

UNIVERSITY OF EDUCATION, WINNEBA

**EXAMINING THE USE OF INSTRUCTIONAL MATERIALS IN THE
TEACHING AND LEARNING OF BIOLOGY IN SOME SELECTED SENIOR
HIGH SCHOOLS IN THE SEKONDI-TAKORADI METROPOLIS**



ESTHER NYARKOAH OBENG

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ESTHER NYARKOAH OBENG

(7130130033)

Dissertation in the Department of Science Education, Faculty of Science Education submitted, to the School of Graduate Studies, University Of Education, Winneba, in partial fulfillment of the requirement for the award of a MASTER OF EDUCATION DEGREE in Science Education of the UNIVERSITY OF EDUCATION, WINNEBA

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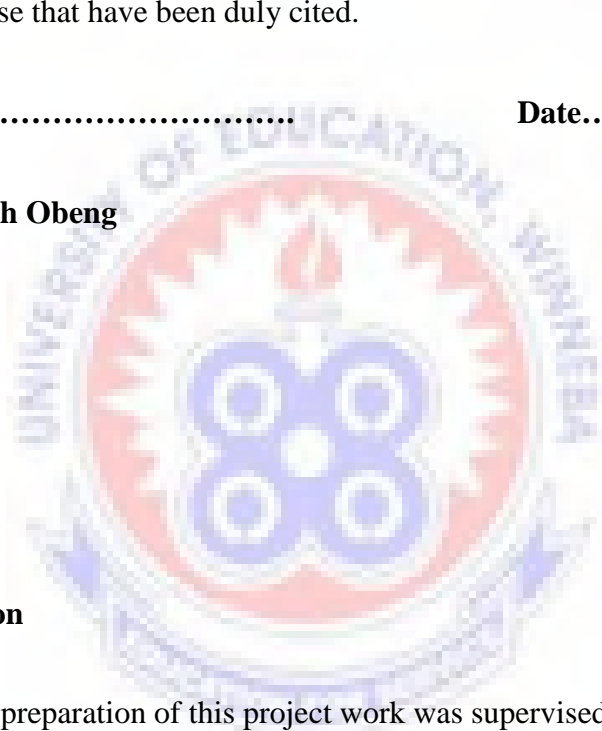
DECLARATION

Candidate's Declaration

I hereby declare that the contents of this project entitled “**Examining the use of Instructional Materials in Some Selected Senior High Schools in the Sekondi-Takoradi Metropolis**” is the result of my own original research and that no part of it has been presented for another degree elsewhere except for those that have been duly cited.

Candidate's Signature **Date**.....

Name: Esther Nyarkoah Obeng



Supervisor's Declaration

I hereby declare that the preparation of this project work was supervised in accordance with the guidelines on project work laid down by the University of Education

Supervisor's signature: **Date**.....

Name: Dr. Joseph Nana Annan

DEDICATION

This work is dedicated to my three children: Ewurama Nhyira Acquah, Enimyam Abayie Acquah and Odomankoma Bin Acquah nicknamed Champion woman, Organer and Captain respectively.



ACKNOWLEDGEMENTS

All praises to Almighty GOD alone, the omnipotent, the omnipresent, the most merciful and the most compassionate and his only begotten son JESUS CHRIST, the most perfect and exalted among all creatures ever born and lived on the surface of the earth, who is the torch of guidance and knowledge for humanity.

The work presented in this study was accomplished under the inspiring guidance, generous assistance and enlightened supervision of Dr. Joseph Nana Annan, Senior lecturer, Department of Biology Education of the University of Education. I am at a loss for words to express the feelings of gratitude to my respected supervisor for his determination to work, firmness of character and constructive criticisms throughout this study. No word can adequately express the depth of my gratitude for this help offered graciously at all times.

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ABSTRACT

This study was designed to find out the types of instructional materials available, the frequency of use, the effective utilization as well as perceptions of teachers and students on the use of instructional materials in the teaching and learning of Biology in the Senior High Schools in the Sekondi-Takoradi Metropolis of the Western region of Ghana.

The research design used was descriptive. In all, one hundred and twenty respondents made up of a hundred biology students and twenty biology teachers responded to questionnaires specially designed for the purpose.

It was found out that the most available and frequently used instructional materials in the sampled schools were chalkboards/whiteboards and textbooks. Instructional materials such as bulletin boards, projectors radios/recorders and camera/pictures were unavailable.

The research also revealed that the major problems confronting the use of the available instructional materials were overcrowded classrooms/laboratories, lack of storage facilities among others. It was recommended by the researcher that the Ministry of Education and the Ghana Education Service should as a matter of urgency procure and supply all the needed but unavailable instructional materials for the schools for effective teaching and learning of Biology. Also the biology teachers should be trained periodically on how to handle the available instructional materials. Furthermore, the administrators of the Senior High Schools should liaise with the educational directors in the various districts to appeal to Non-Governmental/ donor organizations for support to organize regular in-service training for the Biology teachers to update their skills in handling the available instructional materials.

CHAPTER ONE

INTRODUCTION

Overview

This chapter deals with the background of the study, statement of the problem, the purpose of the study, research questions, significance of the study, delimitation of the study and the limitations of the study as well.

Background of the Study

Education is a life activity, therefore a learner must be supplied with the necessary skills to enable him or her perform effectively in his or her community and the world at large.

There is abundance of research in the fields of science education, educational psychology and instructional theory and technology literature on materials to enhance learning from expository text. These instructional materials are visuals of all kinds, advanced organizers, concept maps, pre and post instructional questions and tests and other adjunct instructional activities ranging from “home lab” experiments and mini-project works. Since the late 1960’s, there have been a wide variety of models and “theories” posed about instructional aids as well as each of the aforementioned type of aids. In general, however both the research and the theory on instructional aids is pragmatic, and practitioner oriented, which may reflect to some degree the difficulty and complexities of the research and theory construction problems in this area. (Ashcraft 2002)

Lack of standardized terms and concepts, weak theoretical foundation and in some cases questionable research designs have made the literature in this area inconsistent, fragmented and

somewhat unsystematic and in most instances difficult to evaluate, and particularly difficult to extend and /or operationalize. This difficulty has been particularly true in the area of science education and the learning of science technical materials, where the quality of the empirical research done, it may be argued, has declined over the past two decades with the decline of strict experimental and scientific research.

It is in view of this that the Education Reform Review committee on Pre-tertiary education (1994) stated that “one of the basic principles underlining the reform package of basic education was that , the people of Ghana need to be able to develop and adopt scientific and technological skills to help them use their rich untapped resources for development”. The child can have the information through good use of visuals and auditory instructional materials especially those provided from the locality.

In Ghana, the basic school science syllabus put premium on activity as a baseline for science education. This must be done, if our nation is to attain its modest aim of becoming an agro-based industrialized country and a middle income earning nation like the so called Asian-Tiger; in the years 2010 and 2020 respectively (Ghana Government,1994).

An outstanding development in modern education is the increased use of supplementary devices by the teacher through the use of more than one sensory channel to help clarify, establish and correlate accuracy and enrich imagination of children (Kochhar, 2004). Instructional materials therefore promote learning of science concepts, develop problem solving skills, increase understanding in the sciences and scientific methods.

The teacher of today does not consider the child as a vessel waiting to be filled up with facts nor as a pliable plastic material, which can be transformed into any shape enabling him to project his

ideas on it. The modern teacher considers each child as akin to a plant and helps the child to grow according to his/her abilities and aptitude. Children learn by doing and learn how to learn in groups and also individually.

Statement of the Problem

Increase in population and explosion of knowledge are affecting the pattern of human life and also inflicting its full impact on education. The explosion of population and knowledge has raised the serious question of both quality and quantity of education. Educationists are of the opinion that the educational problems relating to the quantity and quality could be tackled by applying systematic approach of instructional technology. Therefore, there has been a rapid development of communication technology in education at all levels with a purpose of extending educational facilities and upgrading instructions. The type of instructional materials available for teaching and learning of science is crucial to the understanding of scientific concepts and processes. According to Tamakloe *et al* (1996), it should be possible to categorise resources according to the five objective senses namely auditory (hearing), gustatory (taste), olfactory (smell), tactile (touch) and visual (sight). Therefore conscious effort should be directed in using instructional materials to meet the objective senses.

The selection and use of instructional materials in the teaching and learning of Biology poses a great challenge to the teacher (Aggarwal,1995). If instructional materials are wisely selected and intelligently used, it will arouse and develop intense and beneficial interest and motivate pupils learning. It is in line with this that the research was conducted to examine how instructional materials are used in the teaching and learning of Biology in the Senior High School

Purpose of Study

The main purpose of this study was to examine the availability and use of instructional materials for teaching and learning of Biology in the Senior High Schools. The study examined the following:

- a) The type of instructional materials available in the chosen senior high schools.
- b) The frequency of use of instructional materials.
- c) How do teachers perceive the use of instructional materials in biology lessons presentations?
- d) What factors hinder the usage and application of instructional materials?

Research Questions

The study was carried out to find answers to the following questions:

- I. What kinds of instructional materials are available for the teaching of biology?
- II. What instructional materials are frequently being used during the teaching and learning process?
- III. How do teachers perceive the use of instructional materials in Biology lessons presentations?
- IV. What factors hinder the usage and application of instructional materials

Significance of the Study

The study is significant because its findings will help both biology teachers and students to identify the importance and appreciate the need for the use of instructional materials to improve their instructional techniques. On the basis of the findings, the researcher will provide workable

suggestions /recommendations for the effective teaching and learning of Biology in senior secondary schools.

Furthermore, it is believed that when instructional materials are used in the presentation of the subject matter of Biology, the students understanding and performance will be enhanced. Finally, the data collected will create awareness of the availability and use of instructional materials to be used by teachers and students.

Delimitations of the Study

This research was conducted specifically to determine the availability and use of instructional materials in the teaching and learning of Biology in some selected Senior High Schools. The research also looked at how teachers frequently use instructional materials in their teaching techniques. It also examined the perception of teachers in the use of instructional materials.

Limitations of the Study

Since not all schools in the Western Region were sampled in the study, complete generalisation and objectivity could not be assured.

CHAPTER TWO

LITERATURE REVIEW

Overview

The following areas were considered in reviewing related literature:

- a) What are teaching /instructional materials?
- b) The criteria for selecting teaching /instructional materials.
- c) Classification of instructional materials.
- d) Educational values of teaching materials.
- e) Evaluation of instructional materials.
- f) Problems in the use of instructional materials.

What are teaching/instructional materials?

Instructional materials are aids to teaching and learning that communicate through the ear or the eye (Farrant, 1991). The field of philosophy that deals with the structure and production of knowledge (epistemology) has also experienced important advances. It is now generally agreed by leading philosophers/epistemologists that knowledge is constructed. This implies that children learn best when they have opportunity to see and hear, to examine, to manipulate, to question and discuss for themselves.

The teacher's goals are to help students learn how to think and to understand the nature of science. Although the learners are expected to design some teaching or learning aids appropriate for their needs the school is expected to have in stock certain basic aids. Among these are maps,

charts, pictures, usable chalkboards, projectors, laboratory with basic equipment and adequate number of textbooks to lighten the burden of teachers, saving him/her from the ordeal of spending long hours in preparing all sorts of equipment (Tamakloe, 2005)

Criteria for Selecting Instructional Materials

Choosing the most appropriate instructional materials for teaching purposes would probably present a problem. Dale (1984) outlined the following questions to be considered when selecting teaching aid for teaching.

1. Do the materials give a true picture of the ideas they represent?
2. Do the materials contribute meaningful content to the topic under study?
3. Is the material appropriate for the age, intelligence, experience of the learners
4. Is the physical condition of the materials satisfactory?
5. Is there a teacher's guide to provide a briefing for effective use?
6. Can the material in question help to make students better thinkers and develop their critical faculties?
7. Is the material worth the time, expense, and effort involved?

Classification of instructional Materials

Instructional materials means all materials that are designed for use by pupils/students and their teachers as a learning resource and helps pupils to acquire facts, skills or opinions or develop cognitive process. Learning outcomes are of different types. Facts, rules and action sequences are one type of learning outcomes while concepts, patterns and abstractions are other types of outcomes. These outcomes are two fairly broad distinctions and can overlap, but are useful guides in selecting an instructional material to maximise learning when the objectives include

facts, rules and action sequences or concepts, patterns and abstractions. Different instructional materials are needed to teach these learning outcomes. To teach facts, rules and action sequences, those strategies that emphasize knowledge acquisition are used (Gillani, 2005).

According to Kochhar (2004) instructional materials is any device that assists an instructor to transmit to a learner facts, skills, attitudes, knowledge, understanding and appreciation. He outlined instructional aids into seven types.

1. Audio aids (aids through the ear)
2. Visual aids (aids through the eye)
3. Audio-visual aids (aids through the eye and ear)
4. Three dimensional aids
5. Classification of teaching aids into software and hardware.
6. Aids through activity (simulations and games)
7. Miscellaneous, which includes journals, newspaper and magazines.

For the purposes of this research, the following instructional materials were considered:

Audio aids, Visual aids and Audio-visual aids.

Audio Aids

Audio media can make several unique contributions to the teaching-learning process. (Heinich *et al*, 1996) maintain that hearing and listening are not the same although they are interrelated. Hearing is a physiological process in which sound waves entering the outer ear are transmitted to the eardrum, converted into mechanical vibrations in the middle ear and changed in the inner ear into electrical impulses that travel to the brain, but listening is a physiological process that begins with someone's awareness of an attention to sounds or speech patterns through identification and recognition of specific auditory signals.

There are a number of audio aids available for instruction. They include audio tape, records, radio and telephone

Types of Audio Aids

Record Players

These are means of audio playback. Portable record players may be used in areas of study such as language training, sound recognition of animals and in ecological studies. Care should be taken to keep records clear and free of finger mark, chalk dust and scratches.

Tape Recorder

Tape recorder in its own can be very effective for classroom instruction. Pre-loaded tapes consisting of lesson by eminent teachers on any subject can be played in the class. Aggarwal (1995) argued that such instruction become impressive not only because of the novelty but also because of their being well-thought out and planned.

Radio

There is hardly any doubt regarding the potential of the radio as an instructional aid. Radio is the most significant medium for education in its broadest sense that has been introduced since the turn of the century (Aggarwal, 1995). By utilizing the rich educational and cultural offerings of the radio, children and adults in communities, however remote, have access to the best of the world's stores of knowledge and art.

Walkin (1991) recounted the following merits of school radio broadcasting.

1. Bringing the school into contact with the world around.
2. Helping in the spread of elementary education.
3. Helping in the promotion of adult education.
4. Assisting in the spread of non-formal education.

5. Enrichment of school programme.
6. Developing critical thinking.
7. Providing opportunities for student participation.
8. Popularising science with a view to developing scientific outlook.
9. Providing information about population education, energy conservation and preservation of wildlife.

However, it must be pointed out that, radio broadcast is a one-way communication. Students cannot put questions to the broadcaster and it depends merely on the use of the sense of hearing.

Visual Aids

It is often said that one picture (or visual) is worth a thousand words (of text); but visuals without text are most often just “pretty pictures” and pretty ambiguous picture as well. Furthermore, the point that is rarely made (and particularly as a counter argument) is that one word (example: freedom, democracy, friend) is often worth a million plus pictures (as any poet or novelist knows) and that text is far more powerful and generative than visuals because of the richness and layers of nuanced semantic networks, a point that is often forgotten in the current “moving image” and “sound-bite” age we live in or in what is now referred to as the “presentation culture” by current sociologists (Higgins, 2007)

Gestalt psychology and cognitive theory have convincingly demonstrated that “visuals” depict, show and establish relationships and that all learning is the learning of relationships (Neisser, 1967; Ashcraft, 2002). However, “visuals” do not have and do not communicate the key and fine-grain details, specifics and nuances of relationships. Visual materials include all media instruments that involve the use of sight such as books, chalkboards, charts, pictures, posters, maps, models, diagrams, wall charts, specimen etc.

Types of Visual Aids

Chalkboard/White board (Writing board)

This is the commonest and most readily available form of instructional material. If writing board illustrations are kept legible and coloured for easy differentiation, it could be among the best forms of instructional material (Walklin, 1991). It is also a common teaching technique that the upper part of the writing board should be used whenever possible, and when writing on the board communicate with the group and not the board.

The following may be kept in mind while using the writing board:

- ✓ Writings on the board should be eligible.
- ✓ Writing should be started from the top left corner.
- ✓ Writings should be in straight line.
- ✓ Writings on the board should not be covered by standing in front of it.
- ✓ Only salient points of the subject matter should be written on the board.
- ✓ Always ensure that the writing board is well-lit by natural or artificial means.
- ✓ Ensure that the chalkboard/white board is periodically serviced.
- ✓ Diagrammatic visual presentation involving many processes should be prepared before the lesson begins.
- ✓ A proper chalkboard/whiteboard cleaner should be used to clean and not the hand
- ✓ The extreme lower corner of the chalkboard/whiteboard should not be used as writing there cannot easily be seen

Textbooks

Traditionally, the textbook has been the most frequently used instructional material at all levels beyond the primary classes, and in most cases it is the only one used by the teacher.

In support, Allan and Thomas (2000) states that textbooks are well organized, coherent, unified relatively up-to-date, and relatively unbiased. That is to say textbooks are scrutinized by scholars and educators. Allan and Thomas outlined the following advantages of textbooks as an instructional material:

- ✓ A textbook provides an outline that the teacher can use in planning courses, units and lessons.
- ✓ Textbooks help the teacher to know the extent of coverage and the duration of the selected topic.
- ✓ It helps the teacher to select the appropriate teaching methods and the sequence of presentation.
- ✓ The textbook is also a reference for further reading.
- ✓ The textbook again provides information that is consistent and reliable
- ✓ It summarises a great deal of pertinent information.
- ✓ Textbooks enable the students to take home in a convenient form most of the materials they need to learn for the course.
- ✓ Textbooks provide a common resource for all students to follow.
- ✓ Provides the teacher with ideas regarding the organization of information and activities.
- ✓ Textbooks also relieve the teacher of the burden of having to prepare material for the course.

- ✓ Scientific explanations and illustrations/descriptions are usually straight forward and succinct in textbooks.
- ✓ The textbook also makes assessment and evaluation easier.

Models

These are substitutes for real things. In support, Farrant (1991) stated that the value of a model is to simplify the real thing they represent and make it easier for the child to understand. A model is a three dimensional representation of the real thing. According to Aggarwal, a model is a replica of the original. Being three dimensional, models evoke great interest and simplify matters. Models can be prepared with several kinds of materials like cardboards, clay, plastic, wood, etc.

Charts

A chart is a combination of pictorial, numerical, and or vertical material which presents a clear visual summary. Bar charts, histograms, pie charts, flow and organisational charts are commonly used to represent proportions or relationships. Walklin (1991) stated that the visual impact of charts bring figures to life and tends to be more meaningful than a list of numbers or percentages.

Charts serve the following purposes:

- ✓ It shows relationships by means of facts, figures and statistics.
- ✓ It helps presents materials symbolically.
- ✓ It summarises information.
- ✓ It shows continuity in a process
- ✓ It presents abstract ideas in visual form.
- ✓ It shows development of structure.
- ✓ It motivates the students.

- ✓ It arouses the interest of students and stimulates them to think further.

Pictures

The area of visual resources limits pictures to those that are still. These are the direct opposites of motion pictures. According to Kochhar (2004), pictures can be divided into those that are non-projected and those that are projected. The non-projected still pictures are photographs, illustrations and stereotypes (Dale, 1984). Photographs are prints from images taken by the camera. A photograph can be monochromatic or polychromatic. It can be reproduced and used as illustrations in books, newspapers or magazines.

Illustrations are constructions from reality of objects and are different from those which are produced from photography or prints of photographs. Although illustrations serve almost the same purpose as photographs, they are difficult to produce. Illustrations may be produced by an artist from lithographs or they can be drawings made by the teacher or students to depict an object or a scene. Once produced, an illustration can be printed in books, magazines or periodicals at less cost than originals. It is vital to reiterate that an illustration can serve the same purpose as a photograph.

Some teachers, in the process of the use of still pictures, are preoccupied with the decorative aspects of their classrooms to the total neglect of what they are meant to do. In the classrooms of these teachers are found beautiful, well mounted pictures on the walls which have practically nothing to do with many lessons at hand. Apart from the fact that the pictures have no relevance to the lessons, they are likely to distract the student's attention from many lessons.

Transparencies

The terminology transparency is used with the instrument known as the projector although slides and filmstrips are also transparencies. This is because transparencies are mainly tailored to specific treatment of certain topics. Nonetheless, there are numerous commercially produced transparencies. The device is such that what is to be presented is produced onto a transparent material and projected onto a screen by the overhead projector. A transparency can be monochromatic or polychromatic. Transparencies with overlays are particularly helpful in fostering vocabulary development. A subject that has been dull and uninviting with the use of transparency and overhead projector, can help students become eager to learn new words. Teachers can make them quickly and easily. They can be stored easily for future use and are inexpensive.

Diagrams

The use of the word diagram poses problems of meaning. Many teachers are at a loss as to what constitutes a diagram. Perhaps Dale's (1984) explanation will help clarify the issue to a considerable extent. He is of the opinion that a diagram is a graphic design that explains rather than represents; a visual symbol made up of lines and geometric forms, from which pictorial elements are absent. The most crucial aspect of the description is that a diagram is designed to explain process and phenomenon. A diagram can be used to make clear a sequence either in a text or a speech. It can also be used to explain the organizational structure of a school or any institution. A diagram can also be used to explain certain scientific phenomenon, for instance, the nervous system of human beings. So diagrams, constitute a collection of visual resources or aids which the teacher uses to facilitate explanation of points raised in the class.

Wall Charts and Posters

There are many commercially produced wall charts available for the science teacher to use. For effective teaching of biology, the teacher can make good use of these charts.

When the biology teacher is planning or selecting a chart for teaching purpose, the following factors should be considered;

- Contents
- Teaching situation
- Visual impact and
- Labelling.

Specimen

The immediate surrounding is a rich source of supply of specimen (Farrant, 1991). As a general rule, living specimen are better visual aids than preserved ones or pictures of them.

Audio-Visual Aids

These are materials that use sight and sound to present information. They are supplementary devices by which the teacher, through the utilization of more than one sensory channel is able to clarify, establish and correlate concepts, interpretation and appreciation (Aggarwal, 1995). That is audio-visual aids in teaching and learning communicates through the senses of the ear and the eye and helps to bridge the gap between the different types of learners. A person's ability to remember what he or she learns can be increased vastly through a combination of seeing and hearing information. Aggarwal (1995) recounted the following popular sayings on audio-visual aids: Boredom results from lack of involvement, audio-visual aids relieve boredom and mental

fatigue by providing a point for attention, the more senses involved in a learning situation, the better the learning outcome and the ability to recall.

Dale E. (1984) also stated that audio-visual materials supply concrete basis for the conceptual thinking, they give rise to meaningful concepts, enriched by meaningful association and hence they offer the best antidote for the disease of verbalism.

Audio-visual materials, designed for both seeing and hearing have many benefits. They attract the attention and interest of the learner. They often provide the most direct way of conveying information. For example, school children learning about Nigeria might use such audio-visual materials such as a globe to find the country's location; motion pictures and still pictures to study how the people live and work; exhibits made or grown in Nigeria.

Types of Audio-visual Aids

The most widely used audio-visual devices in Ghana are the cinematograph, the television and video record (Tamakloe, *et al* 1996). Others include films, computers, three- dimensional aids and projectors.

Television

The use of television for teaching began in Ghana in July 1993 (Tamakloe, *et al* 1996) and the target group was those in senior secondary schools.

Walklin (1991) outlined the following important merits of television.

1. It permits the teacher to teach a subject for a large number of student viewers. It preserves the expert teaching skills of such teachers on video tape or film for later use.
2. It provides the teacher an opportunity to observe the instructional methods and ideas of their expert and increase own knowledge of teaching methods and stimulate new ideas.

3. It provides technical advantages not readily available in normal classroom for illustration or demonstration.
4. It makes possible close-up magnification of small objects, components, intricate mechanisms, diagrams etc.
5. It directs the attention of the student to the exact detail of which he should see eliminating distracting surrounding.
6. It makes quick and lasting visual and rural impression which can often reduce the time necessary to teach an idea or technique.
7. It makes it possible to bring large, scarce, new or confined equipment “into the classroom” electronically.
8. It incorporates useful film sequences, slides, graphic art and makes available teaching aids within a television presentation, tailored to meet the needs of a particular course or subject.
9. It brings live demonstration, video-tape or film presentations to the classroom at the instant or immediately after they occur.

Aside all the significance outlined, education through TV medium is limited to a one-way communication from teacher to students. Also the total cost of teaching by television is more than normal classroom instruction, unless television is used to reach a large number of students at one time or sequentially over a period of time. Another limitation of educational TV is that individual differences of the students are not attended to in a TV lesson.

Films

Broadly speaking, a film is a multiple media of communication. According to Walklin (1991) films presents facts in a realistic way, dramatizes human relations, arouses emotions and transmits attitudes. That is a film may be used for the communication of ideas, attitudes and experiences to the masses of people.

Ecological documentaries on wildlife reveal life activities of how the ecosystem interacts. An educational film has been described as the greatest teacher because it teaches not only through the brain but also has a very powerful influence on the mind of children and in shaping their personality (Walklin, 1991). Some of the main advantages of motion pictures which make educational films so powerful an audio-visual aid are outlined below.

Firstly, educational films increase reading interest of the students. Various investigations conducted in the United States of America showed that film producers arouse increased reading interest in children. They are stimulated to get more information about the things that they have observed in a film show.

Secondly, educational film for instance on wildlife interaction in the ecosystem put before us real learning situations which look to be quite real and actual. The children see something happening and this experience is direct. Therefore, he/she is deeply impressed.

Lastly, an educational film as an aid motivates teaching. The student takes a great interest. A long study of many weeks may not be able to bring home facts of the ecosystem to the child, but he will at once understand and learn everything about ecosystem if he /she is shown a film about it. Walklin (1991) summarizes the educational advantages of a film as: means of imparting

information, development of attitudes, enlarging interest and development of the will to solve problems.

Some of the limitations of an educational film may include an element of fiction and the unfamiliarity of the contents to the local environment. Also, the process of an educational film production is very costly and it has some bad effect on eyesight.

Computers

Since the advent of the personal computer in the mid 1990s, computers have rapidly become one of the key instructional technologies used in both formal and informal education. Heinich *et al* (1996) could not have stated it better when they said “the computer can be used by teachers as an aid to managing classroom activities”. It has multitude of roles to play in the classroom and the curriculum ranging from tutor to student tool. To make informed choices, you need to be familiar with various computer applications, games, simulations, tutorials, problem-solving programs, word processing and graphic tools and integrated learning systems. It is extremely important to develop critical skills in appraising instructional software because there are so many major applications of computers in instruction. These applications are the computer-assisted instruction (CAI) and computer- managed instruction (CMI).

In CAI, the student interacts directly with the computer as part of the instructional activity. This may be in the form of material presented by the computer in a controlled sequence such as a drill and practice program or a creative activity.

In CMI, the computer helps both the instructor and the student in maintaining information about the student and in guiding the instructional process. In addition, the computer can be an object of instruction as in courses on computer science and computer literacy. It is also a tool that can be

used during instruction to do complex calculations, data analysis, word processing, power point presentations, etc.

Three-Dimensional Aids

Three-dimensional aids serve as a good substitute for the real objects. There is no doubt that an encounter with real objects serves as an unmatched source of learning (Walklin, 1991). But on account of several reasons it may not be possible to bring the real object to the classroom. The real object may be too large to be brought or to store in the classroom. It may be too small to be seen by a group of students. It may also be too complicated in real form to be understood. It may be too rapid for its operations to be purchased by an educational institution. Being handicapped in such situations, a teacher has to search for some good substitute for the real objects. Models, diagrams, mock-ups are the important three dimensional aids.

Mock-ups refer to specialized model or working replica of the object being depicted. Mock-ups of aeroplanes, auto- mobile engines, bridges, ships and tunnels may be demonstrated and used to explain their structure and actual workings. Mock-ups are often used in technical situations for training purposes. Aggarwal (1995) outlined the following steps in the selection and use of

three-dimensional objects:

1. Three dimensional aids may be selected keeping in mind the instructional needs and requirement.
2. As far as possible, they should be a true representation of the actual objects.
3. The complexity of the aids should match the level of maturity of the students.
4. The aids should make an appeal to as many of the five senses.

5. As far as possible, aids should be prepared by the students under the proper supervision of the teacher.
6. Aids should be prepared with locally available material as far as possible.
7. Necessary instructions should be given to students to handle aids with care.
8. Necessary clarification must be given by the teacher during the presentation of the objects in class.
9. Necessary demonstration in the use of these aids should be given to students.
10. Adequate storage arrangement should be made for their safe custody.

Classification of Teaching Aids into Software and Hardware

Educational technology can be classified into two categories that is the hardware approach and software approach. Hardware approach is based on the application of engineering principles for developing electro-mechanical equipment for instructional purposes. This approach is the result of impact of scientific and technological development during the present century. Hardware approach mechanizes the process of teaching so that teachers would be able to deal with more students with less expenditure in educating them (Aggarwal, 1995).

Hardware aids include the following: Computers, Epidiascope, Motion pictures, Magnetic and Overhead projectors, Radio, Slide and film projectors, Tape recorders, Teaching machines and Television.

Hardware teaching aids include the following: Newspapers, Books, Magazines, Educational games and Flash cards.

The software approach uses principles of psychology for building in the learner a complex repertory of knowledge modifying his behavior. It has originated from the pioneering work of skinner and other behaviorist. Aggarwal (1995) maintains that software approach is characterized by task analysis, writing precise objectives, selection of appropriate learning strategies, immediate reinforcement of response and constant evaluation.

Aids through Activity

The school journeys

These are one of the most valuable of audio-visual aids. A school journey means an out-door lesson. Few school programmes are complete without a field trip. The local factory, retail store, bakeries, radio stations, banks, temple, court etc., are real. School children can see them, ask questions about them and examine them. If we believe that first hand experiences with real things are the primary sources of learning, then “the walls of the school” must expand. Life in the classroom can cover only a small part of our total life, and if our learning is to become full and well-rounded we must go beyond our school walls and into the community as students and as working participants. School authorized, teacher-planned, curriculum-integrated school journeys are most concrete and most real of visual techniques. Among the advantages of school journey are:

1. It supplements and enrich curriculum experiences
2. School journey provides first hand experiences
3. It adds spice to the teaching of various subjects
4. School journey offers varied types of experiences to the pupils
5. It may help the students to select their vocations

6. Children learn that life is learned through living it.

The following are the different types of school journeys: Excursions, field trips and tours.

Excursion

An excursion is any school trip taken by a class to get an over-all view of a situation belonging to the field under study. Excursions are ordinarily for short distances and are completed within the school day. Students may spend half the day or more visiting a local factory, museum, college or conversation project. Their incidental lessons in co-operation, sociability and general attitude are as important as the gathered facts.

The study trip or Field Trip

This is distinguished by its concentration on learning particular facts. Its success is judged by its fulfillment of a predetermined aim, such as collecting specimens for a zoological study, collecting rock samples in geology. A field trip may be made to places within the walking distance of the school building. The class may study the trees in the schoolyard, note the soil erosion on the nearby slope, and visit the grocery store or post office. Such trips are completed within a single class period. The incidental social lessons are not the point of a field trip, though they may be important.

Tour

A tour is an extended excursion that may cover a wide geographical area or even include foreign countries and its duration may be of weeks or months. Tours might be arranged just after a term or during the term, to distant places of sociological or industrial interest.

Simulations and Games

Play is pleasure and natural to children and adolescents. Simulations and game are formalized expressions of play that provide a wide range of social and cognitive experiences (Allan and Thomas, 2000). Simulations are abstractions of the real world, involving objects, processes, or situations. Games are activities with goals, rules and rewards.

Simulations have become increasingly popular among educators, following on their success in military, business, medical and public administrative arena. Simulations permit students to experience the nearest thing to reality.

Games are more informed and cover a wide range of situation. they have been an important instructional tool in the kindergarten and elementary school dating back to the early nineteenth century educational pioneers. Educational games have social and cognitive purposes and are not designed solely to amuse, but games can contribute to learning (Allan and Thomas, 2000). For example, monopoly is a game played for amusement, yet young children who play it learn to count and deal with monetary values. Checkers and chess, besides being amusing, challenges the mind, they involve math, logic, and sequencing of moves.

Numerous simulation and games are commercially produced, but teachers must judge whether they are suitable for their students. Allan and Thomas (2000) outlined the following guidelines to follow when incorporating simulation and games.

1. Distinguish between amusement games and educational games, between game objectives and instructional objectives.
2. Use simulation to enable students to understand the nature of a significant content problem and how to solve the problem.

3. Relate games for teaching thinking skills and for enhancing the social skills of children in the lower grades.
4. Relate simulation and games to the content (skills, concepts, values) you wish to teach; this content should correspond with reality, and the relationship between the real world and the simulation should be clarified to the participants.
5. Provide a postgame discussion for older students to clarify skills, concepts, and values to be learned.
6. Incorporate a class or homework writing exercise into the postgame discussion.
7. Employ a series of questions that require students to discuss their thoughts during the activity, and
8. Lastly, use some form of evaluation feedback, or discussion to determine if your objectives have been achieved.

Miscellaneous Instructional Materials

According to Kochhar (2004), miscellaneous teaching aids include newspapers, magazines, journals, dramatization and booklets. Journals and newspapers are primary sources and are therefore excellent materials for enhancing students' thinking skills and research skills. Journals are publications of professional and academic associations and are more technical than magazines and newspapers. Allan and Thomas (2000) argue that to enrich content, teachers in most subjects can encourage students to read journals, magazines and newspapers. Newspaper, in theory, deals in reporting, not analyzing or interpreting data. It is up to the student to draw conclusions about and evaluate what is being reported. Allan and Thomas (2000) recounted the following guidelines to assist teachers and students in using journals, magazines and newspapers.

1. Identify journals, magazines or newspapers articles that are within the student's reading and comprehension range.
2. Select journals, magazines or newspapers that are compatible with your teaching goals.
3. Train students to read and evaluate these materials.
4. Train students in the use of cards, catalogs, periodicals catalogs, and the classification and retrieval systems of journals and magazines in independent study and research.
5. Maintain a file of pertinent journal, magazines, and newspaper articles to supplement the text and incorporate it into the unit or lesson plan.
6. Update the file frequently.

Educational Evaluation of Instructional Materials

A modern program of education calls for rich and varied instructional experiences for every child. One of the best ways to determine if materials are usable for a particular student is to preview the materials. Kemp and Smellie (1989) suggested the following evaluation criteria for evaluating instructional materials.

1. How well does the material achieve any learning objectives?
2. How up to date and accurate is the content?
3. Is it appropriate for the knowledge level of the audience?
4. Is it appropriate for the experience level of the audience?
5. Is it free from any social bias?
6. What is the production quality?
7. Is the instructional guide/documentation helpful for planning and materials use?
8. What are the strengths or weaknesses?
9. Do I recommend the material for purchase or rental use?

From the above, it could be deduced that a comprehensive evaluation format will enable the teacher to select appropriate instructional materials for use by the student.

Educational Values of Instructional Materials

For many years, educators have theorized about how the human brain and the memory functions during the communication process. Dale (1984) quoting Dewey pointed out that our classrooms have been largely listening and memorizing rooms, the trend towards increasing use of resource materials is thus a broader movement to make a classroom a brighter, more cheerful and interesting place. It therefore behoves on every teacher to be aware of the educational values which teaching aids can offer to facilitate teaching and learning process. According to Anamuah-Mensah and Apafo (1989), the teaching and learning of science at the senior high school level are often characterised by rote learning. As such science teaching tends to be examination oriented and students who pass these exams tend to be unimaginative lack initiative and ability to solve emergent problems. Such students are not likely to be productive in the community and their continued education is saddled with numerous setbacks.

Relevance of Equipment and Materials in Teaching Biology

At the senior high school level, observational, cognitive, manipulative, and other very important skills must be developed to aid learning and handling of materials to help students in acquisition of these skills (Ossei-Anto, 1989). Again, teaching and learning materials opens students to a realism of concepts and aid them to conceptualize and internalize scientific principles. When teaching the urinary system for instance, the concept is made real when a rabbit is dissected and the urinary system is observed. Understanding and conceptualization are often greater when teaching and learning materials are used to demonstrate a concept. The use of teaching and learning materials therefore places both the teacher and the students in a proper teaching and

learning condition (Bloom, 1986). Bloom also noted that teaching and learning aids make teaching easier and learning fun as children learn by doing and observing.

Dale (1984) pointed out the following values of instructional materials.

1. Bring about significant changes in student behaviour.
2. Show the relationship of subject matter to the needs and interest of pupils' with a consequent.
3. Make learning meaningful over a wide range of student abilities,
4. Encourage meaningful use of subject matter by allowing for imaginative involvement and active participation.
5. Provide feedback that will help the pupil to discover how well he has learned.

Problems Associated with Instructional Materials

A key feature of effective teaching is the selection of instructional materials that meet the needs of students and fit the constraints of the teaching and learning environment. The speed of personal computers and the ease of authoring systems permit instructions to be designed and customized using computer-based audio-visual presentations for students.

In spite of the few merits enumerated above, the use of instructional materials may pose some of the following problems:

1. Carefully scripted presentations and activities run the risk of emphasizing teacher delivery rather than students learning.
2. Carefully planned and prepared instructional resources sometimes tempt instructors to race ahead and cover more.
3. The rapid presentations combined with audio-visual overload can tempt students to remain intellectually passive.

In order to avoid the problems mentioned above the teacher can interpose his/her delivery with activities which assess student understanding and encourage reflection and critical thinking. Another possibility is to reduce the pace of the class session, by pausing periodically to invite questions



CHAPTER THREE

METHODOLOGY

Overview

This chapter discusses the procedures that were used in obtaining information for the research work. It focuses on the following areas: research design, population, sample size, research instruments and their descriptions, validity of instrument, data collection and procedure, intervention and implication and finally how the data was analysed.

Before the preparation of the text, the researcher found it very necessary to consult other teachers on how instructional materials have been handled in order to serve as a guide

Research Design

A research design is a systematic plan to study a scientific problem. For this particular research work the research design was Descriptive research. Descriptive research involves collecting data in order to test hypothesis or answer questions concerning the current status of the subject of study (Gay, 1992). The purpose of the descriptive research is to observe, describe and document aspects of the situation as it naturally occurs. There are three basic types of descriptive research methods but for this particular study the type known as survey was used. In a survey, participants answer questions administered through interviews or questionnaires. After participants answer the questions, the researcher describes the responses given.

Population

Secondary school students studying Biology and their teachers in some selected Senior High Schools in the Sekondi-Takoradi Metropolis constituted the population of this study.

Sample size

The research was not carried out in all the senior high schools as a result of cost involved, resources and time constraints. Five senior high schools were sampled for the study. A total of one hundred students and twenty Biology teachers were chosen for the study. The students were made up of twenty students each from Fijai Senior High School, Ahantaman Girls' Senior High School, Archbishop Porter Girls' Secondary School, Ghana Secondary Technical School and St. John's Senior High School. Only students studying Biology as elective subject were included in the sample. The study adopted both simple random and purposive sampling techniques for choosing the respondents. According to Ball (1990), purposive sampling is used in order to get information from those who have in-depth knowledge about particular issues, by virtue of their professional role, expertise or experience. Researchers therefore use their judgment to handpick cases that need to be included in the sample. Purposeful sampling was used to sample fifty (50) students in SHS 3 because the researcher was of the view that they had stayed in school long enough to be able to give more accurate responses. Purposeful sampling was also used to select twenty five (25) students each from SHS1 and SHS2. Again the inclusion of the two girls' school and two boys' schools was also purposeful. This was to ensure gender balance. Random sampling was used to select the respondents from the various schools sampled.

Research instruments

Considering the topic as well as the population under study, questionnaires were employed as data collection tools. The questionnaires elicited from the students and teachers, the state of instructional materials in the schools, the problems teachers and students encounter when teaching with and without instructional materials and how often teachers use these instructional materials in the teaching and learning of Biology.

Questionnaire is the most widely used instrument for data collection.

Asabere-Ameyaw and Haruna (2007) cited a number of advantages of using questionnaire as relatively economical and that sample can be obtained from a wide area. They also said that, items on questionnaires are standardised and anonymity of respondents is assured. Finally, respondents complete questionnaire items at their leisure so responses are carefully provided. However they also stated some weaknesses of questionnaires as poor recovery rate. That is individual respondents are tempted not to complete and return the questionnaire or questionnaire items could be responded wrongly because respondents may not understand them or respondents views could be influenced by others if the items are discussed with them when completing the questionnaire. Due to the fact that the merits of a questionnaire outweighed the demerits, the researcher adopted questionnaire as the instrument for the study.

Two sets of questionnaire were developed based on the research questions posed. One set consisting of nine items for the Biology students and the other set consisting of eleven items was for the Biology teachers sampled for the study. The respondents were to provide a few Bio-data after which they placed ticks in boxes placed besides the various responses in the questionnaire. (Appendix I and II)

Validity and Reliability of the Research Instruments

The issue of validity and reliability were vital in the study because the credibility of a research work depends on the reliability of the data, method of data collection, and also the validity of the findings (Cohen, Manion & Morrison, 2007; Lecompte & Preissle, 1994). Fraenkel and Wallem (2000) cautioned that it is possible to design a questionnaire that is reliable because the responses are consistent, but may be invalid because it may not measure the concept. Validity of an instrument is the extent to which the items in an instrument measure what they are set out to

measure, while reliability takes care of the extent to which the items in an instrument generate consistent responses over several trials with different respondents in the same setting or circumstance (Cohen *et al*, 2007; Fraenkel & Wallen, 2000; Lecompte & Preissle, 1994; Miles & Huberman, 1994; Seale, 1999). In order to ensure the validity of data collected, a colleague Biology teacher was made to read through them and offer constructive criticism and my supervisor also scrutinised them and offered his suggestions. The suggestions offered were used to improve upon the items. This helped to improve the validity of the items.

Again, to ensure the reliability of the instrument used, they were trial tested with some students in St John's School. The internal consistency was determined using the Cronbach alpha coefficient of reliability and a figure of 0.78 was gained. According to Borg, Gall, and Gall (1993) coefficient of reliability values above 0.75 are considered reliable. Therefore, the above reliability index gave an indication that the instrument was substantially reliable.

Data Collection Procedure

The questionnaires were administered personally to both biology students and biology teachers. A period of one week was given to the teachers for the completion of the questionnaires since a shorter time could cause them to hurriedly answer them and a long period would lead to laziness and forgetfulness. Students were made to answer the questionnaires on the very day it was given under a very cordial and friendly atmosphere.

Data Analysis Procedure

The information obtained from the questionnaires were analysed carefully and systematically using the mode, mean and standard deviation under S.P.S.S. Percentages were also used.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Overview

This chapter presents the analyses of the data collected from biology teachers and students. The study adopted a descriptor-explanatory method; a combination of descriptive and explanatory procedure. Data collected was analysed using descriptive statistics namely frequencies, percentages and mean to explain the variable characteristics using S.P.S.S (version 21) and Excel. Even though the researcher did not make use of hypothetical issues in this study, certain levels of relationship amongst the various variables were made from the tables and charts.

The chapter is presented under the following headings

1. Descriptor-Explanatory Analysis of Data from Biology Teachers
2. Descriptor-Explanatory Analysis of Data from Biology Students

4.1 Descriptor-Explanatory Analysis of Data from Biology Teachers

This section of the study looks at the demographic characteristics of the respondents (Teachers) in terms of name of school, age, gender, academic qualification, number of years taught, number of periods handled in a week, assessment of audio-visual aid in respective schools; frequency of use of the available audio-visual aids; views on using audio-visual materials and factors that hinder the use and application of audio-visual materials in teaching and learning Biology.

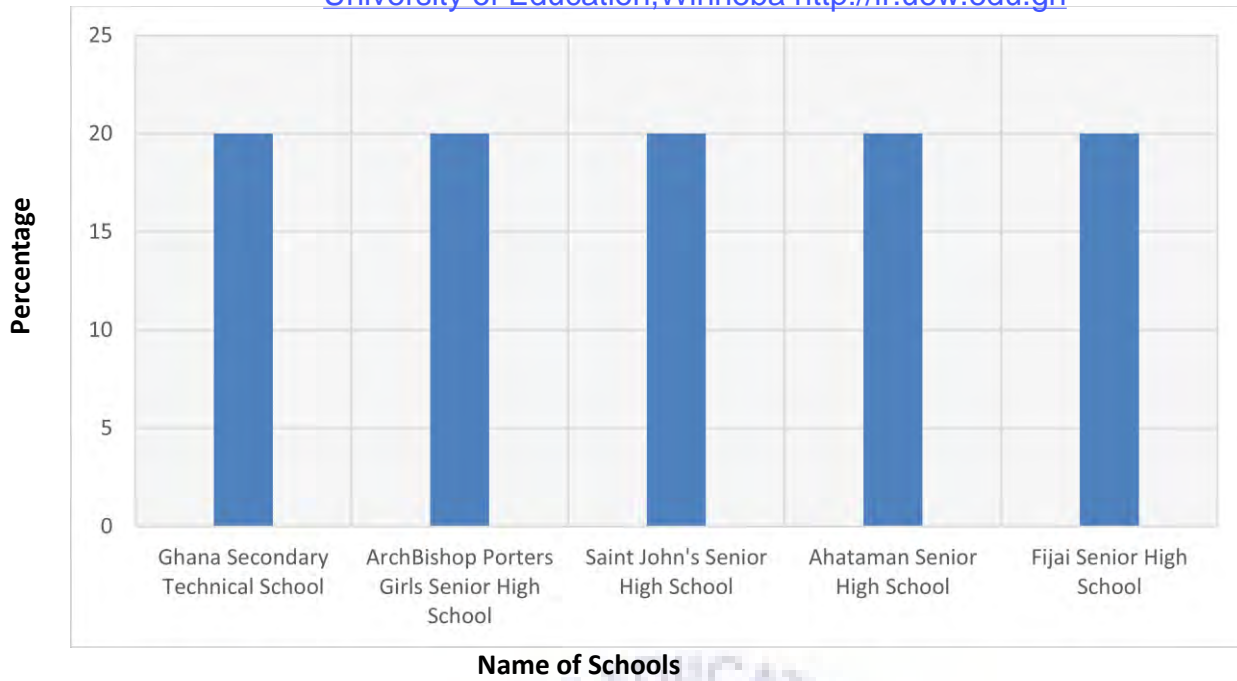


Figure 4.1: Percentage distribution of Respondents (Teachers)

Four Biology teachers representing twenty (20%) each from five (5) schools namely: Ghana Secondary Technical High School; Archbishop Porter Senior High School; Saint John’s Senior High School, Ahantaman Girls Senior High School and Fijai Senior High School were selected and figure 4.1 gives their percentage distribution.

Table 4.1: Gender distribution of Respondents (Teachers) in Various Schools

Name of school	Gender		Total
	Male	Female	
Archbishop Porter SHS	2	2	4
GSTS	2	2	4
Saint John’s SHS	3	1	4
Ahantaman Girls	2	2	4
Fijai SHS	4	0	4
Total	13	8	20

A majority of the teachers who responded to the questionnaire were males. (65%) as opposed to females (35%). For instance, at Fijai Senior High School, all teachers handling Biology were males. (Table 4.1)

Table 4.2: Age in years of the Respondents (Teachers).

Name of school	Range of Ages (in years)				Total
	20-30	31-40	41-50	51 and above	
Archbishop Porters SHS	2	2	0	0	4
GSTS	2	1	1	0	4
Saint John's SHS	0	2	2	0	4
Ahantaman Girls	0	3	0	1	4
Fijai SHS	0	3	1	0	4
Total	4	11	4	1	20

The respondents varied in age, ranging from 20 to over 50 years and above (Table 4.2). The highest proportion of the respondents fell into the 31-40 age grouping. This accounted for 55% of the total respondents. This was followed by the 20-30 age group and 41-50 age groupings which also contributed 20% each with the least being 51 and above year's age group (5%).

In terms of academic qualification of respondents, 55% of the respondents were holders of Bachelor of Education degree whilst 45% were Bachelor of Science degree holders (Table 4.3). For instance, it can be observed that at Archbishop Porter Girls Senior High School, 75% of the teachers were holders of Bachelor of Education (B.Ed.) degree whilst 25% had Bachelor of Science degree.

Table 4.3: Academic Qualification of Teachers in the Various Schools

Name of school	Academic qualification				Total
	HND	B.Ed.	B.Sc.	Masters	
Archbishop Porters SHS	0	3	1	0	4
GSTS	0	0	4	0	4
Saint John's SHS	0	3	1	0	4
Ahantaman Girls	0	2	2	0	4
Fijai SHS	0	3	1	0	4
Total	0	11	9	0	20

This was so in all the sampled schools as handlers of Biology as a course were seen to be bachelor of science and bachelor of education degree holders respectively (Table 4.3)

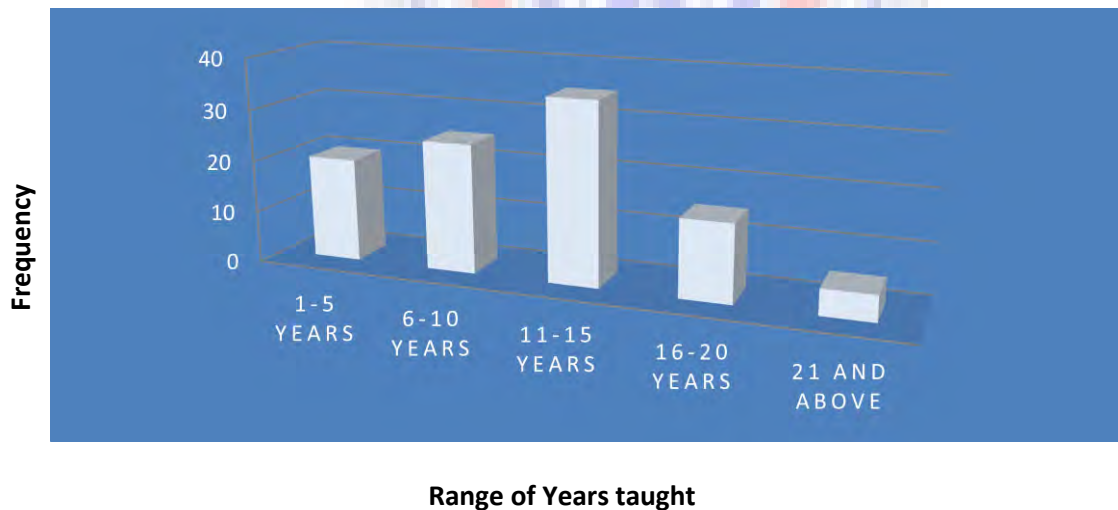


Figure 4.2: Number of years taught by the Respondents (Teachers)

When asked the number of years that they have taught Biology, 35% out of the total respondents indicated that they have taught between 11-15 years. This was followed by 6-10 years (25%) and 5% of the respondents said that they have been teaching Biology for more than 21 years.

(Figure 4.2)

Table 4.4: Number of Periods handled by the teachers in a Week

Number of periods	
Per week of Teachers	Frequency
1-5	0
6-10	0
11-15	3
16-20	5
21-25	10
26 and above	2
Total	20

A majority of the respondents (50%) pointed out they teach between 21-25 periods per week, followed by 16-20 periods per week (25%) whereas 10% said they teach more than 26 periods per week. (See Table 4.4 above)

In terms of the level of availability of audio-visual aids for teaching Biology in the selected schools. Evidence from the data collected showed that textbooks were 95% available and 5% non-availability. Bulletin boards were 75% non-available and 25% available. Radio and recording saw 65% of the respondents (teachers) asserting non-availability whilst 35% of the

respondent indicated their availability. The respondents however indicated that charts were available in all the schools sampled. (Figure 4.3).

Camera/pictures were also 65% non-available and 35% available. Respondents were however lopsided towards availability to television set; computer; pen drive/DVD/CD; projector; specimen; models; and charts (see Figure 4.1). They accounted for 70%; 90%; 75%; 70%; 100%; 95%; and 100% in that order whilst 30%; 10%; 25%; 30%; and 5% were non-availability of audio-visual aids.

In the respective schools, it was evidently clear that most of the instructional materials were available. For instance at Ghana Secondary Technical School, the respondents indicated that eight out of the twelve instructional materials in the questionnaire were available constituting 66.66%. said they were available. Again respondents from three of the schools sampled, that is Archbishop Porter Girl's Secondary School, St. John's School and Ahantaman Girl's Secondary School indicated equal numbers of availability and non-availability of the instructional materials. The respondents in the three schools named above all indicated that ten out of the twelve instructional materials named in the questionnaire were available which constitute 83.33% availability and 16.67% non-availability. Data collected from Fijai Secondary School was the only one that presented some slight disparities because as some of the respondents indicated the availability of a particular instructional some indicated its non-availability. For example, one respondent said textbooks were non-available whilst the others said they were available.

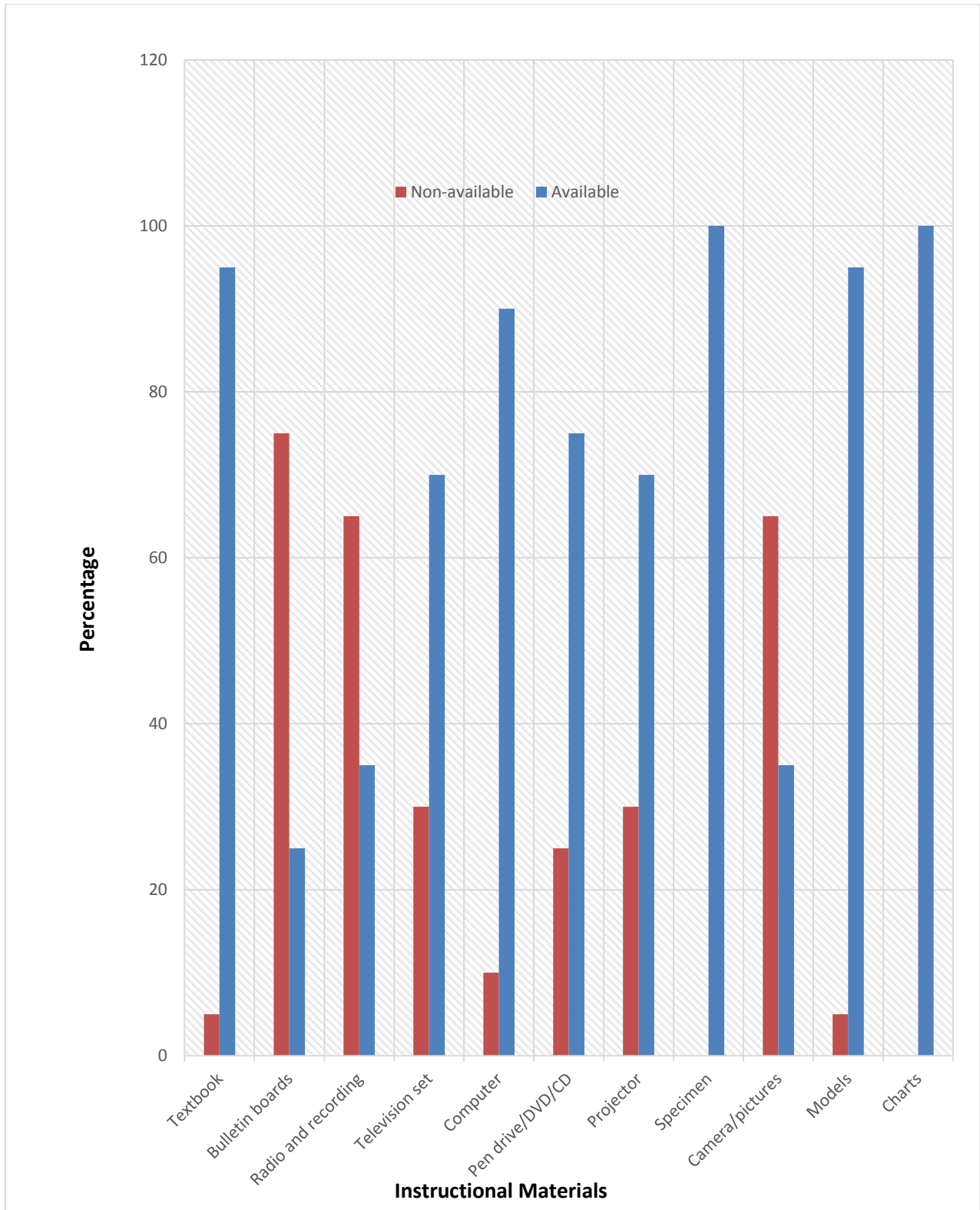


Figure 4.3: Availability of Instructional Materials in the Schools as indicated by the Teachers

Respondents (teachers) further indicated the frequency of use of the available audio-visual aids in aiding in the teaching and learning of biology (Table 4.5). Chalkboard/white board, textbooks, projectors, specimen, camera/pictures, models and charts were skewed towards very often and often.

Table 4.5: Frequency of Use of the Available Instructional Materials as indicated by the Teachers

Instructional Material	Percentage Rating			
	Very often	Often	Rarely	Not at all
Chalkboard/White board	85.0	15.0	0.0	0.0
Textbooks	45.0	55.0	0.0	0.0
Bulletin boards	0.0	15.0	15.0	70.0
Radio and recording	0.0	10.0	10.0	80.0
Television set	5.0	10.0	60.0	25.0
Computer	5.0	68.0	32.0	0.0
Pen drive/DVD/CD	5.0	20.0	70.0	5.0
Projector	0.0	30.0	68.0	2.0
Specimen	30.0	68.0	5.0	0.0
Camera/Pictures	40.0	55.0	5.0	0.0
Models	20.0	80.0	0.0	0.0
Charts	30.0	70.0	0.0	0.0

85% of the respondents indicated that chalkboard/white board were used very often in their schools whilst the 68% indicated often usage to computers, projectors and specimen. However, pen drive/DVD/CD and Television sets were said to be rarely used. These accounted for 25% and 30% in that order. Bulletin boards saw (70%) of the respondents claiming that they don't use

them at all, radio and recording also had (80%) of the respondents saying they don't use them at all in their teaching. (Table 4.5)

Table 4.6: Views of Respondents (Teachers) on the use of Instructional Materials in Teaching Biology

Views	Percentage Rating			
	Strongly agree	Agree	Disagree	Strongly disagree
I like using them	70.0	30.0	0.0	0.0
I have been trained to use them	14.0	10.0	50.0	26.0
They are easy to use	45.0	55	0.0	0.0
My students appreciate using them	70.0	30.0	0.0	0.0
They make abstract topics more practical	65.0	35.0	0.0	0.0
They make my lessons lively	73.0	27.0	0.0	0.0

Respondents (teachers) were asked to express their views on using audio-visual materials in teaching biology (Table 4.6). Evidence from the data collected indicates that respondents were skewed towards strongly agree and agree in relation to the views. "I like using them". This presented strongly agree (70%) and agree (30%). "They are easy to use" realized 45% for strongly agree and 55% for agree and "they make my lessons lively" also accounted for strongly agree (73%) and agree were 27%. The view "My students appreciate using them" again accounted for (70%) strongly agree and (30%) agree. The view "They make abstract topics more practical" also had 65% of the respondents strongly agreeing to it and 35% agreeing. This pattern

was not the same for the view “I have been trained to use them” as it rather had majority of the respondents asserting disagree and strongly disagree, that is 50% and 26% respectively.

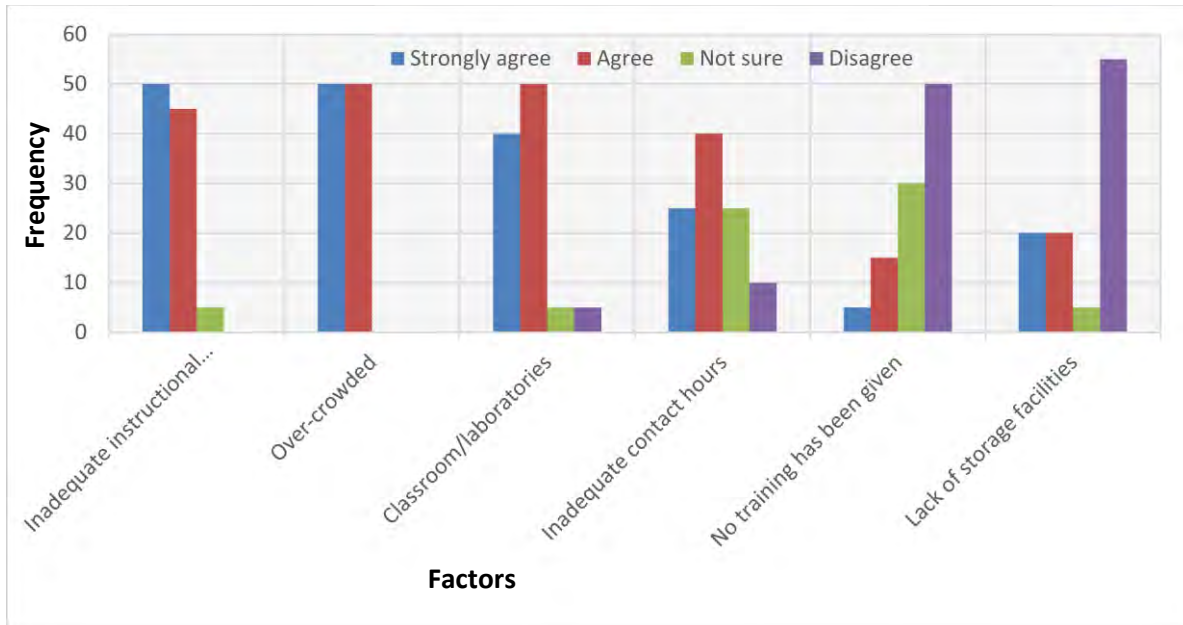


Figure 4.4: Factors Hindering the use and Application of Instructional Material as indicated by the Teachers

With regards to the question on the factors that hinder the use and application of instructional materials during Biology lessons, it can be observed from the figure above that majority of the respondents (Teachers) indicated strongly agree and agree to the factors; inadequate instructional materials, over-crowded classrooms/laboratories and to some extent contact hours. These gave percentages ranging from 25% to 50% and 40% to 50% with respect to strongly agree and agree while 50% and 55% of the respondents disagreed on the item; no training has been giving and lack of storage facilities in turn.

Similarly, the statement/item (variable): “lack of storage facilities” is deemed more influential a factor because it produced a higher mean and relative lower standard deviation compared to the statements/items: “no training has been given” and inadequate contact hours (Figure 4.4). Respondents asserted that teachers should be well trained especially in biology practical; biology lessons should be taught practically and be student centred; whilst some teachers also suggested that the use of pamphlet in teaching biology should be stopped so as to improve teaching and learning of Biology at the senior high school (SHS) level. Furthermore, the respondents (teachers) were to give suggestions on how the teaching and learning of Biology at the SHS level could be improved and below are some of the suggestions sampled from the respondents (teachers):

1. Modern classrooms should be built to install some of the facilities to enhance the teaching and learning of Biology.
2. More models should be brought to the schools for the teachers to work with them.
3. Small class sizes.
4. Longer duration for practical lessons.
5. Field trips.
6. Regular training should be given to the teachers on the use of projector and other science equipment.
7. Formulation of policies to favour teachers in terms of allowances and other incentives.

4.2 Descriptor-Explanatory Analysis of Data from Biology Students

This section of the study looks at the demographic characteristics of the respondents (name of school, gender, form and age); assessment of availability of instructional materials in the schools; frequency of use of the available instructional materials and views on using audio-visual materials in helping students understand biology lessons better.

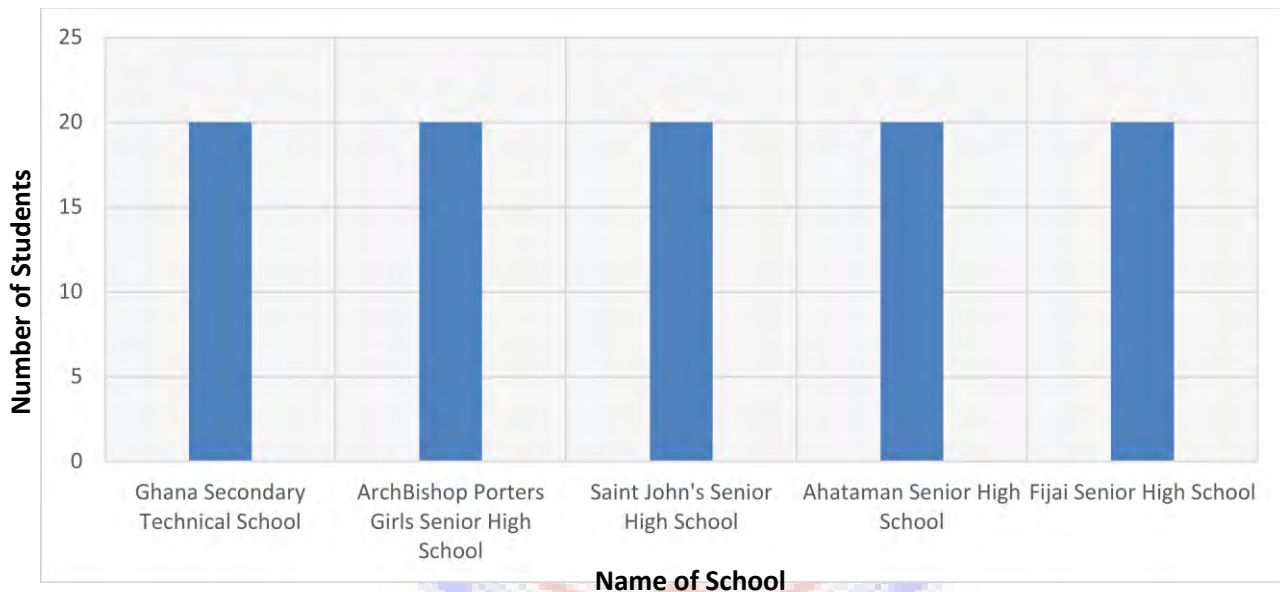


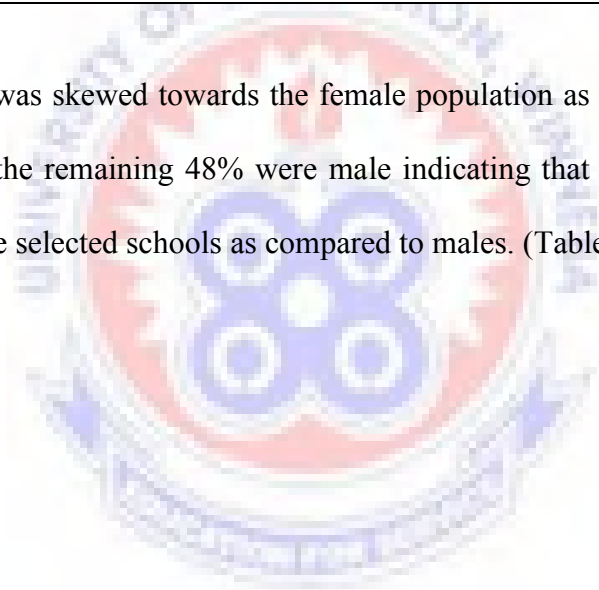
Figure 4.5: Name of School and the Number of Respondents (Students)

The study sampled twenty students each from five schools namely: Ghana Secondary Technical School, Archbishop Porter Girls' Senior High School, Saint John's Senior High School, Ahataman Girls' Senior High School and Fijai Senior High School. This is shown in the figure 4.5 above.

Table 4.7: Gender distribution of Respondents (students) in the various Schools

Name of school	Gender		Total
	Male	Female	
Archbishop Porters SHS	0	20	20
GSTS	20	0	20
Saint John's SHS	20	0	20
Ahantaman Girls	0	20	20
Fijai SHS	8	12	20
Total	48	52	100

The gender of students was skewed towards the female population as it accounted for (52%) of the total sample whilst the remaining 48% were male indicating that more female students are enrolled in biology in the selected schools as compared to males. (Table 4.7).



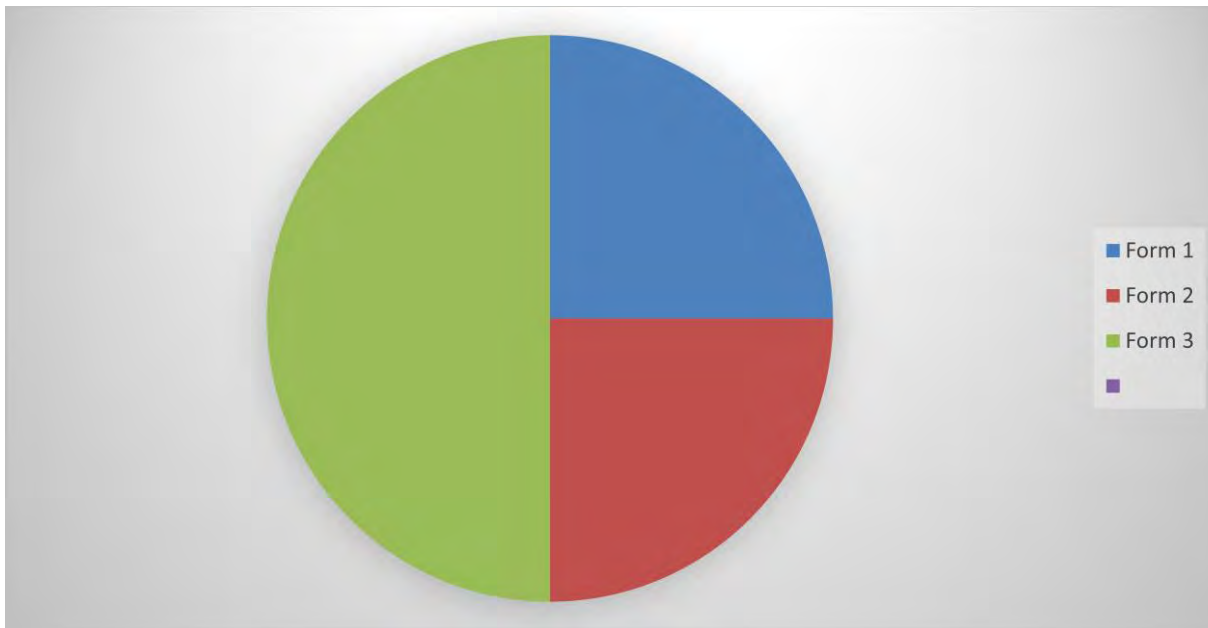


Figure 4.6: Distribution of Respondents (Students) by Form

A majority of the students were in SHS 3 as can be seen in the pie chart above. They constituted 50% of the respondents (students), whereas 25% were in SHS 2 and SHS 1 respectively.

Table 4.8: Age Distribution of Students (in years)

Name of school	Age in years				Total
	11-13	14-16	17-19	20 and above	
Archbishop Porters SHS	1	4	10	5	20
GSTS	0	3	10	7	20
Saint John's SHS	0	5	11	4	20
Ahantaman Girls	1	5	9	5	20
Fijai SHS	2	4	9	5	20
Total	4	21	49	26	100

The ages of the respondents (students) varied in years as it ranged from 11 years to 20 years and above. The highest proportion of their age fell in the age range 17-19. This accounted for 49% of

the total number of students sampled for the study, followed by the 20 and above age group (26%) and the least was the age group 11-13 (4%).

The students were also to indicate the availability or non-availability of instructional materials in their schools and figure 4.7 gives a summary of the data collected from the students. All the respondents (students) confirmed 100% availability of chalk board/white board (this was the case with regards to the teachers). It can be observed from the chart that text books were (94%) available and 6% claimed non-availability. Bulletin boards saw 79% of the students claiming non-availability and 21% of the respondents claiming their availability. Radio and recording saw 81% of the respondents asserting non-availability whilst 19% of the respondent indicated availability.

However, respondents were skewed towards availability to the items: television set, computer, projector, specimen, camera/pictures, models and charts with at least 55% whilst the instructional materials with the greatest percentage of non-availability were pen drive/DVD/CD. This accounted for 65% of the total student's population claiming their non-availability (Figure 4.7). The data from the students seems to be a confirmation of that from the teachers.

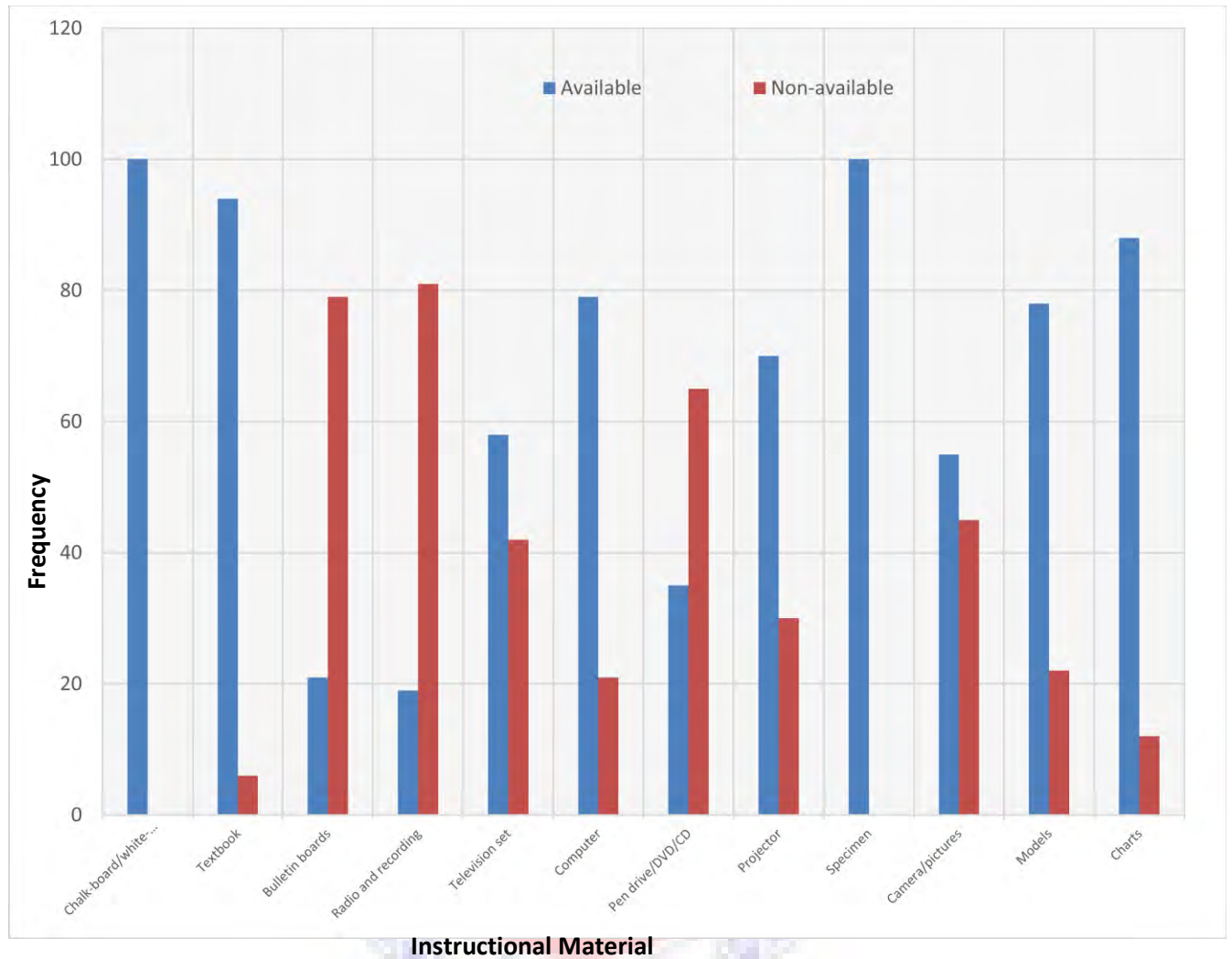


Figure 4.7: Availability of Instructional Materials as Indicated by the students

With regards to the item “indicate the frequency of use of the available audio-visual aids/materials in the teaching and learning of biology”, responses from the students indicated that Chalkboard/white board, textbooks, specimen, camera/pictures, models and charts were skewed towards very often and often. For instance, 88% of the respondents indicated that chalkboard/white board were used very often in their schools whilst the remaining 12% were for often. However items like projectors, pen drives/DVD/CD cameras/pictures are rarely used. (Table 4.9)

Table 4.9: Frequency of Use of the Available Instructional Materials as indicated by the Students

S/No.	Aid	Percentage Rating			
		Very often	Often	Rarely	Not at all
1	Chalkboard/White board	88.0	12.0	0.0	0.0
2	Textbooks	65.0	35.0	0.0	0.0
3	Bulletin boards	0.0	10.0	25.0	65.0
4	Radio and recording	0.0	15.0	25.0	50.0
5	Television set	5.0	25.0	20.0	50.0
6	Computer	10.0	45.0	30.0	15.0
7	Pen drive/DVD/CD	5.0	20.0	20.0	55.0
8	Projector	35.0	10.0	55.0	0.0
9	Specimen	40.0	60.0	0.0	0.0
10	Camera/Pictures	0.0	30.0	25.0	45.0
11	Models	55.0	40.0	0.0	0.0
12	Charts	65.0	35.0	0.0	0.0

In terms of Bulletin boards 65% out of the total respondents indicated “not at all” when asked about the frequency of its usage whilst 25% indicated rare usage of same item.

Respondents were skewed towards strongly agree and to some extent agree to the views: the use of audio-visual aids helps me understand biology better and I find biology lessons more interesting when audio-visual materials are used (Figure 4.8). The strongly agree accounted for 69% and 65% respectively and those who asserted agree accounted for 20% each.

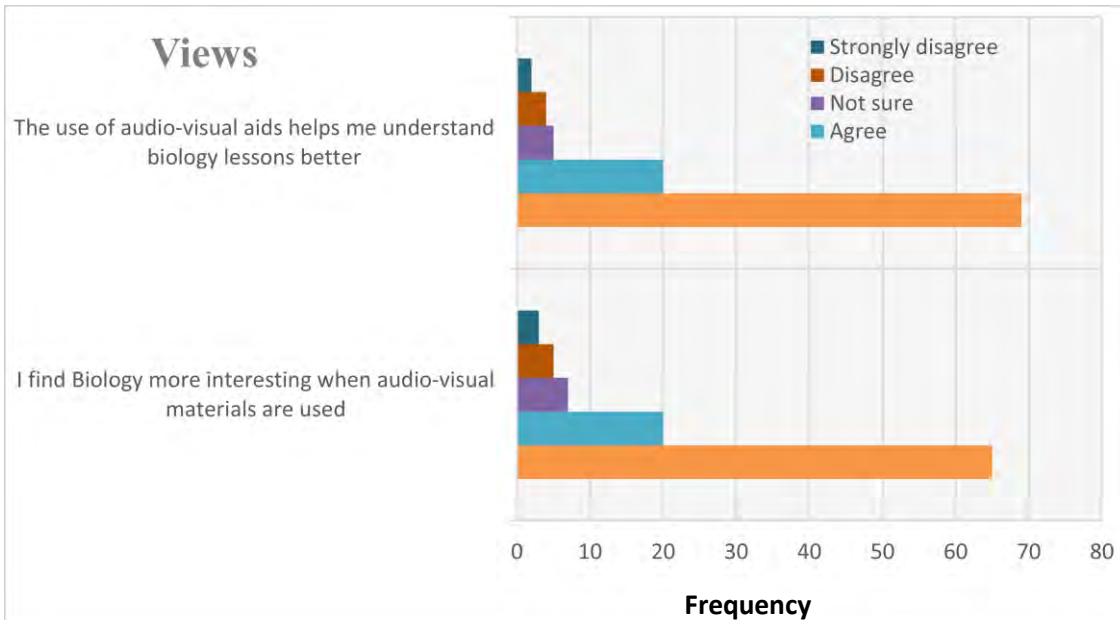


Figure 4.8: Views of Students on the Use of Instructional Materials during Biology Lessons

It can be inferred from the graph above that students have an appreciation in terms of understanding and learning biology when audio-visual aids/materials are used in teaching biology thus suggested that teachers should frequently use audio-visual materials and specimens during biology lessons.

The students were also to give suggestions that could lead to the improvement of the teaching and learning of Biology and below are samples of their suggestions:

- Teaching of Biology should be made more practical with regular visits to the lab.
- Introduction of good quality textbooks
- Projectors should be used to teach so that it will more practical

- Television sets/Laptops should be used to teach topics involving practical work rather than theories
- Teachers should use models and also visualize some biological phenomena
- Regular visits to nature parks
- Equipment needed for effective learning should be provided and students should be allowed to make use of the specimen and equipment
- Some topics should be removed from the Biology syllabus
- Without instructional materials, Biology lessons become boring, rigid, dull and unrealistic, etc.

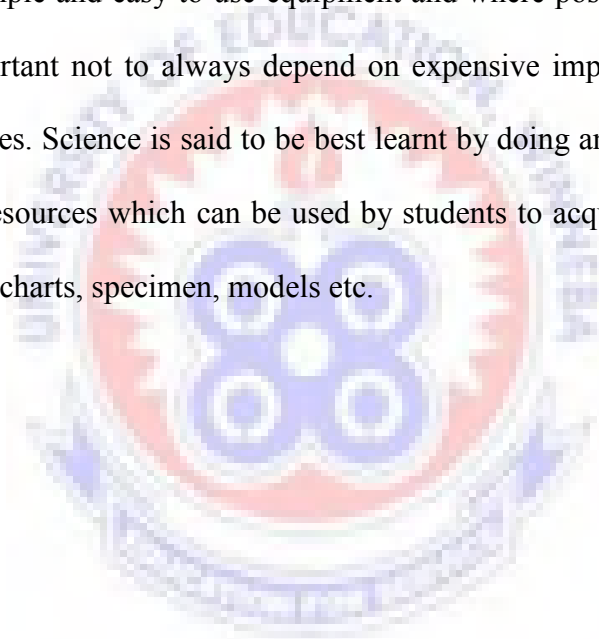
Discussions of findings

Educationists are of the opinion that the educational problems relating to the quantity and quality could be tackled by applying systematic approach to instructional technology because instructional materials aid to improve the process of learning. Venkataiah (1996) describes instructional technology as “the media born of the communications revolution which can be used for instructional purposes alongside the textbook and blackboard” and a systematic way of designing, carrying out and evaluating the total process of learning and communicating and employing a combination of human and non- human resources to teaching and learning.

Biology is a practical subject and it involves a lot of demonstrations. This enables students to verify what they have been taught in theory and even to make new discoveries. It is, therefore necessary to provide equipment and materials for teaching and learning of Biology. To Bates (1971), the provision of equipment and materials for teaching and learning makes up the second most important factor after the teacher. This is evident from the suggestions some of the students

gave for the improvement of Biology lessons. Some of the respondents said that without instructional materials, Biology lessons become boring, rigid, dull and unrealistic (abstract). The use of instructional materials and equipment in teaching Biology thus makes the subject relevant, meaningful and also improves the process of learning.

Effective teaching and learning of Biology at the SHS level requires laboratories, equipment and textbooks in addition to qualified teachers. Akilakpa-Sawyer (1994) said “the teacher can only function to his maximum capacity when all other resources have been provided”. It is therefore important to provide simple and easy to use equipment and where possible local substitutes can be used. It is also important not to always depend on expensive imported items but to utilize locally available resources. Science is said to be best learnt by doing and so it is ideal to provide many and appropriate resources which can be used by students to acquire learning experiences. These resources include charts, specimen, models etc.



CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Overview

This chapter presents the summary of the findings, implication of the findings for teaching and learning of science and conclusions drawn from the study. The chapter also includes recommendations and suggestions for further studies.

Summary of Findings

The study sought to examine the availability and use of instructional materials for the teaching and learning of Biology in the Senior High Schools in the Sekondi-Takoradi Metropolis.

- Majority of the teachers who responded to the questionnaire were males. This implies males dominated in the teaching of Biology.
- Again the majority of the Biology teachers had certificates that qualified them to teach Biology in the SHSs.
- Also the majority of the teachers had more periods to teach.
- Most schools have most of the audio-visual instructional materials but some of them (e.g. bulletin boards, radio/recorders and camera/pictures) were however unavailable.
- The most frequently used instructional aid in the sampled schools were chalkboards/whiteboards as well as textbooks.
- Majority of the teachers also claimed that they liked the use of the audio-visual aids in their lesson presentation in order to facilitate the understanding of their lessons but their schedules are very busy hence their inability to use the available resources.

- The main problems hindering the use of audio-visual aids in the teaching and learning and learning of Biology are inadequate instructional materials, overcrowded classrooms/laboratories and inadequate contact hours.

Conclusions

Biology is a practical subject and it involves a lot of experimentations. This enables students to verify what they have been taught in theory and even to make new discoveries. It is therefore, necessary to provide equipment and materials for the teaching and learning of Biology. The use of instructional materials in teaching Biology was found to be more effective as both the students and teachers claimed it increased the interest and enhanced the motivation level of the students.

The investigations revealed that some of the audio-visuals aids (e.g. chalkboard/whiteboard, textbooks, television sets, computers, pen drive/DVD/CD, specimen, models and charts) are available in the selected senior High Schools in the Metropolis. However, projectors, bulletin board radios and recorders as well as cameras/pictures were not readily available.

Chalkboard/whiteboards are the most frequently used instructional material in the teaching and learning of Biology. Among some of the factors that hinder the use of the available instructional materials are inadequate contact hours, overcrowded laboratories/classrooms and lack of storage facilities in the selected schools.

Recommendations

The findings from the study provide the basis for the following recommendations.

1. The Ministry of Education and the Ghana Education Service should as a matter of urgency provide all the Senior High Schools with all the needed instructional materials for effective teaching and learning
2. In-service training should be given the Biology teachers as well as the laboratory assistants on how to use the instructional materials supplied effectively.
3. Biology teachers should be well motivated in order to use the few available instructional materials for their lessons and also to improvise.
4. Class sizes for Biology classes should not exceed forty
5. The heads of the second cycle institutions must regularly arrange field trips for the Biology students so that the students may be able to study nature very closely and in its original state.
6. Since the study was conducted on students in the urban area, another study is needed to be planned and conducted on students from rural areas and with a larger sample.
7. The science resource centre project should be reactivated to restock the schools with the necessary science laboratory equipment.

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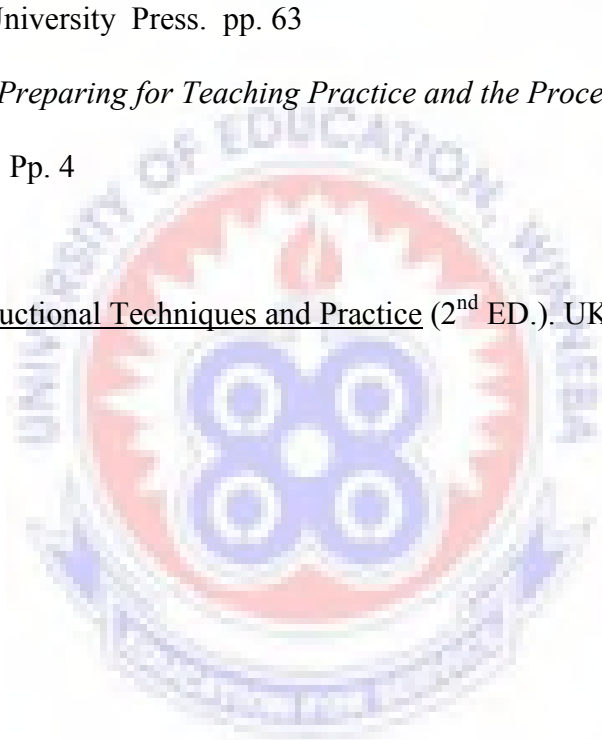
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APPENDIX 1

UNIVERSITY OF EDUCATION

DEPARTMENT OF SCIENCE EDUCATION

QUESTIONNAIRE FOR BIOLOGY TEACHERS

This questionnaire is being administered specifically for an academic purpose. It is on the topic:

Examining the use of Instructional Materials in the Teaching and Learning of Biology in Senior High Schools. Any information provided will be treated confidentially.

Please tick or write where applicable.

1. Name of School.....
2. Gender Male [] Female []
3. Age (in years) 20-30 [] 31-40 [] 41-50 [] 51 and above []
4. Academic qualification Master Degree [] B. Sc [] B. Ed [] Diploma/HND []
Others, specify.....
5. Number of years taught 1-5[] 6-10[] 11-15[] 16-20[] 21 and over []
6. How many periods do you teach in a week? 1-5[] 6-10[] 11-15[] 16-20[]
21-25[] 26 and above[]
7. Indicate whether the following audio visual aids are available or non- available in your school

Instructional aid	Available	Non-Available
Textbook		
Bulletin boards		
Radio and Recording		
Television set		
Computer		
Pen Drive/DVD/CD		
Projector		
Specimen		
Camera/Pictures		
Models		
Charts		

8. Indicate the frequency of use of the available instructional materials the teaching and learning of Biology

Aid	Very Often	Often	Rarely	Not at all
Chalkboard/White board				
Textbooks				
Bulletin boards				
Radio and recording				
Television set				
Computer				
Pen drive/DVD/CD				
Projector				
Specimen				
Camera/Pictures				
Models				
Charts				

9. What are your views on using audio-visual materials in teaching Biology?

View	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
I like using them					
I don't like using them					
I have been trained to use them					
I have not been trained to use them					
They are easy to use					
My students appreciate using them					
They make abstract topics more practical					
They make my lessons lively					

10. What factors hinder the use and application of audio-visual material teaching Biology?

Problem	Strongly agree	Agree	Disagree	Strongly Disagree
Inadequate audio-visual aids				
Over-crowded classroom/Laboratories				
Inadequate contact hours				
No training has been given				
Lack of storage facilities				

Problem	Strongly agree	Agree	Not sure	Disagree	Strongly agree
Inadequate instructional materials					
Over-crowded classroom/Laboratories					
Inadequate contact hours					
No training has been given					
Lack of storage facilities					

11. State three suggestions that you think will assist in improving teaching and learning of Biology at the SHS level.

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APPENDIX II

UNIVERSITY OF EDUCATION

DEPARTMENT OF SCIENCE EDUCATION

QUESTIONNAIRE FOR BIOLOGY STUDENTS

This questionnaire is being administered specifically for academic purpose on the topic:

Examining the use of Instructional Materials in the Teaching and Learning of Biology in Senior High Schools, therefore any information provided will be treated confidentially.

Please, tick () or write as application.

1. Name of School.....

2. Gender Male [] Female []

3. Form SHS 1 [] SHS 2 [] SHS 3 []

4. Age (in years) 11-13 [] 14-16 [] 17-19 [] 20 and above []

5. Tick [] whether the following audio-visual aids are available or non-available in your school.

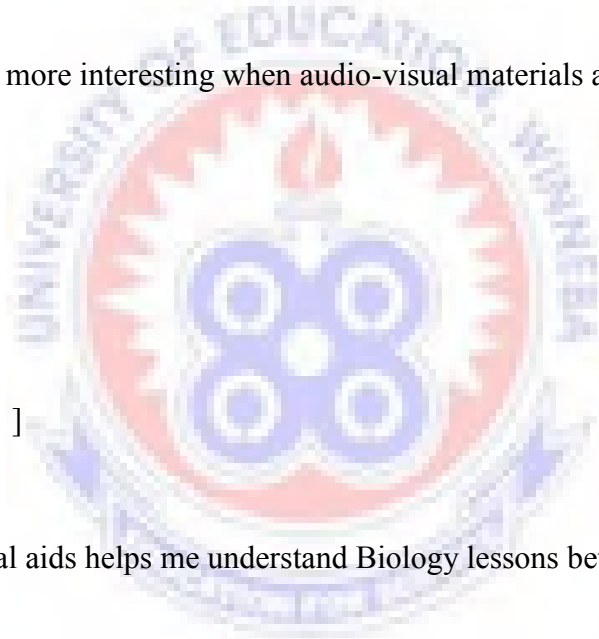
AIDS	AVAILABLE	NON-AVAILABLE
Chalkboard/White-board		
Textbooks		
Bulletin boards		
Radio and Recording		
Television set		
Computer		
Pen Drive/DVD/CD		
Projector		
Specimen		
Camera/Pictures		
Models		
Charts		

6. Tick [] the frequency of use of the available audio-visual aids by your teacher during Biology lessons

AIDS	Very Often	Often	Rarely	Not at all
Chalkboard/White board				
Textbooks				
Bulletin boards				
Radio Recording				
Television set				
Computer				
Pen drive/DVD/CD				
Projector				
Specimen				
Camera/Pictures				
Models				
Charts				

7. I find Biology lessons more interesting when audio-visual materials are used

- (I) Strongly agree []
- (II) Agree []
- (III) Not sure []
- (IV) Disagree []
- (V) Strongly disagree []



8. The use of audio-visual aids helps me understand Biology lessons better.

- (I) Strongly agree []
- (II) Agree []
- (III) Not sure []
- (IV) Disagree []
- (V) Strongly disagree

9. Give any two suggestions that you think will help in improving the teaching and learning of Biology at SHS level.

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