in that particular subject (Attewell, 2001). Despite the positive impact of technology in enhancing a favorable learning environment, barriers do exist that limit the effectiveness of technology in the classroom situation.

Why Use computer assisted instruction to Enhance Teaching and Learning of Biology?

Media can be used in almost any discipline to enhanced learning, both in class and for out of class assignment. Short films and television clips, written article and blog

posting can be viewed to reinforce concepts and spark discussion. Songs and music videos, especially when the lyrics are made available can be used to the same effect.

Research suggests that people learn abstract, new, and novel concepts more easily when they are presented in both verbal and visual form.

Other empirical research shows that visual media make concepts more accessible to a person than text media and help with later recall. In Willingham's (2009) research he asks a simple question to make his point, "Why do students remember everything that's on television and forget what we lecture?" – Because visual media helps students retain concepts and ideas.

Bransford, Browning and Cocking (1999, p 194) also note the crucial role that technology plays for creating learning environments that extend the possibilities of one-way communication media, such as movies, documentaries, television shows and music into new areas that require interactive learning like visualizations and student-created content.

The Meaning of Interest in Science Teaching And Learning

There are numerous publications on the meaning of interest construct in everyday and scientific language use (Schiefele, 2009). Generally agreement can be found with regard to the central characteristics of the interest constructs for example that it is a multidimensional construct whose operational definition requires both cognitive and emotional categories (Gardner, 1996; Krapp, Hidi, & Renninger, 2004; Schiefele, 2009). Interest is characterized as an affective variable (Rennie &, Punch, 1991).

However, enjoyment can occur for many reasons, and interest is only one of these. Interest describes the cognitive and affective relationship between a student and

particular classes of subject matter. The decisive criterion of the interest constructs which enables it to be clearly distinguished from several neighboring motivational concepts is its concept specific. An interest is always directed towards an object activity, field of knowledge or goal. One must be interested in something (Gardner, 1996).

Although there is a wide range of interest definitions, all of them agree that interest is the tendency to think, feel, or act positively or negatively towards elements in the environments (Petty, 1995). Social psychologists have long viewed interest as having three components: the cognitive, the affective, and the behavioural. The cognitive component is a set of beliefs about the attributes of the interest element and its assessment is performed using paper-and-pencil test. The affective component includes feelings about element and its assessment is performed using psychological indices (Heart rate). Finally the behavior's components pertain to the way people act towards the element and its assessment is performed with directly observed behaviors (Eagly & Chaiken, 1993).

Many studies have shown that interest-triggered learning activity led to a higher degree of deep-level learning (Krapp, 2002). Interest is a relationship between an individual and an object. Most researchers differentiate between individual and situational interests (Krapp, Hiddi, & Renninger, 2004). Individual interest is understood to develop gradual and affect ones knowledge and values over time, while situational interest appears suddenly as a response to something in the environment. If it gives something good to them, possibly they will be interested in it.

Interest in something is arising from the individual's interest because of their requirement of their feeling that something (they will be learning) will have meaning

for them. Students, who have certain needs or desires towards something, will have high interest and are more enthusiastic to achieve what they want to do. As Gordon (2002) said interest in a condition that correlate with some body's own needs, aspiration and desire. Thus students interest in and excitement about what they are learning is one of the most important factors in education.

Interest motivates people to choose the most interesting activity in life. Because each activity in has its own characteristics, as such people always select activities and things that are interesting. Additionally, Crow and Crow (2008) state that an interest is a motivating force that impels an individual's towards participation in one activity rather than another. It indicates that interest provides a strong motivation in learning. Marimba (1992) states that interest is a tendency to a subject that we feel there is an important to the subject with happy feeling about it.

Interest is been related to science which is also connected to students participation in science lessons and exhibition of effective performance (Norby, 2003). While Gardener has described science-related interest in as a learned tendency to evaluate objects, people, events and situations in a specific way or a set of prepositions related to science , Norby with his friends that aimed at determining the effects of interest on science education, has put forward that students interest towards science lessons affect their academic achievement, their gaining scientific interest and their tendency to continue studying in the field of science (Altinok, 2004).

According to some of the definitions above it can be concluded that interest is feeling of like and attention to something which is taking someone's fancy without command or compulsion from outside.

Factor's Influencing Students Interest in Science

There are some factors that influence a person's interest according to Osborne, Simon and Collins (2003). These include:

(i) Enjoyment

Enjoyment means the pleasure felt when having a good time or good act of receiving from something. Somebody who can enjoy something especially the lesson, he or she will give a good action, by giving an attention to teacher's explanation or reading a book.

(ii) Motivation

Motivation is some kind of internal drive which pushes someone to do or think in order to achieve something. In learning, motivation is important. Learner motivation is important makes teaching and learning immeasurably easier and more pleasant. Interest will increase if there is motivation both from internal and external factors

Motivation is one of the affective factors in integrated science. Its role in learning has been the source of speculations for many years; however many experiments and research that have been done suggests that sources on self-rating motivation are closely related to school attainment.

Someone who has motivation in his subject area, will have the interest to read the subject area books, go to historic places of interest and join his subject area community like other people who have interest in different areas. They will find the information and try to examine and implement what they are interested in.

Someone who has motivation will try something harder, and will surrender. He will read books to increase his achievement. On the

contrary, those who have weak **motivation** will easily feel hopeless. They will not concentrate in their lessons and they will like to destruct other people.

The student's motivation in learning integrated science also affects their marks in the subject. It is believed that the students with high motivation in learning integrated science will be more successful than students with low motivation or no motivation at all.

(iii)Attention

Attention is represented by concentrations or activity of soul to perception. If the student gives good attention to integrated science, certainly the student has an interest in the subject. In other words, interest comes from attention.

Attention is important in learning. Learning is important effective when a person is paying attention. Poor attention can be a sign of disorders in people learning process.

Someone who has attention in something means that he or she has interest in something. In other words, it is generally interest that leads a person to know more.

(iv)Need

Need is defined as circumstance in which something is lacking or necessary or require some course of action. Needs also means a condition or situation in which something is required or wanted. Students need to learn integrated science is caused by the lack of knowledge of the subject. Need could motivate the people to give their attention to the lesson. Interest that appears from peoples need encourages the people to put their

best effort. For instance the people who need knowledge from the integrated science book will try to learn the language and terms of the subject more.

There are many kinds of needs. Not one of the can best be achieved when separated from the teaching and learning process. Individuals differ in their need to achieve something. Some are highly motivated internally to succeed both in competitions with others or working alone. Others are motivated by fear or failure and are le likely to take risk which leads to achievement. The need to achieve can become a motivational factor in learning.

(v) Desire

The natural longing for excitement and enjoyment or the thought of any good, impels to action or effort its continuance or possession. If a person has desire to learn integrated science automatically he or she will try to know it more.

The role of interest in learning

Interest plays an important role in the learning process. If there is the intention in learning, at least, they who study need to have positive interest in the lesson.

According to emotional interest theory, the addition of interesting but irrelevant materials to a textbook lesson energizes readers so that they pay more attention and learn more after all. Although the materials are irrelevant to the explanation, it is related to the topic and intended to heighten the reader's curiosity and interest in the topic.

According to emotional interest theory, emotional interest adjuncts, such as seductive text or seductive illustrations, influence the reader's efforts by promoting his or her enjoyment of the text. The increase in emotional arousal influences the reader's cognition, that is, the increase in enjoyment causes the reader to pay more attention to and encode more of the materials in the text. If emotional interest theory is correct, we can predict that adding emotional interest adjuncts to text will result in increases on tests of retention and transfer (Kinstch, 2005).

Interest will become a motivation force, strength to encourage somebody to learn. Students who like the lesson will look like being encouraged to learn continually than the others who only accept the lesson. They just do not move to learn more and more because of the lack of encouragement or interest.

Interest manifestation

From the foregone definitions, it appears interest is not quantifiable. It is a psychological construct, and therefore it can only be detected by indirect methods. Interest manifests itself in different ways. Its manifestations are linked to concepts such as perceptions, personality and perceptual selectivity. To show the existence of a relationship between interest and beliefs or perceptions, Crawley and Koballa (2002) stated; beliefs that an individual holds about the consequences of engaging in the specific behaviour within subject effect or personal norm help the person form an interest towards engaging in the behaviour.

In an attempt to examine and understand the interest and performance of second year college pre-service teachers' toward integrated science using CAI, interest manifestation was considered.

Student's interest towards learning Biology

On interest, a personality factor is considered in this study as that variable which could predict the level of learning difficulty of the student in a particular area of study. To learn effectively students need to integrate new material into their existing knowledge base, construct new understanding, and adapt existing conceptions and beliefs as needed, according to Bolarin (1988), interest is the key to educational successes. For this submission, Bolarin observed that, at any level of graduation, learners will learn better in subjects or courses if they have some degrees of likeness for such subjects or the courses. This implies that learners will fail to learn little if they do not like the subjects. Interests therefore, at a higher stage become subjective feeling of value which is experienced when striving. This feeling implies an end – point on object, a reward, purpose or situation in which one is interested and for which an individual strives at (Johnson, 1992). This means that when one is interested in a thing, one is ready to devote attention to it.

Thomas, according to Bolarin (1988) found that with the ability held constant, through statistical techniques, students with educational interest had higher grade point averages in specific related courses than those with low interest level. The aforementioned therefore, is in agreement with the submission of Lavin (1965), that there is a reciprocal relationship between interest and learning achievements as each reinforces the other. This then indicates that interest measure can serve as a motivating factor of attention and thus enhancing good memory to the learners.

Therefore, the level of learning difficulty of students is minimized for those with good personalities, right attitudes and high level of educational interest in a particular subject. Consequently, effort must be made to see that students develop the right

interest or attitude to learning and where such is hindered by the teacher or any other factors, attempt must be made for necessary adjustments.

Uyoata (2002) investigated the effects of computer –based instructional mode on primary school pupils’ interest or attitude towards science. He indicated that computer based instructional mode proved to be more potent in stimulating pupils’ interest to developing more positive interest towards science than the conventional method of teaching. Opara (2002) also investigated the efficacy of self –regulation process of students’ interest in quantitative chemical analysis.

It was found that teaching method was significant on the interest of students in quantitative chemical analysis. This confirms that self –regulation enhanced the interest of students in the experimental group more than the students in the traditional group. The reason for this observation could be due to the fact that the stages used in the process of self –regulation were meant to actively involve the learner, as well as create an environment in which equilibration can occur in the minds of learners. Local materials used were meant to capture the interest of students and to help them link materials in the environment with activities in the classroom. Hassan (1975) who investigated the influence of some selected variables including instructions on the development of students’ interest in science. He found out that certain instructional factors are important in the development of science interest among the secondary students. Attitude to science and interest could play a substantial role among the students studying science, but the problem of which of the two variables will possess the strongest strength for producing performance in science still remain inconclusive. These necessitate the imperativeness of such variables for further verification in this study.

The Concept of computer assisted instruction in Science Teaching and Learning.

The use of computers in education started in the 1960s. With the advent of convenient microcomputers in the 1970s, computer use in schools has become widespread from primary education through the university level and even in some pre-school programs. Instructional media are basically used in one of two ways: either they provide a straightforward presentation of data or they fill a tutorial role in which the student is tested on comprehension.

If the computer has a tutorial program, the student is asked a question by the computer; the student types in an answer and then gets an immediate response to the answer. If the answer is correct, the student is routed to more challenging problems; if the answer is incorrect, various computer messages will indicate the flaw in procedure, and the program will bypass more complicated questions until the student shows mastery in that area.

Computer-assisted instruction (CAI) is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place.

CAI uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the classroom, and it can be utilized to help a student in all areas of the curriculum. CAI programs use tutorials, drill and practice, simulation, and problem solving approaches to present topics, and they test the student's understanding.

The use of computer assisted instruction in teaching and learning process

Properly designed learning materials inspired by technology and delivered technologically add value to a teaching environment in which contact hours are limited but balancing between the potential of technology and the careful grooming and attention students sometimes require is critical observation. Technologically inspired teaching materials should create a “cognitive apprenticeship” they should help develop underlying thought processes such as critical thinking, analysis and problem solving. Instructional technology can do other things as well. New materials delivered via the internet that help with the repetition necessary for developing reading, writing and listening in English can eliminate drudgery for educators and can be entertaining. Because of their lifestyles, entertainment value is a key consideration for students in media-rich environments Grabe and Grabe (1998). Gamble (1984) asserts that instructional technology in teaching learning process makes learning an interesting and fulfilling experience as the students find it easier to follow, understand, respond to and retain the content learnt. Instructional technologies heighten motivation for learning thus the lesson becomes emotionally stimulating as well as intellectually rewarding, they provide freshness and variety thus provide students with experiences that are fresh exhilarating delightfully new and varied, they appeal to students of varied abilities, they encourage active participation in the learning process as students heighten their sense of involvement by engaging in stimulating, provocative discussion and allows students to make immediate use of their learning as they apply it in meaningful ways to new situations and unexpected events hence making involvement inevitable observes Hoban (1962) and Newby, Stepich, Lehman, Russell, Leftwich (2006).

Jean Piaget a Swiss psychologist who argues that “the more a child has seen and heard the more he/she wants to see and hear...” This means that resources give needed reinforcement such as the programmed instruction and computers provide many ways in which a student is rewarded by finding out how well he/she has learnt, they widen the range of students’ experience, assure order and continuity of thought especially if it is a well-prepared television program, motion picture or film trips, will present the subject matter in a logical carefully structured fashion and finally improve the effectiveness of other materials as they provide a rich variety of sensory experience to amplify and reinforce the concepts that have been presented in textbooks.

Dale (1969) urges that: “...through meaningful diversity of instructional methods, we help the child to develop meaningful concepts. His/her relatively sense ...involved learning modify and extend the range of his/her abstraction.”

Education described rich text materials (materials combining multimedia such as audio and video among others) as potentially enriching, experiential, flexible, fun, powerful, self-paced and time saving. They also believe that properly used technology could further critical thinking and independent learning, expand individual exploration, shift some of the learning out of the classroom, expand time for other classroom activities liberate (student and teachers alike) from the mundane, create an environment of learning, experimenting doing and enjoying and the level of the playing field between public and private schools.

This implies that many courses can combine old and new technologies and thus create a more effective and dynamic classroom. They successful combination of old and new means, blending the delivery of class materials and creating “rich text materials”. Blending delivery is delivering educational materials in multiple means, including

textbooks, online learning management systems, the internet, the intranet and CD ROM observes Grabe and Grabe (1998). Rich text materials are those that combine multimedia such as print, audio, video into one well thought and designed package. With careful consideration, each instructional technology can be used for what it does best (Grabe and Grabe, 1998).

That is because both blending and creating rich text maximize the affordances of a technological medium: what the medium offers, what it provides, what it furnishes and what it invites. For instance, paper offers several common affordances. Paper is thin, light, porous, opaque and flexible. That means one can write on it, fold it and bind it. Digital technology also offers several unique affordances. It is dynamic, keyboard able and can manage large amounts of information. That means one can create interactivity and dimensionality and can simultaneously appeal to more senses than paper acknowledges (Grabe & Grabe, 1998).

Because of the workload, lack of dedicated time and occasional technological intimidation, educators should be partnered with others in “production cells” to author rich text materials and to determine means of delivery. Some who have had success in integrating multimedia into course structures have found that these production cells should include a content expert, an instructional designer and software expert observer notes.

According to the republic of Kenya Report on education sector strategy (2007-2010), knowledge evolves. It is always a new trend; Kenya is now poised to infuse ICT in all her subject areas. This then demands of an increase in number of professional organizations through which teachers can acquire new knowledge in their respective subject specializations. According to Newby et al. (2006), secondary schools“

teaching and learning ICT can be incorporated in Computer Assisted Instruction (CAI) and Computer Managed Instructions (CMI). In addition, the use of internet, electronic mail, the conferencing file transfer and topic searching have provided access to information that covers a variety of topics in research, Science and technology.

In conclusion, as a means of facilitating teaching and learning in schools, instructional technology is not just a means of transforming knowledge, but the most important thing is, an extension of both the teacher and the chalkboard.

In this case, the curriculum or the syllabus can apply instructional technology with ease and students can be comfortable with minimal assistance. Instructional technologies increase interest, comprehension and retention. Instructional technologies add concreteness to the teaching situation and increase motivation.

More recently, computer assisted instructional media have not been recognized as a potentially powerful tools for implementing an approach to learning in science.

Computer assisted instruction have some basic principles generally accepted as the basis for designing a classroom-learning environment emphasizes learner's active roles in learning, knowledge construction, as well as learner's engagement in authentic learning activities. As a result, school curricula are changing in order to become more student-centered, connect school subject matter to real-life authentic situations, and promote student understanding, conceptual change, and thinking rather than rote memorizing or drills and practice. Essentially, contemporary curricula and teaching practices aimed at contextualize or situate students learning in authentic rich, and relevant learning experiences.

Many aspects of technology like computer assisted instruction make it easier to create environment's that fit the principles of a learner-centred environment (Bransford, Brown, & Cocking, 2001). In this new way of teaching and learning, ICT is not considered a means for delivering information to learners but a tool for engaging them in inquiry-based learning, scaffolding their knowledge construction and facilitating conceptual understanding (Jonassen & Reeves, 1996). Also as Bransford, Brown and Cocking (2001) argued, ICT can help students visualized difficult to understand concepts, build models for facilitating understanding , and interact with specific parts of the learning environment's to explore and test ideas . They also argued that technologies do not guarantee effective learning and that inappropriate uses of technology can actually hinder learning. Pedersen and Yerrick (2000) also argued that it is a primary responsibility of teacher education programs to adequately prepare-service teachers to teach science with computers in accordance with current science education visions.

Penner (2000/2001) argued that one method that could possibly assists the inquiry learning processes is computer modeling. Undoubtedly, science educators (Frederiksen & White, 1998) have long recognized the importance of computer assisted instruction in building and understanding abstract science concepts and phenomena.

Jonassen (2004) also argued that the most powerful method of engaging, fostering, and assessing conceptual change is the construction of qualitative and semi-quantitative models that represent their conceptual understanding of what learners are studying. It should be mentioned, however, that computer assisted instructional experiences can be inappropriate for children under the age of 10, because working

with instructional media requires a certain level of abstraction in thinking that develops progressively with age but in general, not prior to the age of 10. Concrete science experiences inquiring into real objects can be more beneficial, meaningful, and motivating for students under the age of 10.

Computer assisted instruction can be manipulated by the learner in order to control variables and test hypothesis.

Gilbert (1991) suggests that science should be viewed as a process of constructing predictive conceptual models. This will enable students to analyse and synthesis scientific facts, as well as integrate them with scientific theory and give them a unified view of science (Gilbert, 1993). In essence, the primary purpose of using instructional media is the construction and revision of conceptual understanding (Jonassen, 2004).

The Advantages of using computer assisted instruction in teaching:

- Many media sources (feature films, music videos, visualizations, news stories) have very high production quality capable of showcasing complex ideas in a short period of time. This helps develop quantitative reasoning. Learn more about this technique using the Teaching Quantitative Reasoning with the News module.
- Media offers both cognitive and affective experiences. It can provoke discussion, an assessment of one's values, and an assessment of self if the scenes have strong emotional content.
- The uses of media sources help connect learners with events that are culturally relevant. As a result, a positive consequence of utilizing media is that instructors must keep their materials and examples up-to-date.

- News stories can be used to connect theories taught in the classroom with real world events and policies. It helps teachers to teach what is expected, measured, observed and hence achieve the desired objectives.
- It enhances learners understanding and remembrance.
- It relates abstractions to concrete, through the use of instructional media such as visual aids by teachers.
- It is used to explain relationship. In spite of careful planning, subject areas tend to be compartmentalized. Field trips, movies and pictures all tend to give reality to separate learning. As concepts are applied and seen in interaction, the base of understanding is broadened and complete integration is facilitated.
- Extends the scope of experience when learners interact with these media. They can go far without leaving the classroom. For instance, in educational television, various concepts can be taught through real life experiences, excursions and demonstrations, etc. which motivate.

Challenges on the use of CAI in developing countries

CAI has also come under strong criticisms. The critiques see its short comings in the area of implementation, user friendliness and availability. Others argue from a more nuanced view of the literature that computer can be effective in certain situations, such as when used by teachers with skills and experience in using computers with self-assessed programmes, users of CAI can be left on their own too much.

When computers and/or machines used in CAI are malfunctioned, it does not only lead to loss of time but creates a negative attitude towards CAI.

Moreover Another disadvantage worth mentioning is its individualistic nature. As each student sits behind his or her computer they tend to be on their own rather than a group.

In Short CAI May Have The Following Shortcomings:

- a. Users may feel overwhelmed by the information and resources available
- b. Over use of multimedia may divert the attention from the content.
- c. Learning becomes too mechanical
- d. Non availability of CAI packages
- e. Lack of infrastructure
- f. Non availability of computers in developing countries
- g. Unavailability of power in remote areas in most developing countries

Never the less, CAI is one of the few areas where educational experts see it as a modern strategy to effective teaching and learning. With its vast educational benefits, it would be completely wrong for educationists to completely put it to their back door.

CHAPTER THREE

METHODOLOGY

Overview

This chapter covers the research methodology employed in the study. It discusses the research design, research setting, population and sampling technique. The data collection instruments, data collection procedure, validity and reliability of the research instruments, data analysis and ethical issues are also discussed in this chapter.

Research design

The nature of a research is determined by how the gathered information is used to solve the stated problem of the study. The nature of this study called for a multidimensional research design. As such the research design used for this study was action research design with a mixed method approach in which the multiple methods of data collection analysis were used.

Burns (2000) acknowledges action research as an influential tool for school and classroom investigations. The choice of action research design for this study was centred on the following:

1. Action research design remedying problems in a specific situation or somewhat improving a given set of circumstances as a single level was used for the study.
2. Action research design also serves as a means of in-service training thereby equipping the teacher with new skills and methods, sharpening analytical powers and heightening self-awareness since the researcher used the same classes he was teaching for the research.

3. Finally, it is a means of providing a preferable alternative to the more subjective, impressionistic approach to problem-solving in the classroom since the classes that the researcher was teaching was used for the study.

A mixed method research approach is an approach which is conducted by the use of various methods to collect data (Cronholm, & Hjalmarsson, 2011; Creswell, 2012). In mixed method, quantitative and quality data are collected. According to Anderson (2006), several purposes are captured as the major reasons for using the mixed method research approach.

Anderson indicated that the mixed research approach makes researchers seek to view problems from multiple perspectives so as to enhance and enrich the meaning of a single perspective. Plano-Clark (2010) also indicates that the approach helps to merge quantitative and qualitative data to develop a complete understanding of the problem or a complementary picture and to validate or triangulate results. The rationale behind the choice of the mixed method research approach in this study was to obtain complete and detailed information on form two Biology students of Chereponi Senior High School with regard to the use of computer assisted instruction in promoting interest and performance in selected Biology topics.

Research setting

The school is located at the last ends of the northern region of Ghana. It is boarded on the east by the republic of Togo. This part of the country was formerly part of the Trans- Togo land.

The inhabitants in the community are predominantly peasant farmers of varied ethnic groups such as Busangas, Binmobas and Kunkombas. However a number of them are

government workers and business people. The school is the only higher institution in the community.

The school is deprived and less endowed in terms of infrastructure, staff, equipment, resources and road network.

Population

The target population for the study was form two Biology students. The target population was made up of 600 students, comprising 212 first year students, 198 second year students and 180 third year students in the 2015\2016 academic year. The accessible population for the study however comprised all the first year biology students. The accessible population was used based on their original class grouping. Each of the classes consisted of 11 females and 24 males. The class grouping was done by the assessment officer with the use of computer generated groupings.

Sampling and sampling techniques

The sample consisted of 198 second year students from Chereponi Senior High School. The sample was made up of 58 females and 140 males. Purposive sampling technique was used to obtain the sample for the study. According to Small (2009), purposive sample also commonly called a judgmental or subjective sample is one that is selected based on the knowledge of a population and the purpose of the study. Purposive sampling was very useful for this situation because the first year students had just been admitted into the school; therefore they had not yet done enough content in some Biology topics. Secondly, the third year students were also preparing for their WASSCE.

It was convenient because the second year students were assigned to the researcher to teach during the academic year.

Research instruments

Four instruments were used to collect the data for the study. The instruments were test, questionnaire, observation and interview. The test and questionnaire were used to collect quantitative data while the observation schedule and interviews were used to collect qualitative data.

Test

A test dubbed interim assessment for form two Biology students of Chereponi Senior High School was a short assessment often administered multiple of times during a session. It is a form of assessment educators use to evaluate when students are on their learning progress and to determine whether they are on track to perform well in future assessment, such as standardized tests or end of course examinations.

The test consisted of a total of 24 items in four sets of six items per each selected topic used for the test. Each set included five test items and one take home test (assignment) for each topic taught (appendix A) the topics included; fundamental ecological concepts, pollution, transport in plants and hereditary respectively. Most of the items were filled in short answer items. It was in a form of five test items and one take home test (assignment) for each topic taught. Most of the items were selected from past examination questions. These were chosen because of their standard nature.

Other parallel items were developed by the researcher to supplement those of the WASSCE questions.

The test was used to monitor form two Biology students of Chereponi Senior High Student's progress and identify gaps in them, for teachers to modify instruction to suit learner's needs. Student's growth scores required to be a factor in evaluating teachers and to hold them accountable for making content knowledge accessible to their students (Mathis, 2012).

Questionnaires

Form two Biology students interest in science questionnaire (Appendix B) was used to collect information on the student's interest level in selected topics in Biology after the use of computer assisted instruction. The questionnaires had thirty closed ended items. The first two questions were used to collect personal information of the respondents and 28 items to collect information on respondent's interest in Biology. Each item consisted of a statement followed by a five point Likert type options ranging from Strongly Agree (SA-5), Agree (A-4), Neutral (N-3), Disagree and Strongly Disagree (D-1).

Observation schedule

The third instrument that was used was an observation checklist (Appendix C). Form two Biology students observation schedule was used to collect information on student's participation on selected Biology topics during the intervention stage as a means of their interest in Biology. This was also used to identify some of the indicators of student's interest in Biology with regard to the use of computer assisted instruction. According to Patton (1990), one of the key disadvantages of interviews and questionnaires is that the information the respondent provides may not be accurate. Such inaccuracies occur either due to the respondent's lack of awareness of their own behaviour, lack of an accurate memory of what they do, deliberately lies to

make them appear better than they are or a desire to tell the researcher what they think the researcher wants to hear. The observation schedule consisted of 10 optional types of items to collect information on student's interest on the use of computer based stimulation. Each item consisted of an indication of interest in computer assisted instruction statement followed by a four Likert type of options ranging from 4=always, 3=often, 2=sometimes to 1=never. This observation schedule was in one scale.

Interview

The fourth instrument that was used was an interview (Appendix D) that sorts to buttress the information obtained from the observation checklists and the questionnaire on form two Biology students interest in Biology. An interview consists of a series of well-chosen questions which are designed to elicit a portrait of a student's understanding about scientific concept (Southerland, Smith & Cummins, 2000). It could be opened-ended or semi-structured or closed-ended or structured.

An interview was used to probe further the information on the form two students' interest in Biology. The interview consisted of eight items comprising open-ended questions.

Validity of the Research Instruments

Interview

To ensure the a participants' scores on the interview items made meaning and for good conclusions to be drawn from the study to the research population, the instruments were presented to two Senior Lecturers as well as my supervisors in the Faculty of Science Education, University of Education, Winneba for their critique and

suggestions on the items as suggested by Best and Khan (1995). This was to improve the face validity of the instruments. The researcher then modified the items using the suggestions put forward by the experts

Questionnaire

Equally a sample of the questionnaire was answered by 50 students of Saboba Senior High School which has a similar setting, conditions and features with Chereponi Senior High School as a pilot study. Their responses were used by the researcher to assess the validity of each questionnaire item and necessary adjustments were then made where indicated.

The items were also given to my supervisors in the Department of Science Educations, University of Education, and Winneba who examined the items and gave their comments on them. The main aim of this was to evaluate the concept developed by the students in Biology and to assess the overall progress achieved in selected topics in Biology by the form two Biology students. This helped in the identification of gaps in the form two Biology students in the learning of Biology at the Senior High School level.

Reliability of the Research Instruments

In order to ensure that the research instruments produce, consistent results that are accurate and precise devoid of any ambiguities (Hackman, 2002) as much as possible, all the research instruments were pilot tested using the 50 students from Saboba Senior High School in the Northern Region of Ghana.

Data from the questionnaires were statistically analyzed to determine the reliability of the instruments. Reliability refers to the extent to which an instrument such as a questionnaire or a test yields the results on repeated application (Durrheim, 2000). It means the degree of dependability of measurement instrument. One instrument was subjected to reliability test. That is, the questionnaire instrument.

To estimate the internal consistency of the scores on the main questionnaire instrument, Cronbachs alpha (Appendix E) was calculated and the reliability coefficient found to be 0.78. According to Fraenkel and Wallen (2003), reliability should be at least 0.70 and preferably higher.

Intervention stage

The intervention process was conducted over a four-week period. The process involved the use of CAI to teach the first four selected topics. The topics covered were fundamental ecological concepts, pollution, transport in plants and digestive system. The first four topics were selected based on the topics assigned to the researcher to teach during the second term of the 2014/2015 academic year. The intervention went through some major stages as indicated in Figure 3.1. First of all, selection of various models that were relevant to the selected topics of Biology was done via the internet with the aid of an internet Download Manager (IDM). Another stage was the grouping of CAI into each topic as indicated in the course outline.

Finally, the instructional process of each topic was done by taking the learners through each lesson step by step with the help of CAI. The researcher only served as a guide on each instructional process. The intervention process is as indicated in Figure 3.1.

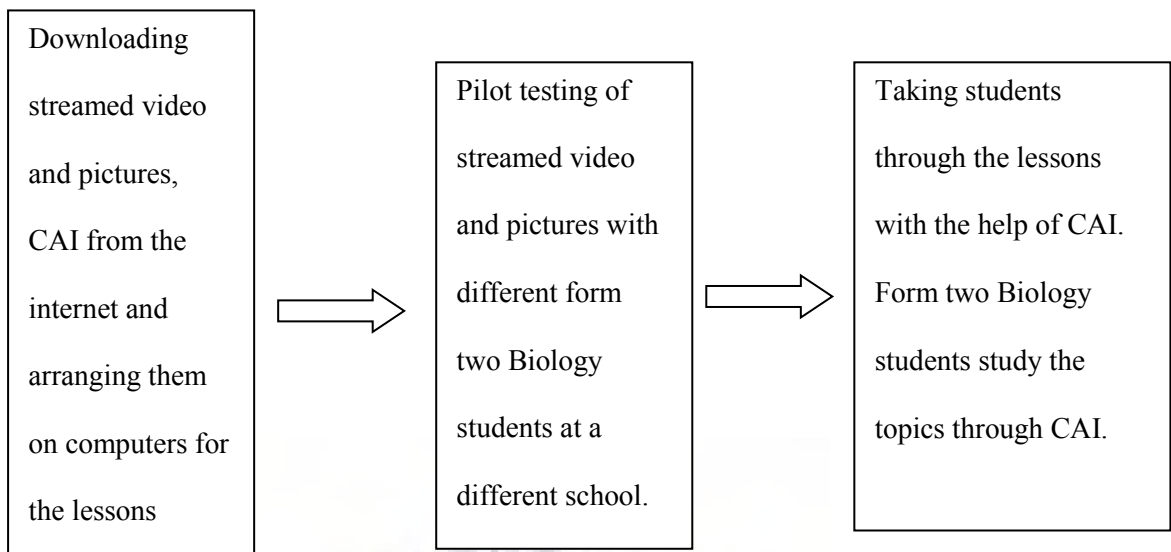


Figure 3.1: Major stages in intervention

Steps on How to Use Computer assisted instruction

1. Selection of picture and videos from computer programmes for each selected topic.
2. Building specific instruction for each selected topic.
3. Observing/reflecting on the computer assisted instruction built.
4. Referring to literature in each specific topic on relevant books
5. Identifying the types of computer assisted instruction involved in the formation of each selected topic.
6. Writing the key information for each selected topic
7. Group or class discussion.

Treatment Procedure

Lesson note was structured according to biology syllabus for Senior High School in Ghana

The treatment was carried out on the 208 Form Two Biology students in Chereponi Senior High School. During this period, students were taught on the digestive system, fundamental ecological concepts, pollution and transport in plants using the computer assisted instruction. In all four (4) weeks were used for the intervention.

Week One

Digestive System Lesson Plan

In this digestive system lesson plan which is adaptable for SHS 2 students use a free online science interactive to learn about the organs and organ substructures of the human digestive system. Students work in teams to identify the digestive system's parts and structures, and drag and drop them to the correct position within the body to build a complete system. Students also attempt case studies where a problem within the system must be linked to the structure affected.

Students:

- Work collaboratively to identify the parts and structures of the human digestive system.
- Use an online interactive to build a complete digestive system and explore how the parts work together.
- Apply problem solving skills to various case studies, linking variables to the organ structure affected.

Materials:

Interactive whiteboard

Computer with internet access

Four small dry erase boards, iPad/tablets, or large sheets of papers

Preparation:

This lesson plan features an interactive activity in which students learn about the human digestive system. Build-A-Body is a drag and drop interactive in which players choose organs from the organ tray and drag and drop them in their correct position within the body to build the digestive system. The interactive also includes case studies where a problem within the system must be linked to the structure affected. To prepare for this lesson, preview the Digestive System movie and the Build-A-Body interactive, and plan how to adapt the resources for your students' needs.

Lesson Procedure:

Play the Digestive System movie to review what students have already learned about the digestive system.

Project the Build-A-Body interactive for the class to see. Divide the class into four groups, and tell students they will have the chance to compete in teams to assemble a human digestive system. The game will be played in two sections: identifying parts and structures within the system, and attempting case studies where a problem with the system must be linked to the structure affected.

Read the text to the left of the illustration, and then choose one part of the digestive system that's listed on the right. Challenge students to work with their team to define the part, and write a definition on a small dry erase board, iPad/tablet, or even a sheet of paper. On your signal, have each team hold up their definition for you to read.

Click on the body part and read the definition that is now displayed on the left. Compare the definitions to those that students generated. For quicker game play, the teacher can determine whether each team's definition is accurate enough to receive points (3 points for an excellent answer, 2 points for a good answer, 1 point for partially correct response, or 0 points for an inaccurate response). For more in-depth game play, display all the teams' answers at the front of the room and have the class analyse them together. You could rank the responses from most thorough and accurate to least, awarding the top-rated response 3 points, the second top-rated response 2 points, the third top-rated response of 1 point and the fourth-place response earning no points. Keep track of each team's points on the board.

After discussing each part of the digestive system, students are to answer case studies where a problem within the body must be linked to the structure affected. They click on one of the case studies at the top of the screen, and have each team work together to determine combinations to try. Each team writes down their strategy. Have one player from each team take turns coming up to the interactive whiteboard, enter their solution and award points based on the level of success each strategy produces. Alternatively (and to save time), you could assign a different variable to each group.

Students are encouraged to reflect on the structures they explored through the interactive. Students are made to conduct further research about one of the problems raised in the case studies, and make additional real-world connections.

Week Two

Title of lesson: pollution

Learning outcomes

With the help of computer assisted instruction and teacher guidance students should be able to research information on the topic pollution on the internet.

With the teacher guidance students should be able to identify ways to protect the environment from pollution.

Materials

1. Papers
2. Crayons and/or colour markers
3. Pencil and paper (to make notes for lesson plan assessment and reflections).

Technologies that will be used in this lesson include:

- Computer with internet connection
- Students will computer to research information on the internet.

Procedure

Step one

Divide students into groups. Assign a small group of students to one computer. Explain to students to use the computer to find out information about pollution. List two or more questions that introduce students to the topic that establish a connection to student's prior knowledge by asking them:

1. Have you ever picked up trash that may not be your own? Why did you decide to do that?
2. Can you tell me some ways you can help prevent pollution?

Today we are going to learn about the different types of pollution and how we can keep our environment clean by visiting websites on the internet and we will do a funny activity.

Researcher/teacher has made a special webpage for your class. (During the discussion have students turn away from the computer to interact.)

Step two

Have students sit at the computer where they control the mouse and the computer. Explain to student's the processes of the lesson. After we have visited several websites about pollution, students were made to explain the various types of pollution we have and their causes. They should also be able to create posters that will be put around the school to remind students of the various ways of keeping their environment clean.

Check for understanding

Have students explore and discuss the information in each of the 3 pre- selected websites. Ask students guiding questions about the important concepts in each of the visited websites. List three or more questions

1. What is air pollution?
2. How does the thinning of the ozone layer affect our health?
3. What are the three major sources of water pollution?
4. Why is it important for everyone to get involved in the recycling process?

Students are then given the chance to ask questions about things they observed and did not understand. The class was then brought to an end.

Week Three

In this fundamental ecology lesson plan which is adaptable for SHS 2 students to use a free online science interactive to learn about the various types of ecosystem's we have. Students were shown different types of ecosystems on the internet and were ask to explain the various types they had seen.

Students:

- Work collaboratively to identify the types of ecosystems.
- Use an online interactive to be able to differentiate the various types of ecosystems they had seen and give reasons for that.

Materials:

Interactive whiteboard

Computer with internet access

Four small dry erase boards, iPad/tablets, or large sheets of papers

Preparation:

The lesson plan features an interactive activity in which students learn about the ecology. Students went to different websites where they observed the different types of ecosystems and the compositions of each type. To prepare for this lesson, students were asked to describe their environment in which they found themselves and the various things they can find in their environment, whether living or non-living things.

Students are encouraged to reflect on what they observed through the interaction. Students were then put into groups to write a report on what they observed and learnt so far.

Week Four

Transport in plants

Lesson Plan

In this lesson plan students used free online science interactive sites to learn about the two main types of plant tissues that are used in the transport system. Students visited different educational websites where they had the opportunity to see how plants absorb mineral salts and water from the soil and the various mechanisms that were involved in the process.

After students had finished viewing clips on this they were put into groups to discuss what they saw.

After that there was a general class discussion, where students had the opportunity to ask questions about things that they did not understand and the class was brought to an end.

Data Collection Procedure

The data collection started with the presentation of an introductory letter from the Head of the Department of Science Education, University of Education, Winneba, to the headmaster of Chereponi Senior High School, seeking permission to conduct the study which took place within the third week of January, 2016.

The students' interest in Science Questionnaire was one of the instruments that were used for the data collection that sourced for information on students' interest in Biology before and after the intervention process. The questionnaire consisted of 30 closed- ended items which respondents were given the whole day to make careful consideration of the indicators in completing the questionnaire and to return them to

the researcher at the end of the day. The questionnaire was administered within the second first week of February, 2016 before the intervention process and that of the post questionnaire was done within the third week of March, 2016 after the intervention process. Both the pre-questionnaire and the post-questionnaire recorded a recovery rate of 100% respectively.

The next instrument that was used for the data collection was the students Observation Schedule. The observation schedule was carried out in all the four topics treated using CAI. The observation schedule consisted of 10 Likert scale items in which the observers were expected to tick the indicators observed on the learners during the computer assisted instructions.

Open ended interview was another instrument that was used for the data collection. The interview was done after the intervention stage. The interview was done on 20 form two Biology students who were randomly selected. The interview consisted of eight items that were intended to source for form two Biology students interest in Biology after the intervention with the use of CAI. It also included other probing questions that were posed by the researcher during the interview as when and where the need arose. The interview process of data collection took place within the third week of March, 2016.

The fourth instrument used for the data collection was also the test dubbed Interim Assessment for students). This was used during the period of intervention. The test was used after each completed topic. This consisted of four set of items that were used after the treatment of each topic. It was used to source for form two Biology students' performance in Biology after the treatment of each selected topic within the use of CAI.

Data Analysis

The data collected from the questionnaire and observations were analyzed using Statistical Product and Service Solutions (SPSS version 16.0). Descriptive statistics was used to organize the data collected from questionnaire and observation into frequencies and percentages in order to answer the research questions.

The data collected from the test (interim assessment) were also organized cumulatively into groups: that is excellent, very good, good average (fair) and below average (poor). The data collected from the interview were also reported. This was done to answer the research questions 1, 2, 3 and 4 formulated for the study.

Ethical Issues

The researcher need to protect the identity of the students and the institution, develops a trust with them and promote the integrity of the research. In order to ensure proactive participation of the intact respondents and their school, confidentiality of their information and opportunity that was offered in this study was make known to them in order to protect the rights and welfare of participants and to minimize the risk of physical and mental discomfort from the information they provided. To maintain confidentiality, names and index numbers were not used to identify the respondents. Instead, codes were assigned to each respondent for easy data analysis. After the data collection, round off activities like expressing gratitude to all respondents, the observers, the staff and headmaster of the school for the permission, participation and commitment granted for this study was done.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Overview

In this chapter, the analysis of data collected from the questionnaires, interviews, test (interim assessment) and observation schedules for Form two students of Chereponi Senior High School are presented. The results were then used to answer the research questions formulated for the study.

This chapter is divided into sections; the first section presents the demographic characteristics of the respondents. The second section presents the findings based on the research questions for the study.

The research question one (1) was analyzed quantitatively while the research question 2 was analysed qualitatively.

Demographic Information of the Sample

The study sample was made up of 198 students (140 male and 58 females). The demographic information is presented in Figure 4.1.

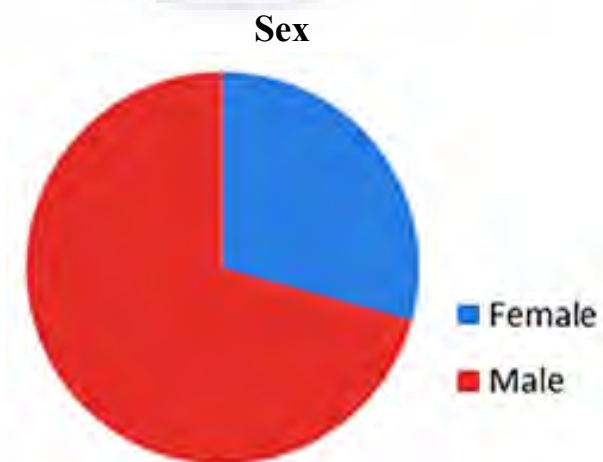


Figure 4.1: Sex of the Respondents

Figure 4.2 shows that for the study sample 70.70% (n=140) were males and 29.29% (n=58) were females.

The age distribution of the sample is shown in Table 4.1. The student's ages are grouped. provides the age distribution of the sample used in the study.

Table 4.1: Age distribution of respondents

Age	Frequency	Percentage
13-15	22	11.1
16-18	97	49.0
18-20	45	22.7
21 and above	34	17.2
Total	198	100.0

The dominant age group ranged between 16-18 years (49.0%, n=97), followed by 18-20 years (22.7%, n=45), followed by ages 21 and above years (17.2%, n=34) and finally followed by ages 13-15 years (11.1%, n=22) respectively.

Programmes offered by respondents of the study are represented in Figure 4.2

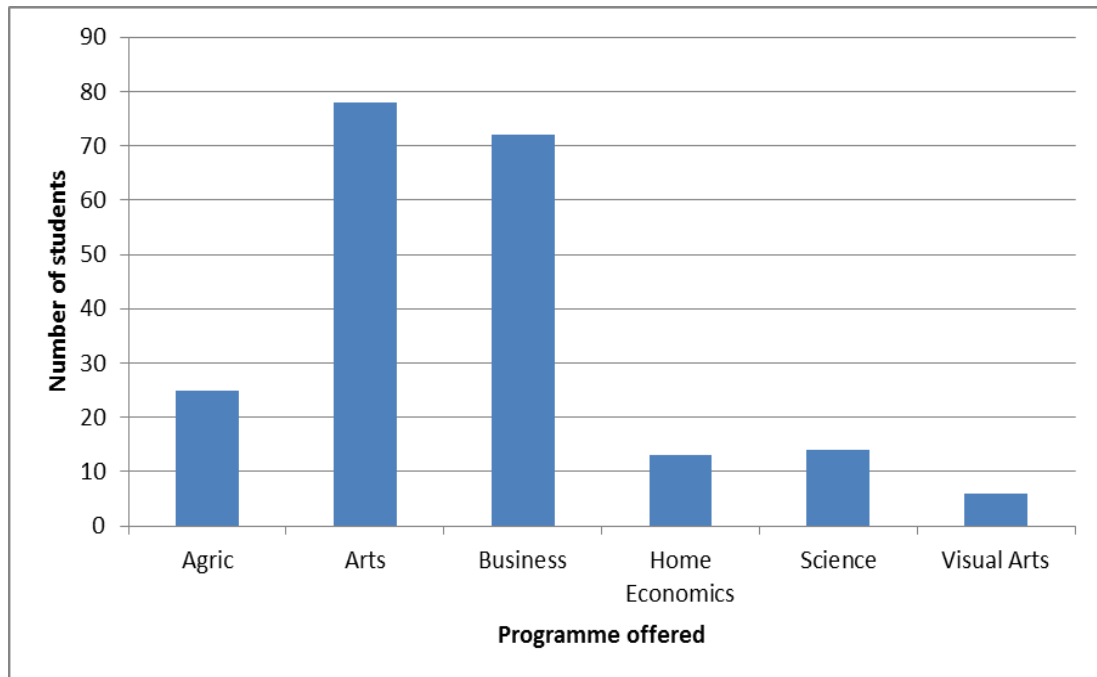


Figure 4.2: Programmes offered by the Respondents at the SHS Level

From 4.2. the dominant subject was Arts (37%, n=78) and the least programme offered was Visual Arts (3%, n=6). It can be seen from the results that majority of the students did not have a strong background in science. Majority of the students are arts and business based courses and as such these categories of students do not take science seriously at the JHS level. Thus it can be said that these students have a weak background in science and it would be understandable that they would find it difficult to maintain an active interest in biology.

Research Question one (1)

How will the use of CIA help improve the performance of learners at Chereponi senior high school in some selected topics in Biology?

The intent of research question one (1) was to investigate whether the use of CAI will improve upon the performance of the form two students' scores in Biology. The data used in answering this question was the students' scores on tests and assignments, which were conducted at various points during the use of CAI. The tests and assignments were collated and finally cumulatively graded over 100 for the final scores, which was to ascertain their level performance in the subject.

A summary of the overall performance of the students in the tests and assignments given to them during the use of CAI in teaching Biology are presented in Table 4.7. The scores of each test and assignment were cumulatively graded over 100 for the final score. The grading scale used was 80-100 for Excellent, 70-79 for Very Good, 60-69 for Good, 50-59 for fair and less than 50 for Poor.

Table 4.7: Cumulated Test Scores for form two Biology students of Chereponi SHS during the use of CAI in some selected Biology topics

Grading	Frequency	Percentage (%)
Excellent	119	60.1
Very Good	72	36.4
Good	2	1.0
Fair	0	0.0
Poor	5	2.5
Total	198	100

From Table 4.7, the Mean Total Test score was 79 with a maximum score of 90 and minimum of 21. One hundred and nineteen (60.1%, n=119) of the students received an Excellent grade, seventy two (36% (n=72) received Very Good, two (1.0%, n=2) students received a Good grade and five students (2.5, n=5) received a Poor grade. No student received a Fair Grade.

A breakdown of the average performance on tests during the period of using the CAI in Biology to Form two students of Chereponi Senior High School is presented in Table 4.8.

Table 4.8: Average Performance of form two students of Chereponi Senior High School in test administered

Statistics	Test 1	Test 2	Test 3	Test 4
Mean score	62	76	81	87
Max	76	81	88	95
Min	21	36	39	45

From Table 4.8 it can be seen that there was a progression in the average performance of students from test 1 to test 4. This can also be seen in the increase in both the maximum and minimum scores from test 1 to test 4. This shows an increase and improved performance of students as they used the CAI for learning Biology.

Hypothesis testing

To determine whether there was a statistical significance in the performance of Form two Biology students when they were taught selected topics in Biology using computer assisted instruction (CAI). Research question one was therefore formulated into the null hypothesis as:

Ho: There is no significant difference in the performance of form two students when they were taught selected topics in biology using computer assisted instruction.

Table 4.9: Comparing the mean pre-test and post-test of students

Type of test	N	Mean	SD	variance	Df	t-value	p-value
Pre-test	198	8.23	5.51	30.32	197	1.972	4.81E4
Post-test	198	13.29	4.54	20.62	197		

The results from the table shows that, t-value =1.972 and a p-value of 4.81E40 at $t=1.972, p<0.05$) renders a decision that the difference is statistically significant based on the 95% confidence level. This means that, there is a significant difference in the performance of students with the introduction of computer assisted instruction in teaching the four selected topics in Biology, therefore, the null hypotheses is rejected.

Research Question Two (2)

What is the effect of the use of CIA on student's interest in Biology?

Pre-intervention Questionnaire

The purpose of research question two (2) was to find out or investigate how the use of CAI in teaching Form two students Biology affected their interest in learning the subject. As indicated previously, the CAI was introduced to the form two students as a way of stimulating their interest in learning of the subject and the question sought to measure and ascertain if the CAI had any sort of effect whatsoever on their interest in the subject. The data was collected using a pre-designed instrument to measure the extent of their interest in the subject. The questionnaire was administered prior to the

introduction of the CAI and this presented the researcher with the baseline information which formed the basis for the study. The same instruments were administered after the CAI had been introduced to the students.

The data was analysed using descriptive statistics of the Likert scale items presented in the questionnaire and a comparison of the pre-intervention questionnaire and post-intervention questionnaire made. The results of the analyses are presented in the Table 4.2. The pre questionnaire data means the data for form two students on their interest in biology before the CAI programme was used to teach them. For the interpretation of the mean score, Likert scale items, where strongly agree was given a value of 5, Agree was given a value of 4, Neutral was given a value of 3, Disagree a value of 2 and strongly Disagree a value of 1 were used. This is also represented in Figure 4.3.

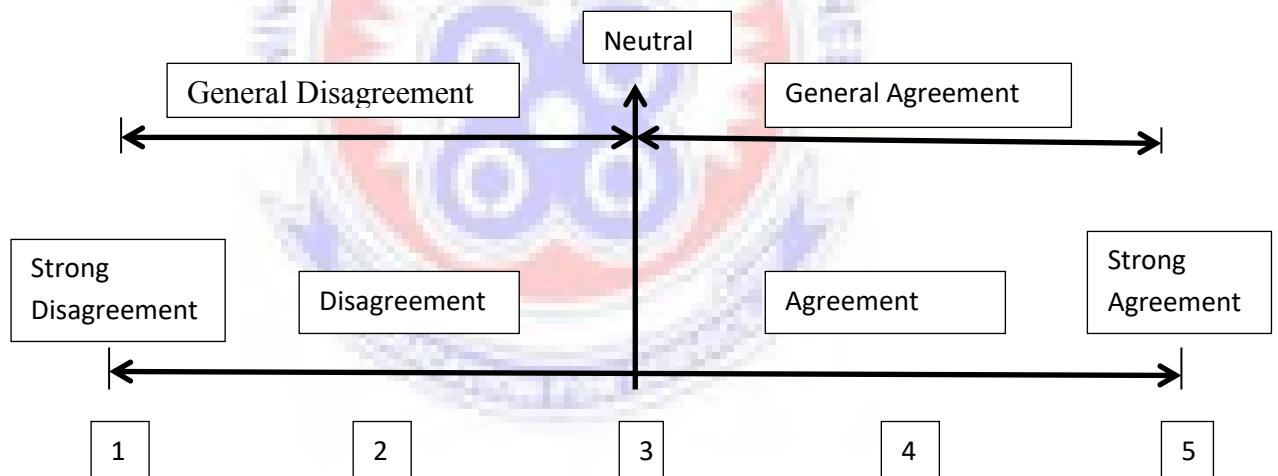


Figure 4.3: An illustration of the Neutral position on the Five-point Likert-type Scale

Table 4.2: Pre-intervention questionnaire on Interest of form two students in

Biology

Question/ item	SA	A	N	D	SD	Mean	Interpretation
Q3	122 (59%)	71 (34%)	8 (4%)	1 (0.5%)	6 (3%)	1.55	Disagree
Q4	54 (26%)	97 (47%)	34 (16%)	16 (7%)	7 (3%)	2.16	Disagree
Q5	18 (9%)	35 (17%)	46 (22%)	73 (35%)	36 (17%)	3.36	Neutral
Q6	9 (4%)	46 (24%)	52 (25%)	72 (35%)	26 (15%)	3.27	Neutral
Q7	13 (16%)	40 (19%)	29 (14%)	78 (37%)	26 (15%)	3.52	Agree
Q8	157 (75%)	42 (20%)	1 (0.5%)	5 (2.4%)	3 (1.4%)	1.34	Strongly Agree
Q9	65 (31%)	65 (31%)	38 (18%)	21 (10%)	12 (6%)	2.25	Disagree
Q10	5 (2%)	5 (2%)	11 (5%)	83 (40%)	100 (48%)	4.27	Agree
Q11	7 (3%)	22 (11%)	34 (16%)	80 (38%)	65 (31%)	3.84	Agree
Q12	16 (8%)	53 (25%)	30 (14%)	76 (36%)	33 (16%)	3.27	Neutral
Q13	19 (9%)	63 (30%)	82 (39%)	33 (16%)	11 (5%)	2.78	Neutral
Q14	21 (10%)	77 (37%)	58 (28%)	44 (21%)	8 (4%)	2.72	Neutral
Q15	44 (21%)	107 (51%)	31 (15%)	20 (10%)	6 (3%)	2.22	Disagree
Q16	10 (5%)	37 (18%)	40 (19%)	79 (38%)	42 (42%)	3.51	Agree

Q17	11 (5%)	35 (18%)	23 (19%)	80 (38%)	59 (42%)	3.68	Agree
Q18	87 (42%)	87 (42%)	18 (9%)	9 (4%)	7 (3%)	1.86	Disagree
Q19	69 (33%)	82 (39%)	32 (15%)	18 (9%)	7 (3%)	2.10	Disagree
Q20	42 (20%)	92 (44%)	38 (18%)	24 (11%)	12 (6%)	2.38	Disagree
Q21	23 (11%)	57 (27%)	32 (15%)	66 (32%)	30 (14%)	3.11	Neutral
Q22	12 (6%)	37 (18%)	35 (17%)	83 (40%)	41 (20%)	3.50	Agree
Q23	22 (5%)	68 (33%)	54 (26%)	43 (21%)	21 (10%)	2.87	Neutral
Q24	10 (5%)	14 (7%)	25 (12%)	80 (38%)	79 (38%)	3.98	Agree
Q25	17 (8%)	18 (9%)	31 (15%)	82 (39%)	60 (29%)	3.72	Agree
Q26	32 (15%)	80 (38%)	51 (24%)	35 (17%)	9 (4%)	2.56	Neutral
Q27	22 (11%)	41 (20%)	30 (14%)	76 (36%)	39 (19%)	3.33	Neutral
Q28	30 (14%)	60 (29%)	40 (19%)	54 (26%)	24 (11%)	2.91	Neutral
Q29	29 (14%)	57 (27%)	43 (21%)	62 (30%)	17 (8%)	1.91	Disagree
Q30	85 (41%)	91 (44%)	13 (6%)	10 (5%)	9 (4%)	1.88	Disagree

Note: Question 1 and 2 were used to elicit demographic details from the student

Post-Intervention questionnaire

Table 4.3 present the post-intervention data for form two students of Chereponi SHS on their interest in Biology after the CAI programme was used to teach them.

Table 4.3: Post-intervention questionnaire on interest of Form two students of Chereponi SHS in Biology

Question/item	SA	A	N	D	SD	Mean	Interpretation
Q3	122 (59%)	81 (38.5%)	2 (1%)	1 (0.5%)	2 (1%)	4.46	Agree
Q4	73 (35%)	113 (54%)	9 (4%)	10 (5%)	4 (2%)	4.16	Agree
Q5	5 (2%)	17 (8%)	46 (22%)	91 (43%)	49 (24%)	4.36	Agree
Q6	59 (28%)	105 (51%)	13 (6%)	22 (11%)	9 (4%)	4.27	Agree
Q7	4 (2%)	12 (6%)	15 (7%)	103 (50%)	74 (36%)	1.52	Disagree
Q8	157 (75%)	42 (20%)	1 (0.5%)	5 (2.4%)	3 (1.4%)	4.34	Agree
Q9	65 (31%)	72 (35%)	38 (18%)	21 (10%)	12 (6%)	3.62	Agree
Q10	5 (2%)	9 (4%)	11 (5%)	83 (40%)	100 (48%)	1.27	Strongly Disagree
Q11	7 (3%)	22 (11%)	34 (16%)	80 (38%)	65 (31%)	1.74	Disagree
Q12	16 (8%)	53 (25%)	30 (14%)	76 (36%)	33 (31%)	1.27	Strongly Disagree
Q13	19 (9%)	63 (30%)	82 (39%)	33 (16%)	11 (5%)	3.86	Agree
Q14	21 (10%)	77 (37%)	58 (28%)	44 (21%)	8 (4%)	3.72	Agree
Q15	44 (21%)	107 (51%)	31 (15%)	20 (10%)	6 (3%)	3.82	Agree
Q16	10 (5%)	37 (17%)	40 (11%)	79 (38%)	42 (42%)	1.51	Disagree
Q17	11 (5%)	35 (17%)	23 (11%)	80 (38%)	59 (28%)	1.38	Strongly Disagree

Q18	87 (42%)	87 (42%)	18 (9%)	9 (4%)	7 (3%)	3.86	Agree
Q19	69 (33%)	82 (39%)	32 (15%)	18 (9%)	7 (3%)	4.30	Agree
Q20	42 (20%)	92 (44%)	38 (18%)	24 (11%)	12 (6%)	3.38	Neutral
Q21	23 (11%)	57 (27%)	32 (15%)	66 (32%)	30 (14%)	1.11	Strongly Disagree
Q22	12 (6%)	37 (18%)	35 (17%)	83 (40%)	41 (20%)	3.30	Neutral
Q23	22 (5%)	68 (33%)	54 (26%)	43 (21%)	21 (10%)	3.87	Agree
Q24	10 (5%)	14 (7%)	25 (12%)	80 (38%)	79 (38%)	1.98	Disagree
Q25	17 (8%)	18 (9%)	31 (15%)	82 (39%)	60 (29%)	1.67	Disagree
Q26	32 (15%)	80 (38%)	51 (24%)	35 (17%)	9 (4%)	3.56	Agree
Q27	2 (1%)	7 (4%)	10 (5%)	125 (60%)	64 (31%)	2.33	Disagree
Q28	52 (25%)	130 (63%)	4 (2%)	14 (7%)	6 (4%)	3.91	Agree
Q29	49 (24%)	137 (66%)	10 (5%)	9 (4.5%)	3 (1.5%)	3.91	Agree
Q30	58 (28%)	139 (67%)	7 (3%)	3 (1.5%)	1 (0.5%)	3.88	Agree

A comparison of the mean response scores for the pre-intervention questionnaire (pre-IQ) and post intervention questionnaire (post-IQ) and the interpretation of the mean scores as compared to Likert scale items used in measuring the response is presented in Table 4.4.

Table 4.4: Comparison of Pre-intervention questionnaire and Post-intervention questionnaire Data of form two biology students Interest in Biology Science

Question/item	Pre-IQ		Post-IQ	
	Mean	Interpretation	Mean	Interpretation
Q3	1.55	Disagree	4.46	Strongly Agree
Q4	2.16	Disagree	4.16	Agree
Q5	3.36	Neutral	4.36	Agree
Q6	3.27	Neutral	4.27	Agree
Q7	3.52	Agree	1.52	Disagree
Q8	1.34	Strongly Disagree	4.34	Agree
Q9	2.25	Disagree	3.62	Agree
Q10	4.27	Agree	1.27	Strongly Agree
Q11	3.84	Agree	1.74	Disagree
Q12	3.27	Neutral	1.27	Strongly Agree
Q13	2.78	Neutral	3.86	Agree
Q14	2.72	Neutral	3.72	Agree
Q15	2.22	Disagree	3.82	Agree
Q16	3.51	Agree	1.51	Disagree
Q17	3.68	Agree	1.38	Strongly Agree
Q18	1.86	Disagree	3.86	Agree
Q19	2.1	Disagree	4.30	Agree
Q20	2.38	Disagree	3.38	Neutral
Q21	3.11	Neutral	1.11	Strongly Agree
Q22	3.50	Agree	3.30	Neutral
Q23	2.87	Neutral	3.87	Agree
Q24	3.98	Agree	1.98	Disagree
Q25	3.72	Agree	1.67	Disagree
Q26	2.56	Neutral	3.56	Agree
Q27	3.33	Neutral	2.33	Disagree
Q28	2.91	Neutral	3.91	Agree
Q29	1.91	Disagree	3.91	Agree
Q30	1.88	Disagree	3.88	Agree
Overall mean	2.05		3.08	

Note: the overall average mean for the pre-intervention questionnaire (pre-IQ) was 2.05 and that of the post intervention questionnaire (post-IQ) was 3.08.

It could be seen from Table 4.4 that there was an observed difference in the responses on the pre-intervention questionnaire and post-intervention questionnaire. The overall average mean of the pre-intervention questionnaire was 2.05 and that of the post-intervention questionnaire was 3.08.

A t-test analysis carried out to determine whether the observed difference was statistically significant.

Table 4.5: Results of t-test Analysis of Pre-intervention questionnaire and Post-intervention questionnaire Scores of Form two students of Chereponi SHS

Statistics	N	Mean	SD	Df	t-cal	p.value
Pre-IQ	28	1.03	2.12	27	8.15	0.02
Post-IQ	28	3.92	1.01			

The results $t(28) = 8.15, p < 0.05$ show that there is a statistically significant difference in the pre and post intervention interest questionnaire scores of form two students of Chereponi Senior High School with respect to their interest in Biology.

Observation Schedule Responses

The purpose of the observation instrument in the form of a questionnaire was used to further elicit information about students' actions and general interest in class during the use of CAI. The instrument was in all the four selected topics that CAI was utilized. The questionnaire item utilized a Likert scale in its design. The data was analysed using descriptive statistics. The responses of observers from each of the observations were collated and an average was struck and the percentage responses for each item are presented in Table 4.6.

Table 4.6: Observation Schedule Responses

Question/item	Always	Often	Sometimes	Never
Q1	73%	17%	10%	0%
Q2	15%	57%	25%	3%
Q3	32%	40%	23%	5%
Q4	25%	55%	15%	5%
Q5	25%	52%	13%	10%
Q6	8%	63%	22%	8%
Q7	57%	28%	12%	3%
Q8	15%	55%	27%	3%
Q9	30%	42%	20%	8%
Q10	70%	2%	5%	0%

The percentages of responses in Table 4.6 show that the use of CAI in teaching science had a positive effect on their interest and learning of Biology. This can be deduced from the high frequency of positive responses of students from the observation checklist.

Qualitative Data Analysis on Interview session with students

A qualitative data analyses of form two Biology students of Chereponi SHS on comments made during the interview session is presented with respect to their impressions about the effects of CAI on their interest in Biology. Data was collected from twenty (20) students in a focus group interview session. The students who participated in the focus group sessions were randomly selected and were made up of ten (10) males and ten (10) females. Two interview sessions were conducted for the students and each interview session was made up of ten (10) students, five (5) males

and five (5) females. The responses of the interviewees were recorded and a thematic analysis was done to code and group responses to the various questions on students' impressions about the use of CAI in the teaching of Biology. A few of their comments are shown under the following themes:

Understanding of concepts in the selected Biology topics

The students were of the view that the use of the computer-assisted instruction has made them understand concepts in Biology topics, hence they have become confident and can depend on their own understanding to explain concepts in Biology.

One student stated that: "My learning of science has increased. And now I am very punctual to class and I find that I am able to understand the concepts and this has improved my confidence in discussing concepts in Biology with my colleagues"

Learning by doing

Students had several opportunities to try severally within the shortest possible time before getting the right response. This actually motivated them to be curious of trying to get the right answer all the time, and in so doing they had better conceptual understanding in Biology.

Another student commented that: "I am now able to answer questions in class and I understand everything better. This because with the CAI I am now able to go over concepts I don't understand to make sure that I get them before I move on to the next topic of lesson "

Visualising what is going on

Most students were of the view, because they could visualise what is being taught with the use of the computer animations and simulations, most of the concepts were

easily understood. Hence the Biology lessons were lively and they stay longer without thinking about time spent. Unlike the use of the traditional lecture approach where most of these concepts are taught in abstract.

Another student came out that: “I am no longer bored in class and I can stay longer in class. Because of the CAI I ensure that I pay attention to what is going. With CAI I can visualise concepts. This time it is not the same as the abstract things we were doing that we cannot relate with anything.”

Discussions

The findings of the data analyses for research question one revealed that there was a statistically significant difference in the performance of Form Two students of Chereponi Senior High School in the use of computer assisted instruction. The students scored high marks in the test with an observed increase in test scores as they continued to interact with the CAI in learning Biology.

The findings of the data analyses for research question one are in line with Freeman (2000) who studied the relationship among laboratory instruction, interest towards Biology and performance in Biology of students enrolled in a ninth-grade physical biology course in a large urban high school. He concluded that interest towards Biology influences performances and additionally that a hands-on laboratory programme influences the interest of students towards Biology and influences their performances in Biology knowledge. Freeman defined interest towards Biology as the students' perception of their ability to perform in Biology.

According to Koballa and Glynn (2007), attitudes are feelings of like or dislike. Simpson and Troost (1982) referred to interest towards Biology and science learning and concluded that people are committed to Biology when they better understand it.

Fair-Brother (2000) claimed that pupils learn if only they want to learn. There are many problems regarding the way science is taught in school, especially if a consideration is made on non-science students as an important target population.

The first stumbling block for research into interest towards science is that such interest does not consist of a single unitary construct but rather, consists of a large number of sub-constructs all of which contribute in varying proportions towards an individual's interest towards Biology. Various researches have incorporated a range of components in their measures of interest to Biology including the perception of the science teacher, anxiety towards science, the value of science (Brown, 1995; Piburn, 1993), self-esteem at science; motivation towards science; enjoyment of science (Crawley & Black, 1992; Koballa, 1995), attitude of friends and peers towards science; attitudes of parents towards science; the nature of the science classroom environment (Haladyna, Olsen, & Shaughnessy, 1982), achievement in Biology and fear of failure of the course (Breakwell & beardshell, 1992; Koballa, 1995).

Interest may refer to a resulting curiosity in something by an individual due to the interaction of the person with the context and situation; interest (Hidi & Harackiewicz, 2000).

Osborne, Simon and Collins (2003) view it as a particular type of interest towards some specific action to be performed towards an object (interest towards doing school

science). Crawley and Coe (1990) explored interest as a specific issue of students attitude towards biology and their attitude to studying further courses in science.

In an analysis of Biology education from a socio-cultural perspective, Lemke (2001) points out that student's willingness to entertain particular conceptual accounts of phenomena depend on community beliefs, acceptable identities, and the consequences for a student's life outside the classroom.

While some may question the value of scientific knowledge (De Boer, 2000), lack of interest in Biology remains a matter of concern for any society attempting to raise its standards of scientific literacy (Osborne, Simon, & Collins, 2003). This becomes especially so with the evidence that children's interest to science declines from the point of entry to secondary school (Breakwell & Beardsell, 1992).

Findings on the effect of the data analyses for research question two revealed that there was a statistically significant difference in the use of CAI to improve upon the interest of form two students of Chereponi Senior High School in Biology. There was an observed improvement in form two students of Chereponi Senior High School interest in Biology with the use of computer assisted instruction. The results of the analyses show that interest should be a major factor in the learning process. If there is no intention to learn, at least students who are studying need to have a positive interest in the lesson. According to emotional interest theory the addition of interesting things but irrelevant material to a text book lesson engages readers so that they pay more attention in learning and learn more. Although the material is irrelevant to the explanation, it is related to the topic and intended to heighten the reader's curiosity and interest in that topic.

According to emotional interest adjuncts such as seductive text or seductive illustrations, they influence the readers' affection by promoting their enjoyment on the text. The increase in emotional arousal influences the reader's cognition. That is the increase in enjoyment causes the reader to pay more attention to and encode more of the text. If emotional interest theory is correct, we can predict the emotional interest adjuncts to texts of retention and transfer (Kintsch, 1980).

Interest will become a motivation force that will encourage somebody to learn. The students will look like being encouraged to learn continually than the others who only accept the lesson. They just do not move to learn more and more because of the lack of encouragement or interest.

This goes to confirm the assertion by a number of science educators who are of the view that computer assisted instruction offers a tremendous potential for the enhancement of the teaching and learning of Biology concepts. Switzer and White (1984), and Akpan and Andre (1998) discuss the role of computer assisted instruction in the Biology classroom is to enhance learning. In addition to the stimulation ability, it is also to provide opportunities for learners to develop skills in problem identification, seeking, organizing, analyzing, and evaluating and communication information.

The role of computer assisted instruction in teaching and learning is beyond dispute that its contributions in educational and instructional process are so significant. According to Doganay (2002), the advantages supplied by this method are as follows:

- It increases efficiency in education and instruction; it makes effectiveness of teaching in classroom.
- It makes education and instruction enjoyable and attractive.

- It motivates the students to the lesson by the help of sound, pictures and music
- It makes it easy to repeat complicated problems, concepts and processes many times.
- It contributes to student's intelligence development.
- It gives the students concrete experiences similar to real life.
- It causes the students to reach rich information sources.
- It develops the student's self- confidence.
- It gives the students courage, ambition, and excitement and in this way it makes development and success of students easier.



CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Overview

The purpose of this study was to investigate the effects of CAI in enhancing the performance and interest of form two biology students. This chapter summarizes the research findings and looks at the conclusions and recommendations made by the researcher.

Summary

The research was conducted to find out the interest and performance towards the use of CAI as a teaching approach for form two students of Chereponi Senior High School in the Northern region of Ghana. A sample size of 198 Form Two Biology students was used. The data analyses revealed that there was an improvement in the interest of form two students in Biology with the CAI and this improvement was found to be statistically significant as the p-value of the pre and post questionnaire was $p=0.02$. The data analyses also revealed that there was positive improvement in the “Form Two students” performance in Biology with use of the CAI as a form of instruction and this improvement was found to be statistically significant. The findings revealed that the use of CAI in Biology had a positive impact on the interest and performance of Form Two Biology students of the Chereponi Senior High School.

Conclusion

The purpose of this study was to investigate the effects of the CAI on the interest and performance of form two students of Chereponi Senior High School. The descriptive statistical analysis of the findings revealed that indeed the use of CAI in selected

topics in Biology has positive impact on interest and performance of Form Two Biology students of Chereponi Senior High School. This simply means that teachers, especially those teaching Biology can use computer assisted instruction for teaching, as this will enhance effectively the interest and performance of students enrolled in that subject. Computer based teaching and learning, when used effectively can engage and improve students' interest in studying various subjects especially the so called "difficult" subjects like Biology, Mathematics and Physics.

This research contributes to knowledge, as it has demonstrated that through the use of Computer Assisted Instruction, Form Two students from a remote and disadvantaged rural senior high school, who previously detested the study of Biology, gradually developed keen interest and enthusiasm in the study of this discipline. Thus, this study has also identified the fact that the use of Computer Assisted Instruction is not the reserve of well-endowed urban schools only, but can effectively serve as an essential teaching and learning tool with similar positive outcomes for all caliber of students, rural or urban, needy or affluent.

This study has documented results ascertaining the positive impact of the use of CAI on students learning of selected topics in Biology. If the use of CAI can impact positively the interest of rural students of Chereponi Senior High school in leaning of Biology, it is possible that its use in other schools could bring similar outcomes. In Ghana, many students complain of challenges in studying subjects like Mathematics, Physics, Chemistry and Biology, Probably, the deployment of CAI in our schools, would help improve the general students' distaste for these important disciplines, and thus, enhance the effective preparation of these students in the ultimate service of Mother Ghana. . .

Implication

CAI does have influence on the interest and performance of form two students in selected topics in Biology. Thus biology teaching should be designed in such a way that it incorporates CAI during lesson delivery for students in Chereponi Senior High School so that students would have better conceptual understanding, leading to effective grasp of questions relating to Biology.

Teachers teaching in Chereponi Senior High School should take advantage of the possibilities afforded by CAI and find ways of incorporating it into their teaching activities to ensure that students get the maximum benefits of their teaching as they stimulate and sustain their interest during lessons.

The Headmaster and academic board need to look at the new ways of learning and plan their time table in a way that takes cognizance of CAIs. This will go a long way to ensure that students' performance in the so called difficult subjects is improved, and this will in turn lead to a greater all round achievement by all students.

Recommendations

Based on the results and conclusion from the study, the researcher would like to make the following recommendations with the view that when properly adhered to they would impact positively on the interest and performance of Form Two students of Chereponi Senior High School and indeed other students studying Biology in other schools.

- i. There is the need to create awareness of the interest of CAI as an instructional method of influencing the interest and performance of students in Chereponi senior high school.

- ii. There is the need for schools to provide various CAI support systems for students to help them in their academic work.
- iii. There is also the need to replicate this study in other subject's areas in other Senior High Schools.
- iv. In addition, workshop and seminars should be organized for teachers in Chereponi Senior High School on the use of CAI in providing instruction and on how to provide CAI support systems to enable teachers perform better in their academic work.

Suggestions for Further Research

Based on the findings of this study, the following suggestions for further are made:

1. It would be appropriate if this study is done in other schools in other regions of the country if possible to assess the impact of CAIs instructional mode of having an influence on the interest and performance of students and come out with stronger conclusions.
2. Future studies could also investigate the impact or effects of the use of CAI in other subject's areas. Hence further research needs to be carried out in the area and expanded to include other municipalities in other regions on the attitude of teachers of senior high schools towards the academic work of students.

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APPENDICES

APPENDIX A

Code number..... Sex.....

Time 35minutes each

Answer all questions. Answer the five questions into the answer sheet provided and take home test (assignment) will be collected the next day.

Class Test One (for topic one)

1. Give the meaning of the following terminologies used in digestive system;
 - a. peristalsis
 - b. Assimilation.
2. Define the digestive system.
3. What enzymes are produced in the stomach?
4. Where in the digestive system is water reabsorbed?
5. What is the order of processes that takes place in the digestive system

Class Test Two (for Topic Two)

1. The parts of the earth's surface and the atmosphere that is habitable by living things and is divided into biomes is known as.....
2. Mention any four abiotic factors that influence living organisms in an ecosystem.
3. Write down the use of each of the following ecological instruments;
 - a. Hygrometer
 - b. Barometer
 - c. Secchi disc
 - d. Anemometer
4. What is symbiosis?
5. With an example explain the meaning of the food chain.

Class Test 3 (for Topic Three)

1. What is pollution?
2. State one cause, 2 pollutants, one effect and one control of land pollution.
3. State one cause, 2 pollutants, one effect and one control of water pollution.
4. State one cause, 2 pollutants, one effect and one control of air pollution.
5. State one cause, 2 effects, one effect and one control of noise pollution.

Class Test Four (for Topic Four)

1. What is diffusion
2. What is osmosis
3. Explain the following
 - a. Plasmolysis
 - b. Turgidity

Assignment 1 (Topic One)

Describe briefly how rice and egg stew will be digested beginning from the mouth to the large intestines.

Assignment 2 (Topic Two)

- a. Mention an ecological instrument and describe briefly how it is used
- b. Draw the nitrogen cycle as a nutrient input/recycling and briefly explain its parts

Assignment 3 (Topic Three)

Identify any two common types of pollution in your community and write briefly on them

Assignment 4 (Topic Four)

Carry out an experiment to demonstrate osmosis in a living tissue. Write your report under the following headings; title, materials, procedure, observations, conclusion, suggestions (if necessary).



APPENDIX B

Students interest in science questionnaire

Introduction

The following questionnaire is part of a study been conducted for a Master of Philosophy degree. You are required to respond to the items as sincere as possible. The information that you will provide will only be used for the purpose of research and will be kept confidential.

Therefore, do not write your name or index number on this questionnaire.

Please note that there are no rights or wrong responses to these items but what is only appropriate to you. Please the questionnaire consists of two parts, part A is designed to collect personal information and part B is also designed to collect general information. Each item is followed by five options; choose the option that best describes your opinion by indicating a tick (✓) in the appropriate box. Thank you very much for your co-operation.

A. Personal information

1. Sex: Male Female Age.....
2. SHS/SSS programme : science Agric Arts
Home Economics Business Visual Arts Technical

B General Information

Question /item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3. Biology is useful to my learning process.					
4. Biology is something which I enjoy very much.					
5. Solving Biology					

questions is fun for me.					
6. Biology is easy for me					
7. I would like to spend my less time in school doing Biology					
8. Biology is useful in life					
9. I would like to further Biology after my programme.					
10. No matter how hard I try I cannot understand Biology.					
11. I feel uneasy when someone talks to me about Biology.					
12. I often think I cannot do it when a Biology problem seems difficult.					
13. I am good at solving Biology problems.					
14. Sometimes I do more Biology questions than am given in class.					
15. I remember most of the things I do in Biology.					
16. It makes me nervous to even think about studying Biology.					
17. It scares me to take Biology as one of my					

electives.					
18. It is important to me to understand to understand the topics I do in Biology.					
19. I have a good feeling towards biology.					
20. I always like to do Biology practical, test assignments and homework.					
21. I cannot concentrate on Biology for a long time.					
22. I would like to have fewer Biology lessons.					
23. I understand the Biology concepts very easily.					
24. I hate Biology courses.					
25. I am bored during Biology lessons.					
26. Sometimes I read ahead in Biology.					
27. Biology is a difficult subject.					
28. I feel happy with my results in Biology.					
29. I like studying Biology more than any other subject.					
30. I try to do the very best I can in Biology.					

APPENDIX C

Observation Schedule

Form two students of Chereponi Senior High School observation schedule

Class.....

Date.....

Please make careful considerations of each behavior characteristics in completing this questionnaire. Each indicator is followed by options. Choose the option that best describes learner's behavior during the lesson by indicating a tick (√) in the appropriate box. Thanks for your services as an observer.

S N	Indicator	Always	Often	Sometimes	Never
1.	Students are always punctual and regular to class when CAI is used				
2.	They contribute during Biology when CAI is used.				
3.	CAI enables students to contribute during Biology lessons.				
4.	CAI makes students ask for clarification during Biology lessons				
5.	CAI enables students to respond to questions during Biology lessons.				
6.	CAI improves student's participation in class.				
7.	Students pay attention to the lesson when CAI is used.				
8.	CAI helps me in explaining concepts and ideas better during a lesson.				
9.	CAI improves student peer discussions.				
10.	CAI makes students to learn a lot during Biology lessons.				

APPENDIX D

Interview protocol

Semi-structured interview protocol

1. What is/are your favorite subject(s) at school?
2. Overall, how interesting do/did you find biology lessons with the use of CAI?
3. Do you enjoy learning biology easily or with difficulty when using CAI?

Probing question: why? What will make it easier for you?

4. How does biology compare to your favourite subject(s) at school?

[Rephrase, if biology is their favourite]. What makes it different? What makes it different from English or mathematics?

5. What, if anything has encouraged you personally to learn science? How/why?

Probing question: enjoyment of subject, friends, teachers, practical work, relevance to life, benefits of study/career, parents encouragement etc.

Why? /in what way(s) have these factor(s) encouraged you?

6. How important do your parents think it is for you to do well/bad in science at school?

7. What, if any, has/would discourage you personally from learning science?

Probing question: level of difficulty, friends, poor teaching, and no opportunity for future study/career after school, why/in what way(s) have these factors discouraged you?

8. How important is it that science is taught in the school with CAI?

APPENDIX E

Reliability of questionnaire items

Reliability statistics

Cronbach's Alpha	N Items
.782	28

