UNIVERSITY OF EDUCATION, WINNEBA

USE OF INSTRUCTIONAL RESOURCES IN TEACHING AND LEARNING OF INTEGRATED SCIENCE IN SENIOR HIGH SCHOOLS IN ASANTE MAMPONG MUNICIPALITY

PATIENCE ASANTEWAA

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Faculty of Science Education submitted to the school of
Graduate Studies in partial fulfilment
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DECLARATION

Student's Declaration

I, PATIENCE ASANTEWAA, declare that this thesis, with the exception of quotations and references contained in published works which have all 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:……..……...……

Supervisor's Declaration

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

NAME OF SUPERVISER: DR JAMES A. AZURE

SIGNATURE:……..……

DATE:……..……...……

DEDICATION

This thesis is dedicated to my daughter Athesia Akua Sika Kwenin and my husband Dr. William K. J. Kwenin.

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I also wish to acknowledge Asante Mampong Municipality Education Office for granting me permission and authorisation to conduct this research in Senior High Schools in the Municipality.

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ABSTRACT

The purpose of this study was to investigate the use of instructional resources in the teaching and learning of Integrated Science in Senior High Schools in Asante Mampong Municipality in the Ashanti Region of Ghana. The design of the study is survey. Purposive sampling was used to select 55 academic staff and convenience sampling was used to select 10 students for focus group discussion. The instruments used were questionnaire, observation and focus group discussion. Questionnaires were administered to five (5) Assistant Heads (Academics), five (5) Heads of Science Departments, forty-five (45) Integrated Science Teachers and five (5) focus group discussions with Forms 1 and 2 students. Fifteen (15) teachers were observed in teaching. Statistics used for data analyses included frequencies, means and percentages. Data obtained from students' focus group discussions were presented as narratives. Students were indifferent about the use of Integrated Science textbooks but felt that science laboratories were not properly equipped. It was observed that majority of teachers did not use available laboratory resources. Internet facilities, real objects, visual aids and audio-visual equipment (computers and projectors) were not adequately used for teaching. The major hindrance to the use of instructional resources in teaching Integrated Science lessons was scarcity. The findings also showed that teachers had the tendency to ignore the use of instructional resources in the teaching and learning of Integrated Science. The study recommends among others that schools should be provided with adequate teaching-learning materials, properly equipped laboratories and school farm and to encourage or ensure that teachers use available learning aids.

CHAPTER ONE

INTRODUCTION

1.0 Overview

Chapter One represents the introduction to the research topic which comprised background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitation, limitation and organisation of the study.

1.1 Background to the Study

Science is very important in human life and forms the basis for understanding nature and our world, inventions, technology and healthcare. Science at all levels of education is therefore indispensable (Kola, 2013). Integrated Science is taught as a core subject in both Junior and Senior High Schools in Ghana to give every student an opportunity to learn some amount of science (Adu-Gyamfi, Donkoh & Addo, 2016).

Science is different from any other subject. In order to understand its concepts, one has to look beyond the books and conventional classroom teaching (Niazi, Asghar & Ali, 2018). Effective teaching and learning of science involves seeing, handling, and manipulating real objects and materials. The knowledge that students attain in classrooms would be ineffectual unless they actually observe the process and understand the relationship between action and reaction (Erickson, Marks & Karcher, 2020).

Science involves experimentation and should therefore provide a forum for practically experimenting the theoretical knowledge gained in the classroom and for demonstrating

the psychomotor skills of a teacher and a learner (Adalikwu & Iorkpilgh, 2013). Practical work helps students learn diverse skills and provides them a sense of accomplishment when they make discoveries and reach scientific conclusions through their own experiments (Itzek-Greulich & Vollmer, 2017).

In the teaching of practical lessons in Integrated Science, instructional resources are very important. It adds greater meaning and realism to teaching and learning. Instructional resources have been reported to enhance the learning of science (Arop, Umanah & Effiong, 2015). The use of instructional resources leads to a shift from memorization or rote learning to process learning and consequently promote academic achievement of learners. Effective use of instructional resources motivates and arouses students' interest in science, enhances understanding and recall (Adalikwu & Iorkpilgh, 2013; Igiri & Effiong, 2015). The use of resources is essential in helping students to explore and develop ideas about their environment and be scientifically literate.

Generally, instructional resources have been found to be important at various levels of education, different subjects and across the globe. Several studies have shown a lack of or inadequacy of the needed instructional resources (such as textbooks, library facilities and laboratory equipment) and poor usage of these resources for effective teaching and learning. This trend spans several subjects such as Biology (Okello, 2021) in Uganda, Social Studies (Amuzu, 2018) in Ghana and Chemistry (Adalikwu & Iorkpilgh, 2013; Njeri, 2022) in Nigeria and Kenya respectively. Arop, Umanah and Effiong (2015) were of the view that use of teaching learning resources lead to better understanding of concepts and better academic performance of students.

Classroom resources are key tools to improve the learning process. It is important to select engaging resources for classroom use and to explore the reasons to consider when choosing a resource. Providing quality instruction relies on several factors, including having appropriate classroom resources, items and other sources used for instruction (Shukla 2018). Seasoned teachers are expected to find and use resources that enhance students learning. An important aspect is to use resources that challenge all students, no matter what level they are working on. Using a wide variety of quality classroom resources allows the teacher to teach to the understanding of different ability groups in the classroom (Okoji & Olubayo, 2021).

Classroom resources could be resources used by students in the classroom, resources found outside the classroom that boost student learning and resources used by teachers. Choosing a resource that enables the teacher to achieve learning objectives, or goals for students, and help all students succeed is important (Kaspar & Borgerding, 2017). Learning resources must have a purpose in the classroom and must align to learning objectives and help students understand key concepts. The guiding principle in selecting learning resources is whether the classroom resource is appropriate and purposeful (An, 2021).

Teachers must ensure that selected teaching and learning resources support students to learn the curriculum, suitable for the age group using them and consider the words, behaviour, images or themes of the resources in terms of context, impact on the audience age group, literary, artistic or educational merit of the material and intention of the author and general character of the material (Shukla, 2018). Schools must ensure that teaching and learning resources provide challenging and engaging learning

programmes for students but do not offend students or the wider school community due to their obscene, offensive or controversial nature (Lewis, 2018).

1.2 Problem Statement

It appears there are inadequate instructional resources for teaching and learning of Integrated Science in Senior High Schools in the Asante Mampong Municipality and even not sure those that have them use them in teaching. Furthermore, it is not clear whether those schools that have the facilities adequately put them to use. These are developments observed by the researcher who is a teacher in one of the public Senior High Schools in the Municipality. It is common to see Integrated Science teachers doing abstract teaching without any serious practical activity with their students, especially in the school in which the researcher teaches. If the situation is like this in the researcher's school, could it be the same in other senior High Schools in the municipality? This is a question that merits research.

Actually, unavailability of instructional resources in schools normally result in the use of lecture method by the teacher in teaching and results in rote learning (Organisation for Economic Co-operation and Development/OECD, 2016a). Consequently, experimental or activity-based approach is neglected leading to low teacher-learner interactions, negative attitude towards science and poor performance (Oladehinde, 2019). Such developments can negatively affect the performance and attitude of students towards Integrated Science and thereby contributing to poor performance in the West African Senior School Certificate Examination (WASSCE). However, availability of instructional resources and their effective use can positively influence the teaching and learning of Integrated Science.

It is therefore imperative to identify available instructional resources in schools to promote demonstration and practical lessons to enhance understanding and recall (Arokoyu & Chimuanya, 2017; Oladehinde, 2019). Therefore, this study was designed to investigate the use of instructional resources in the teaching and learning of Integrated Science in the Asante Mampong Municipality in the Ashanti Region of Ghana.

1.3 Purpose of the Study

The purpose of this study was to investigate the use of instructional resources in the teaching and learning of Integrated Science in Senior High Schools in Asante Mampong Municipality in the Ashanti Region of Ghana.

1.4 Objectives

The objectives of the study were to:

i. examine the types of instructional resources available for teaching and learning Integrated Science in Senior High Schools in Asante Mampong Municipality.
ii. determine the extent of utilisation of the instructional resources available in schools by teachers.
iii. find out the factors that militate against the use of instructional resources for teaching and learning.

1.5 Research Questions

i. What types of instructional resources are available for teaching and learning of Integrated Science in Senior High Schools in Asante Mampong Municipality?

ii. To what extent are available instructional resources utilised by teachers for teaching and learning in Senior High Schools in the Municipality?

iii. What factors militate against the use of instructional resources for teaching and learning?

1.6 Significance of the Study

The findings of this study will:

i. draw the attention of the heads and integrated science teachers of second cycle institutions in Asante Mampong Municipality to the importance of the acquisition and utilisation of instructional resources for effective implementation of the integrated science curriculum.

ii. help various stakeholders of Senior High Schools in Asante Mampong (Parent Teacher Association/PTA and Old Students Associations) to use their scarce resources judiciously to procure the needed instructional resources to enhance the teaching and learning of integrated science.

iii. create an awareness for the need for schools in Asante Mampong Municipality to organise in-service training and workshops on the use of instructional resources.

iv. help heads of institutions and Assistant Heads Academic of Senior High Schools in Asante Mampong to supervise and ensure that available learning resources are used for the teaching of Integrated Science.

1.7 Delimitation of the Study

There are six (6) Senior High Schools in Asante Mampong Municipality. Out of the six schools, one is a private school and the remaining five are public Senior High Schools. The research was conducted in the five public Senior High Schools excluding the private Senior High School because they do not benefit from government subventions. The study also looked at only utiilisation of instructional resources by teachers for teaching.

1.8 Limitation of the Study

Due to proximity, financial and time constraints, the research was carried out in Asante Mampong Municipality of Ashanti Region. The sample size is small so the results will only be applicable to schools in the municipality, and cannot be applied to schools in the region.

1.9 Organisation of the Chapters

The study was organised into five major chapters. Chapter one focused on the introduction to the research topic. It comprised background to the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, delimitation, limitation and organisation of the study.

Chapter Two consisted of the reviewed literature on Instructional Material Theory and the conceptual framework of the study. Also literature was reviewed under instructional resources (types, roles and utilisation) and factors (intrinsic and extrinsic) militating against the use of instructional resources.

The research methodology adopted for the study was clearly explained in Chapter Three. It comprised the research design, population, target population, accessible population, sampling procedure, research instruments, validation of Instrument, reliability of Instrument, data collection procedures, data analysis technique and ethical considerations.

Chapter Four also focused on the presentation and interpretation of findings of the study. Chapter Five was devoted to the summary, conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Overview

This chapter is devoted to the review of related literature sourced during the research work. Instructional Material Theory and the conceptual framework of the study were discussed. Also literature was reviewed under; instructional resources, types of instructional resources, roles of instructional resources, utilisation of instructional resources, and intrinsic and extrinsic factors militating against the use of instructional resources.

2.1 Instructional Material Theories

Gagné, Wager, Golas and Keller (2005) have emphasized in their instructional material theory that there is a direct link between the materials used by teachers and the learning results of students. Other authors with similar instructional material theories have also opined that instructional materials have the capacity to develop in students the highest order of intellectual skills since they demonstrate sequentially how to follow the rules/principles to understand and retain knowledge (Adalikwu & Iorkpilgh, 2013). These authors therefore suggest that instructional materials can be used to build superior learning abilities in learners through self-teaching or guided learning.

These cognitive theories are not recent and originated several decades ago. Lev Vygotsky, a Russian psychologist, held similar beliefs, and was of the view that tools and signs in the form of instructional materials have the ability to promote higher levels of thinking in students, which is vital in problem solving activities (Vygotsky, 1978). The researcher is of the view that instructional resources should be used in the teaching

and learning of Integrated Science to enable students to easily perceive learning situations in a positive way. The researcher shares the same view with Farrant (1980) who noted that the inability of the teacher to utilise appropriate instructional resources to teach certain concepts will affect the student negatively in the subject.

2.2 Conceptual Framework

The researcher considers Integrated Science education to be effectively achieved when instructional resources are readily available, accessible and used. The availability and use of instructional resources are critical to a successful learning process. Fig. 1 illustrates the researcher's view on the use of instructional resources.

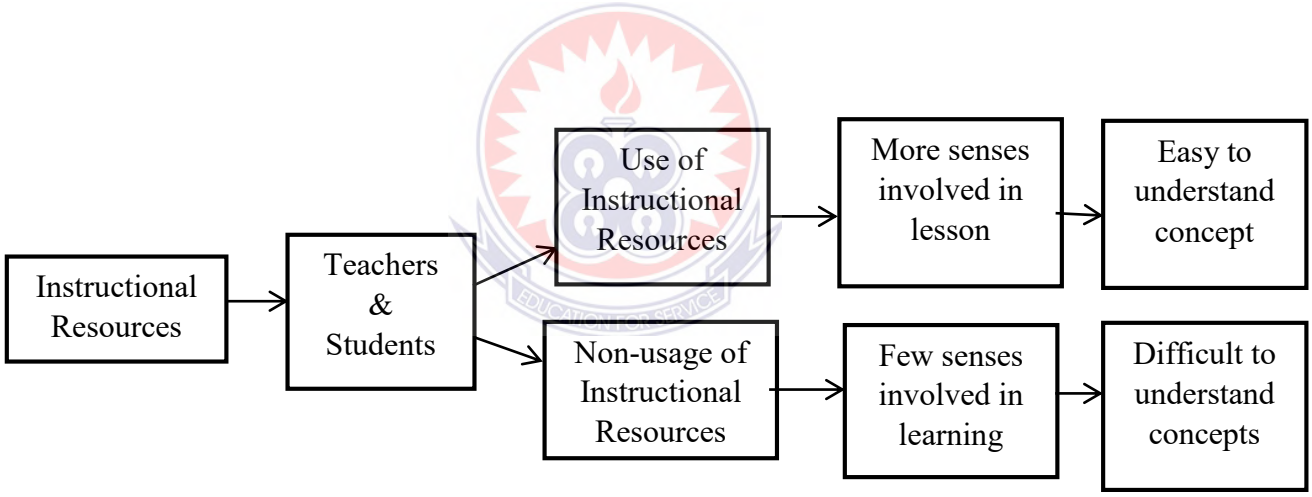

Fig 1: Conceptual framework showing the use of instructional resources and its effects on learning

If instructional resources are available, the student can use them for learning to occur. The teacher can use the instructional resources to improve upon competence to make teaching more effective. Both the teacher and student can make use of the resources for effective teaching and learning. The use of instructional resources improves the

competence of the teacher and facilitates learning of students because it involves the use of more senses. Instructional resources must be available before they can be used for teaching and learning. When not available, both teachers and students cannot use them for teaching and learning respectively. However, availability alone does not guarantee the usage of instructional resources. When available, willingness, attitude and competence of the teacher influence the utilisation of instructional resources and consequently the effectiveness of teaching and learning.

2.3 Instructional Resources

Instructional resources are materials that assist instructors in making the learning of concepts clear and understandable by students. They reduce oral teaching, increase learners' engagement, interest and motivation toward learning sciences (Lewis, 2018). Instructional resources can also be referred to as the human and non-human materials and facilities that can be used to ease, encourage, improved and promote teaching and learning activities. They are materials and resources used in the process of instruction and include everything from printed materials, such as textbooks; to non-book resources, facilities (space), time and human resources.

Instructional materials according to Okoji and Olubayo (2021) are information-carrying technology that can be employed for instruction. They relate to a wide range of equipment and materials used by teachers for teaching and learning in order to encourage students self-activity. Instructional materials include both visual and audio-visual equipment. Visual equipment are those materials that you see whiles Audio-visual materials are those materials that stimulate both the visual (sight) and audio (hearing) senses.

From the vocational point of view, instructional resources refer to any available and accessible theoretical, practical and skill oriented resources that aid in the learning, acquisition and evaluation of vocational technical abilities (Crist, 2014). They integrate all gadgets that aid in conveying facts, skills, attitudes and knowledge to learners inside the instructional system and as they may be utilised in the workplace.

Adequate instructional resources are required for successful teaching and learning to take place. As a result, they can be regarded as the resources that both teachers and students employ to facilitate effective teaching and learning (Okoji & Olubayo, 2021). Teaching-learning resources could be in the form of print and non-print items that are designed to impart information to students in the educational process. Instructional materials include items such as kits, textbooks, magazines, chalkboards newspapers, pictures, recordings, slides, transparencies, videos, video discs, workbooks, and electronic media including but not limited to music, movies, radio, software, CD-ROMs, and online services (Ahmad & Garba, 2021).

The teachers' strategic factor in arranging and offering Integrated Science education, according to Asrizal, Amran, Ananda, Festiyed and Sumarmin (2018), is instructional resources. This is because they assist in the development of a notion that the instructor would not be able to develop without the use of instructional materials. As a result, students are able to learn more easily, which has a good impact on their academic achievement.

Instructional resources, also known as teaching resources or teaching/learning materials (TLM) come in various forms - animate and inanimate forms, human and non-human resources. They aid teachers in teaching and learning situations to help them achieve desired learning objectives (Lewis, 2018). They may be presented as print materials such as textbooks, pamphlets, handouts, study guides, manuals and syllabus. They could be presented in electronic forms as audio materials such as cassettes, microphones, podcast, tape recorders and gramophones. Other instructional resources are visual aids such as charts, real objects, photographs and transparencies. Other forms are audiovisual aids and these include slides, tapes, films, filmstrips, television, videos and multimedia. Instructional resources may be presented in other electronic forms such as interactive computers, graphing calculators, tablets and mobile phones.

Instructional resources encompass all materials and physical means that a teacher may require and use in the teaching-learning process for effective knowledge transfer for the achievement of instructional objectives (Kaspar & Borgerding, 2017). In this vein, physical structures such as laboratories and laboratory equipment, crop and animal farms are resources that enhance the teaching and learning of science.

According to Shukla (2018), teaching learning resources or teaching learning materials have significant roles in how students learn in terms of motivation, stimulation, retention, interest and actionable learning. Devices, methods, or systems that are used to enhance teaching can be called a teaching aid. These devices can be traditional items such as blackboards and flannel boards as well as electronic devices such as tablets and projectors. Scientific tools such as telescopes and microscopes could also be used as teaching aids in a given context distinct from instructional materials.

Teaching aids could be classified as non-electronic (chalkboards, flip boards, slates, print photos & media, telescopes) and electronic/digital. Grouping teaching aids as auditory, visual, audiovisual, live stream apps, documentary repositories, field visits, lab apparatus, plant, animal or rock specimens, collaborative/social (online classrooms or forums) and Internet and Communication Technology (ICT) tools is another system of classification. Teaching aids may also be classified as traditional resources (guidelines, textbooks or reference books, workbooks, flashcards and charts), digital media, open resources (open-source journals, public databases, open courseware, forum discussions, memes) and testing resources (tests and classroom assignments) (Shukla, 2018).

2.4 Operational Definition of Instructional resources

In the context of this study, instructional resources refer to materials used to facilitate teaching and learning of Integrated Science. These include materials which can be read, listened to, manipulated, observed or experienced by students.

2.5 Roles of Instructional Resources

Adequate supply and exploitation of instructional resources enhance effective teaching and learning (Bizimana & Orodho, 2014). The use of physical and material resources (learning resources) stimulate the interest of students and assist both the teacher and the student in overcoming physical limitations during the presentation of the content. In this way they enrich and make learning more enjoyable because they have been found to improve learning in a variety of ways (Arop, Umanah & Effiong, 2015; Igiri &

Effiong, 2015). Among them is the improvement of the multi-sensory and multi-image aspects of lessons.

According to Adebule and Ayoola (2016), using instructional resource in teaching increases students' level of discovery and encourages students to learn more as they observe what they are taught. They claim that interacting with and/or manipulating learning resources results in better understanding, retention and recall of lessons. The ease of retention is possible because activity based lesson creates a picture in the mind of learners which makes it easier to remember (Ong'amo, Ondigi & Omariba, 2017).

The importance of instructional resources is acknowledged by Mukagihana, Nsanganwimana and Aurah (2020). They opined that instructional materials provide the teacher with a sense of direction, coordination, monitoring and more time for correction, as well as brighten the classroom and add variety to the classroom lesson. Other views to support the importance of instructional resources have also been expressed by Abdulkadir, Ibrahim, Moda and Yaro (2021). The use of instruments, equipment and practical sessions in the teaching of technical and vocational courses stimulate students desire to learn. They are also of the view that instructional resources assist in the learning process by making assimilation and memorisation of lessons easy and help in the long retention of information. It improves the students understanding on the working model taught by the teacher and also allows the learner to capture the true picture of what has been presented.

Apart from print-media (word-processed materials), other instructional resources have proven the bright possibility of disseminating educational information and experiences

broadly, rapidly, vividly and with realism and immediacy that printed media could never match (An, 2021). The aforementioned emphasises the need for frequent use of quality and adequate quantity of a variety of instructional resources critical for the successful implementation of any curriculum.

2.6 Utilisation of Instructional Resources

Instructional resources come in various forms and this affects the extent to which they can be ustilised. Specifically, selected teaching/learning resources should be appropriate for curriculum, that is, have a clear instructional purpose, appropriate or have positive connections with learners' knowledge, experience and identity, interesting (engages students) and flexible to students (Abdulkadir, Ibrahim, Moda & Yaro, 2021).

Teacher-made materials are particularly good because they can be tailored to the needs of students and tie in with instruction. In order that instructional resources become effective and useful, they must build knowledge about what is required for achieving particular tasks; engaging; and support the use of assessment to enhance learning (An, 2021). Although several types of learning resources exist, an appropriate learning resource should help students retain information for a longer period of time, aid students to think about concepts, increase student's vocabulary and help students gain a proper view of topics and concepts (Crist, 2014).

2.6.1 Utilisation of Print Materials and Open Textbooks

2.6.1.1 Utilisation of Print Materials

Print materials such as textbooks, pamphlets, handouts, study guides, manuals and syllabus are normally stacked in the library, used by tutors for preparing lesson notes and used by students for personal studies and revision. The choice of textbooks by teachers has a substantial effect on the performance of students. Van den Ham & Heinze (2018) reported that individual Mathematics textbooks substantially differed in their effects on students learning and so textbook choice on performance of students is cumulative over the school years. The choice of textbooks is therefore crucial and an important covariate in educational research and that textbook choice is a relevant factor for educational practice.

In a study conducted by French *et al*. (2015), students who used textbooks had better final marks than those who read sometimes, but surprisingly, and those who rarely read textbooks did equally well as those who read often. These authors also noted that students who often read textbooks for additional information tend to have in-depth knowledge and better understanding of content.

Primary school educators use textbooks in the revision and reinforcement stage, while the secondary school educators mostly use them in the stage of teaching the educational content. This implies that textbooks are necessary learning resources because students are mature and so need recommended textbooks for in-depth studies and for performing comprehensive tasks. Mithans & Grmek (2020) revealed that schools that had high textbooks use rating scores (high textbook-student ratios) had statistically significant achievement test scores than schools that reported relatively low textbooks use rating

scores. It was therefore suggested that standardized textbooks should be fully utilised to facilitate learning in schools rather than storing them for safekeeping (Attakumah, 2020).

An investigation of availability and utilisation of textbooks on students' academic achievement in Public Day Secondary Schools in Kisii County (Kenya), revealed that availability and utilisation of textbooks had a relationship with students' academic achievement (Mogaka, Kariuki & Ogeta, 2019).

2.6.1.2 Utilisation of Open Textbooks

Open, electronic or digital textbooks have been found to be equally important for the teaching and learning of science. Robinson, Fischer, Wiley and Hilton (2014) consider open textbooks as effective or even slightly more effective than their traditional counterparts in the teaching learning process. They are considered as teaching tool that facilitates both effective teaching as well as independent learning.

In a pilot study to assess the effect of open secondary science textbooks on student learning and academic performance, Morales and Baker (2018) observed qualitative and quantitative indications that students' perceptions of an open textbook in place of a standard textbook are improving students' attitudes and behaviors toward learning. The nature of open textbooks make them suitable for integration at all stages of the teaching process (Mithans & Grmek, 2020).

Although the idea of Open Educational Resources (OER) is thriving at the moment, some challenges exist. These include the lack of awareness on copyright issues, quality

in open content and how to sustain OER initiatives (University of Maryland, 2022). Education in the Global South faces several key interrelated challenges, for which OER are seen to be part of the solution. These challenges include: unequal access to education; variable quality of educational resources, teaching, and student performance; and increasing cost and concern about the sustainability of education (Hodgkinson-Williams & Arinto, 2017; University of Maryland, 2022). In developing countries like Ghana, and for less endowed Senior High Schools, other challenges include access to computers and internet connectivity.

2.6.2 Utilisation of Audio, Visual and Audio-visual Aids

In addition to print materials and open textbooks, learning may be perceived through the sense of hearing by using materials that produce sound. The use of devices that produce sound is essential for the teaching of topics in physics such as echo, resonance and sound energy that require sound as a resource (Shukla, 2018).

Visual aids such as real objects and photographs are commonly used to present specimens while charts and graphs are used to present graphical relationships between variables or factors. Visual aids are appropriate in lessons because they serve as notes, provide clearer organisation, facilitate more eye contact and motion by the speaker, contribute to speaker credibility and lead to an improvement of student understanding and memory (Kostereliogl u, 2016).

Visual aids such as maps, film steps, specimen, pictures, charts, blackboard, posters etc. appeal to the students through the sense of sight (Shabiralyani, Hasan, Hamad & Iqbal, 2015; Kostereliogl u, 2016). The use of visual aids in the teaching and learning process

is therefore very important because it simplifies the concepts taught (Dalali & Mwila, 2022).

Audiovisual aids such as slides, films, filmstrips, television, videos, animations and multimedia are used to present processes and phenomena that occur in nature. Audio-visual aids magnified by the use of projector etc. which combine both audio and visual materials aids learning greatly. Appropriate use of audio-visual aids makes it possible to present life situations and natural phenomena, especially physiological processes in their simplest form, originality and to the highest point of similarity better than verbal or lecture method (Mishra & Yadav, 2014). According to them, audio-visual aids enhance attention, arouse interest and promotes a suitable atmosphere for proper understanding with less effort than existing traditional methods of teaching.

According to Sukma (2018), audio-visual media provide the stimuli for students to gain the new knowledge and information in English beyond what are served to them. This is because students perceive concepts or content using their sense of sound and sight. The use of more senses positively influences students' participation in the classroom (Dalali & Mwila, 2022). They serve as good substitutes to monotonous learning environments (Shabiralyani *et al*., 2015). Ibe and Abamuche (2019) reported that student groups exposed to lessons using audio-visual technologies achieved higher in test scores than the groups not exposed to audio-visual aids. Enemuo, Anyaduba and Ezeaka (2019) also reported an improvement in the teaching and learning of computer science and this consequently positively affected students' academic performance.

The use of audio-visual aid is important in the teaching of Science, especially biology in secondary schools (Ibe & Abamuche, 2019). The utilisation of audio-visual aids in teaching is very effective as it increases the level of interest and motivation for learning by students. The frequent and effective use of audio-visuals results in better understanding and performance of students (Agangba & Ayiwah, 2019). Enemuo, Anyaduba and Ezeaka (2019) have shown audio-visual aids to be of immense importance because they help the teacher in creating proper situations and environment for capturing as well as maintaining the interest and attention of the students in the classroom activities, reduce verbalism and serve as a potent motivating force for energizing learners to learn effectively.

Other importance of audio-visual aids are that videos serve as valuable substitutes for the real object or phenomena and so make learning as realistic and meaningful as possible and render abstract concepts and phenomena easily clarified, understood and assimilated through their use (Agangba & Ayiwah, 2019). Verbalism leads to memorisation and this does not aid the development of higher faculties of the mind. The use of videos stirs the imagination, thinking process and reasoning power of the students (Reddy & Chowdary, 2019).

The use of various types of audio-visual aids helps in meeting the requirements of students with different intellectual abilities and so does not promote passiveness, dullness and uninteresting environment in the classroom, and therefore promotes healthy classroom interaction for effective realisation of teaching-learning objectives. Dahiya (2016) emphasised the need for the use of audio-visual aids in the teaching of subjects with more practical aspects such as Home Science. The use of audio-visual

aids makes lessons more interesting and effective because learning is through the organs of audibility and sight (Dahiya, 2016; Reddy & Chowdary, 2019). The use of audio-visuals in teaching is very effective in improving student's performance in the teaching and learning of circulatory system (Agangba & Ayiwah, 2019) and by extension other topics in Integrated Science. Learning and knowledge are perceived through sense organs and so the use of more senses leads to better understanding and retention of the knowledge acquired (Padhi, 2021). Most importantly, audio-visual aids help in cultivating scientific attitude and interest among students (Reddy & Chowdary, 2019). They make the connection between visual clues, the memory process, and the recall of new knowledge easy (Muthaiyan & Silambarasi, 2020).

2.6.3 Utilisation of Science Laboratories

In addition to desks and chairs, science laboratories are designed to have tables with sinks, burners, and other equipment designed to help students learn. The provision of equipped science laboratories provides a conducive environment that allows students to practice and perform experiments. Generally, laboratory activities are designed and conducted to engage students individually, or engage students in small groups and in large-group demonstrations. Typically, laboratories provide settings where students interact with materials to observe and understand the natural world (Itzek-Greulich & Vollmer, 2017). Practical lessons in laboratories involve the use of instruments and materials and this allows students to directly engage with the subject matter they are studying. In this way students often exhibit better retention of topics or lessons in Integrated Science syllabus or curriculum (Niazi, Asghar & Ali, 2018).

Science involves and requires students to perform experiments and engage in hands-on processes. Students with hands-on experience develop the greatest interest and intrinsic motivation followed by problem-based case studies and the least by students taught by lecture method (Erickson *et al*., 2020). While both intrinsic and extrinsic sources contributed to students' motivation to engage with activities, problem-based case studies and hands-on activities in laboratories were associated with greater internalization of motivation. Laboratory experiments therefore increase the interest of students for science (Itzek-Greulich & Vollmer, 2017; Erickson *et al*., 2020).

Due to conduct of practical lessons, performance of students in achievement test was found to be better than the performance of students without practical lessons (Niazi, Asghar & Ali, 2018). Engaging students in experiments and observing results first-hand enhances information or knowledge to stick with them much longer than theoretical lessons or reading over challenging subject matter several times. They therefore concluded that laboratory environment had positive impact on cognitive learning.

The mere existence of laboratories without proper science equipment for schools, and engaging students in practical lessons will not enhance understanding and knowledge retention in science. Laboratories are designed to engage students in lessons to provide practical lessons and improve information retention. Engaging students to conduct experiments rather than just read about them or taking monotonous notes, often makes it easier to understand challenging theories and concepts. Hands-on learning and completing exciting experiments make students become more engaged in the subject matter they are studying and develop a deeper appreciation and interest for science (Erickson *et al*., 2020).

2.6.4 Utilisation of Crop and Animal Farms

Physical structures such as crop and animal farms are resources that are used for practical and demonstrations to make students observe and have hands-on experience in Agricultural Science topics in Integrated Science. The extent to which these resources are utilised depend on their availability, quantity, competencies and motivation of teachers and the ability of institutions to manage them (Darko *et al*., 2016; Diise, Zakaria & Mohammed, 2018).

Onwumere, Modebelu and Ede (2016) reported a positive influence of school farm on the learning of Agricultural Science in Senior Secondary Schools. They are of the view that the establishment of functional school farms will promote the teaching and learning of agricultural science.

2.7 Factors Militating Against the Use of Instructional Resources

The interplay of intrinsic (teacher-related factors) and extrinsic factors (school environment, resources and student-related factors) affect the effective use of instructional resources (Kwasu, & Emma, 2015).

2.7.1 Intrinsic factors

Intrinsic factors are concerned with teacher related factors that serve as a barrier to effective utilisation of instructional resources in the teaching and learning of Integrated Science. These factors could be teacher qualification and competence, workload of teachers, class size and teaching methods used by the teacher. These factors are discussed below.

2.7.1.1 Teacher Qualification and Competence

According to Okpechi and Chiaka (2017), one of the most significant inputs into the educational system is teacher resource. Therefore, effective resource management and utilisation are essential to the standard of learning results. A teacher's function in education is crucial. In addition to being familiar with the material, he or she must also be able to convey it effectively through a number of resources. The effectiveness of the teacher is demonstrated in the teaching strategies, which include choosing appropriate instructional resources to be used during teaching-learning sessions.

Some Integrated Science teachers pursued degree programmes in Physics, Biology, Chemistry or Agricultural Science and for that matter may be deficient in some areas in the teaching of Integrated Science (Azure, 2015). Most of the teachers having been given specific training on how to use instructional resources in teaching science activities in their areas of specialisation are deficient in other aspects of Integrated Science. In this case, the teacher may find it difficult in utilising instructional resources in areas that he or she is not conversant with for effective teaching.

A well-trained Integrated Science teacher is expected to make good use of the resources available in the teaching of the subject because resource selection and utilisation are closely tied to the knowledge and experience of the teacher. In a study conducted by Oppong and Tabi (2020) on the attitude of science teachers towards teaching Integrated Science in Junior High Schools, it was revealed that schools lacked professional Integrated Science teachers and this adversely affected their ability to use appropriate teaching methodologies. Teachers with more teaching experience, high sense of self-

efficacy and confidence have a positive attitude which affects teaching of science in a positive way and this is enhanced by the provision of a laboratory space and other learning resources (Ualesi & Ward, 2018).

2.7.1.2 Workload of Teachers

The number of periods or lessons a teacher teaches per week may adversely affect the utilisations of instructional resources in teaching Integrated Science. No matter how driven, a teacher will become overworked if the workload on him or her is very high (that is, too many periods per week), there is the likelihood that the teacher won't be able to adequately prepare. Even organizing for practical lessons that need for advance planning might not be possible for the teacher.

Jomuad, Antiquina, Cericos, Bacus, Vallejo, Dionio, Bazar, Cocolan and Clarin (2021) noted a high burnout rate of teachers due to a high level of workload. They also reported a significant impact of workload on the level of burnout experienced by teachers. According to them, higher workloads has a negative impact on teachers' performance. Dorji and Wangchuk (2022) have also reported a negative impact on classroom teaching and learning due to overloading of primary school teachers. The devotion of time doing non-academic activities and limited time for lesson planning for different subjects and tasks assessment lead to stress and consequently poor performance.

2.7.1.3 Class Size

Science teaching and learning are negatively impacted by large class sizes. Increased student enrollment interferes with efficient resource use because there may not be enough resources available. Although a study conducted at a university indicated that large class size did not affect the quality of teaching, it did not afford lecturers an

opportunity to pay attention to weaker students and do remedial teachings (Yelkpieri, Namale, Esia-Donkoh & Ofosu-Dwamena, 2012). The use of learning resources in classes with large size is cumbersome and difficult to manage and so not effective for teaching and learning.

In a related study in secondary schools in the Anglophone sub-system of Education in Cameroon, many challenges of effective teaching and poor performance were caused by large class sizes of science students (Moluayonge & Park, 2017). According to them, the provision of more instructional resources to reposition science teaching is a remedy for improvement in teaching in Cameroon. Teachers who work in overcrowded classes limit their teaching methods to lecturing, which is teacher-centered than activity-based or student centered method. As a result, students will lack the opportunity to frequently interact with teachers in overcrowded classrooms and little opportunity to discover and develop on their own.

2.7.1.4 Instructional Method

Teachers use a variety of teaching strategies, including teacher-centered and student-centered methods of instruction in their classrooms. Ganyaupfu (2013) demonstrated that teacher-student interactive methods was the most effective teaching method, followed by student-centered methods and the least effective teaching method being teacher-centered approach. Odey, Arikpo. and Oko (2021) have also reported lecture, discussion and demonstration methods as the prevalent teaching methods in civic education. Students taught by the discovery method recorded the highest performance and those taught by the lecture method recorded the poorest performance. According to Lucero (2021), the approach, where students are guided toward self-direction before

being completely engaged in learning activities by teachers, is recommended by science education.

Utilisation of resources is heavily influenced by the instructional strategy the teacher adopts during the teaching and learning process (Hugerat, 2016). In a situation whereby the teacher adopts the lecture and teacher-centered approach, there is limited or no use of instructional resources in teaching and as a result students are not engaged in practical activity. It is important for Integrated Science teachers to select teaching strategy that will involve students in a variety of hands on activities to prevent both teachers and students from becoming bored during the process (Mamba & Putsoa, 2018).

Ojimba, Nwafor, Chigekwu and Onyekwere (2018) have indicated that teaching methods used either in classroom or school farm had an influence on performance in Agricultural Science. They have shown that the best teaching method for practical agriculture was demonstration method and hands-on method.

2.7.2 Extrinsic factors

In addition to teacher-related factors or intrinsic factors, extrinsic factors such as in-service training, power supply, lack of instructional resources, nature of syllabus and student's attitude affect the effective use of instructional resources.

2.7.2.1 In-service Training

Refresher courses are rarely organised for Integrated Science teachers on how to use some instructional resources such as electronically manipulated teaching resources. Use

of audio-visuals especially, you-tube videos which are downloads will require training on the use of projectors. According to Omeodu and Amadi (2018), teachers should be constantly updated with knowledge and teaching skills by participating in in-service training at least twice a year.

It is important to appreciate that continual professional development gives teachers time to learn and implement new strategies (Mugarura, Ssempala & Nachuha, 2022). These authors further recommend that teachers should frequently be afforded study leave or time off to do training. Science teachers with adequate pre-service and in-service training are better equipped to use appropriate methodologies and teaching techniques that enhance the teaching of science (Oppong & Tabi, 2020). Ghana Education Service should therefore take the initiative to provide sufficient in–service training programmes on the use of instructional resources in teaching science activities to prepare teachers with skills to improve upon mastery and performance of content. This will enable teachers to periodically update their knowledge on how various instructional resources are used for effective teaching of Integrated Science when in-service training are organised for them.

2.7.2.3 Availability of Instructional Resources

The use of teaching learning resources goes with availability. Once these resources are available, the teacher will have easy access and use them in the teaching-learning process. Most teachers are reluctant to spend their money on purchasing or producing the needed instructional materials for teaching. If these resources are not available, it will be difficult for teachers to use them in teaching. Also, if instructional materials are inadequate or unavailble, teachers make students read textbooks and concepts explained to them instead of carrying out activities outlined by the Integrated Science

curriculum (Azure, 2015). Higher performance has been found to be linked with availability of textbooks, revision books, equipped laboratories, libraries in Eldoret Municipality, Kenya (Mudulia, 2012).

Use of audio-visuals especially, you-tube videos, also enhance teaching and learning of Integrated Science. The requirement of electricity for the use of audio-visual aids and erratic power supply makes their use difficult. Apart from erratic power supply, poor funding, inadequate equipment, insecurity, lack of or faulty sockets in classrooms makes it difficult to use some instructional resources for effective teaching (Umar & Liman, 2020).

2.7.2.4 Nature of Integrated Science Syllabus

The voluminous nature of the Integrated Science syllabus may also contribute to why teachers do not use instructional materials in teaching. The syllabus consists of fifty (50) topics which are supposed to be treated for the course (Ministry of Education, 2010). Within this time frame, there are co-curricular activities, mid-semester breaks and first year students reporting late. There are instances where half of the semester is lost. The aforementioned lead to reduction in contact hours. Eventually, five semesters are used to cover these fifty topics in the syllabus, hence, the teacher prefer using the lecture method to teach in order to cover a wider scope.

2.7.2.5 Attitude of Students

A study of fourth graders' home resources and attitudes towards science in the Trends in International Mathematics and Science Study in South Korea, Turkey, and the United

States revealed that having a positive attitude toward science and more home resources positively related to higher class participation and achievements (Geesa, Izci , Song & Chen, 2019).

Attitude of students during practical lessons determine whether the teacher will continue to use instructional resources in teaching or not. For students to successfully complete their practical tasks sequentially without breaking any equipment and comprehend the science principles, they must be well-disciplined. Students who are obedient, motivated and show keen interest, propel teachers to provide them with more practical lessons (Onwumere *et al*., 2016).

Ojimba *et al*. (2018) have indicated that the attitude of students towards teachers had an influence on performance in Agricultural Science. They have shown that unfriendliness of students towards teachers led to poor performance in Agricultural Science.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Overview

This chapter presents the research methodology for the study. The chapter describes the research design, setting, target population, accessible population, sampling procedure, the research instruments, validation of Instrument, reliability of Instrument, data collection procedures, data analysis technique and ethical considerations.

3.1 Research Design

This study adopted a survey design because it aims at the description of state of affairs as they exist. According to Cohen, Manion, and Morrison (2018), the survey design is the most used method for collecting information about people's opinions on education and other social issues.

Mixed method approach was adopted to achieve the aim of the study (Creswell, 2017). The research design was selected because it would help to explore the instructional resources available and to describe their extent of utilisation in the teaching and learning of Integrated Science in Senior High Schools in Asante Mampong Municipality.

3.2 Setting

The study was conducted in Asante Mampong Municipality which is located in the northern part of the Ashanti Region of Ghana. It shares boundaries with Sekyere East, Afigya-Sekyere, and Ejura Sekyeredumasi districts to the north, east, south, and west respectively as presented in Fig. 2 (Mampong Municipal Assembly, 2021).

Fig. 2: Asante Mampong Municipality.

The municipality has 6 Senior High Schools (5 public and 1 private Senior High School). The study was conducted in public Senior High Schools in Asante Mampong Municipality. The gender and programmes offered in sampled schools are presented in Table 1.

Table 1: Gender and programmes offered by Senior High Schools

Schools	Type (Sex)	Programmes						
		Science	Agric	HE	GA	VA	TECH	BUS
A	Mixed	✓	✓	✓	✓	✓	x	✓
B	Girls	✓	✓	✓	✓	✓	x	✓
C	Mixed	✓	✓	✓	✓	✓	x	✓
D	Mixed	x	✓	✓	✓	✓	✓	x
E	Mixed	x	✓	✓	✓	x	✓	x

Agric= Agricultural Science; HE= Home Economics; GA= General Arts;

VA= Visual Arts, TECH= Technical; BUS= Business.

✓ = Programmes offered by students; x = Programme not offered

The five (5) sampled senior high schools in Asante Mampong Municipal had combinations of Science, Agricultural Science, Home Economics, General Arts, Visual Arts, Technical and Business courses on offer.

3.2.1 Target Population

All students and academic staff (Integrated Science Teachers, Science HODs and Assistant Heads Academic) in Senior High Schools in Asante Mampong Municipality.

3.2.2 Accessible Population

All Forms 1 and 2 students and academic staff (Assistant Heads (Academics), Heads of Science Departments and Integrated Science Teachers) in the 5 public Senior High Schools in Asante Mampong Municipality.

3.3 Sample and Sampling Procedure

The sample size for the study was 55 academic staff and 5 student focus groups. Purposive sampling technique was used to sample the five (5) Senior High Schools, five (5) Heads of Science Departments, five (5) Assistant Heads (Academics), and forty-five (45) Integrated Science Teachers from the selected Senior High Schools. Convenient sampling technique was used to select students in session (Forms 1 and 2) for focus group discussion. Ten (10) students were selected from each Senior High School to form focus groups.

3.4. Research Instruments

Data was gathered through Questionnaires, Students Focused Group Discussion and lesson observation.

3.4.1 Questionnaires

Structured questionnaires were used for data collection. The researcher designed questionnaires for Integrated Science Teachers (Appendix A), Heads of Science Department (Appendix B) and Assistant Heads (Academics) (Appendix C). Closed ended items were used in the questionnaires to assist the researcher to assess the extent of utilisation of instructional resources in the teaching and learning of Integrated Science in Senior High Schools.

Questionnaires were divided into sections. Section A was concerned with general information, Section B was divided into three parts (I, II and III). B (I) was concerned with availability of common instructional resources where respondents were to

comment on their adequacy. B (II) was concerned with the availability of other instructional resources. B (II) was modeled on a 5-point Likert scale of Strongly Approved (SA), Approved (A), Neutral (N), Disapproved (D), Strongly Disapproved (SD), with nominal values of 5, 4, 3, 2 and 1 respectively. B (III) was concerned with inadequacy of instructional resources and its effects on the teaching and learning of Integrated Science. Section C was concerned with the utilisation of the instructional resources in teaching and learning of Integrated Science. The questionnaire for this section was modeled on a 5-piont Likert scale of Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), Strongly Disagree (SD), with nominal values of 5, 4, 3, 2 and 1 respectively. Questionnaires for Integrated Science Teachers had an additional section (Section D) which was concerned with hindrances to the use of instructional resources.

3.4.2 Focus Group Discussion

The focus groups in this study consisted of SHS 1 and 2 students from the five selected schools (schools A, B, C, D and E) in Asante Mampong Municipality.
Each group comprised ten students. A semi-structured focus group interview form with flexible questions (Krueger, 1994; Bowling, 2002) were used as a guide for interaction with participants of focus groups in a free environment to obtain relevant data for the study.

The data obtained from audio recordings were transcribed, coded and placed under three basic themes as:

Theme 1: Availability of common instructional resources.

Theme 2: Availability of other instructional resources with sub-themes as availability of laboratories, , availability of school farm, availability of visual and availability of audio-visual aids.

Theme 3: Utilisation of instructional resources.

The Thematic Model (Miles & Huberman, 1994) was used for data analysis.

3.4.3 Observation Guide

The researcher checked the instructional resources that were available in various schools and also observed how these resources were utilised during Integrated Science lessons. The information gathered through the lesson observation helped the researcher to determine the extent of utilisation of instructional resources in the teaching and learning of integrated Science in Senior High Schools in Mampong Municipality.

3.5 Validation of Instruments

Content validity was done by expert review

3.5.1 Expert Review

In addition to corrections made from suggestions by students and teachers from the pilot studies, the researcher employed the expertise of her supervisor and some other lectures with the relevant skills in the field of study to review and make the instruments standard or valid. The feedback given by the experts were used to perfect the instruments and built into final instrument before administering them for data collection.

3.5.2 Pilot Testing of Instruments

The questionnaires and questions for focused group discussion were tested to check for their effectiveness. The pilot testing was carried out using schools that were outside the study area. Purposive sampling was used to select 10 Integrated Science Teachers and twenty students (consisting of 10 in each group) were conveniently selected for focus group discussions.

Piloting of the instrument was done to detect any weakness such as vague statements in order to take corrective measures. It also helped the researcher to revise the research instruments and determine whether the respondents understood the questions.

3.6 Reliability of Instruments

3.6.1 Reliability of Questionnaires

To establish the reliability of the questionnaires, responses collected during the pilot study were correlated using Cronbach Alpha reliability coefficients technique (Cronbach, 1951) to determine the internal consistency of the items. The total items yielded an internal consistency of 0.93 for Integrated Science Teachers, 0.91 for Heads of Science Department and 0.87 for Assistant Heads (Academic) and these rendered the questionnaires reliable since the values obtained fell within the acceptable values of alpha which ranges from 0.7 to 0.95 (Taber, 2018).

3.6.2 Reliability of Focus Group discussions

The number of similar and different opinions between the 1st and 2nd analyses of focus group discussions was made by the researcher. The reliability of the research was determined by using the formula of Miles and Huberman (1994) as described by

Memduhoğlu, Kotluk, & Yayla (2017) to obtain 78 %, 80 % and 76 % for themes 1, 2 and 3 respectively.

3.6.3 Reliability of Observation (inter-observation reliability)

A semi-structured observation form was developed by the researcher and after expert review pilot tested with two other Integrated Science Teachers to determine the inter-observer reliability (Appendix E). Using the Fleiss's Kappa method described by Frost (2020), an inter-observation of 82 % was obtained.

3.7 Data Collection Procedures

A letter of introduction was obtained from the School of Graduate Studies (Department of Integrated Science Education, Faculty of Science Education) of the University of Education, Winneba. This was then presented to the Municipality Education Office in Asante Mampong for the necessary authorisation and assistance to undertake the study in the municipality. A letter of authorisation (Appendix F) was granted to permit the researcher to collect data from target schools. The researcher then proceeded to schools under study and presented the authorisaton letters to Heads of the various Senior High Schools. Following this, Assistant Heads of Academics and Heads of Science Department were contacted.

Questionnaires were given to Integrated Science Teachers (Appendix A), Heads of Science Department (Appendix B) and Assistant Heads of Academics (Appendix C). The questionnaires given to Assistant Heads of Academics, Heads of Science Department and Integrated Science Teachers were retrieved after one week of submission.

Five focus groups (ten students per group) were formed from the five schools under study. A semi-structured interview guide (Appendix D) was used to initiate discussions with students and their responses were recorded.

Observation was also used by the researcher to assess the instructional resources available and their extent of utilisation in teaching Integrated Science. The researcher used the natural participant method and so sat in the classroom with students (Kawulich, 2005). Observations were made in the natural classroom environment where behaviour occurred.

3.8 Data Analysis

Data were analysed using IBM Statistical Package for Social Science (SPSS version 27) Computer Program (IBM Corp., 2020). Data were presented in the form of graphs, frequency tables and percentages.

3.9 Ethical Considerations

The researcher explained to respondents about the purpose and nature of the study being carried out in their schools. The respondents were assured that information provided in the course of the study would be confidential, protected from unauthorised persons and strictly used for academic purposes. The questionnaires did not require respondents to write their names.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Overview

Chapter Four involves analysed data and discussion of results from sampled schools. Discussions of data on adequacy or availability, utilisation and hindrances to the use of instructional resources as presented by academic staff (Assistant Heads [Academic], Heads of Science Department, and teachers of Integrated Science) and students and its effect on the teaching of Integrated Science have been presented.

4.1 Retrieval Rate of Questionnaire

With exception of Integrated Science Teachers with questionnaire return rate of 100 % and students involved in focus group discussions, not all questionnaires could be retrieved from two Assistant Heads (Academic) and one Head of Science Department. Students in the selected schools were engaged in focus group discussion and their concerns or responses recorded. This resulted in retrieval rates of 60 % and 80 % for Assistant Heads (Academic) and Heads of Science Department respectively.

Cumulatively, fifty-two (52) questionnaires were retrieved from a total of 55 questionnaires administered to Assistant Head (Academic), Heads of Science Department and Integrated Science Teachers resulting in a retrieval rate of 94.6 %.

The retrieval rate of questionnaires for Integrated Science Teachers being 100 % showed a willingness to participate and contribute meaningfully to the survey. However, questionnaire return rates by Assistant Head (Academic) and Heads of Science Departments were 60 % and 80 % respectively. A total or overall questionnaire return rate of 94.6 % was attained in this survey. According to Fairfield University,

the average and reasonable acceptable response rate is 60.0±20 % while Keller (2019) considers 60.0 % as the minimum standard for publication in key journals indicating an acceptable response rate in this study.

4.2 Bio-data of Participants

This section is presented in three parts: background information of sampled schools (labeled as A, B, C, D and E), teaching or academic staff, and students.

4.2.1 Background information of Academic Staff

4.2.1.1 Demography of Heads of Science Department and Assistant Heads (Academic)

The demographic characteristics of 4 Heads of Science Department (HODs) and Assistant Heads (Academic) (AHA) are presented in Table 2.

Table 2: Demographic Characteristics of Heads of Science Department and Assistant Heads (Academic)

Study Variable	*HODs		*AHA	
	Freq.	%	Freq.	%
Gender				
Male	2	50.0	2	66.7
Female	2	50.0	1	33.3
Years in School				
Less than 5 years	1	25.0	2	66.7
Between 5-10 years	2	50.0	-	-
Above 10 years	1	25.0	1	33.3

*AHA= Assistant Heads (Academic); NA= Not Applicable;
*HODs= Heads of Science Department

There was gender parity for Heads of Science Department but more male Assistant Heads (Academic) than female Assistant Heads (Academic).

4.2.1.2 Demography and Teaching Experience of Integrated Science Teachers

The demographic characteristics of Integrated Science Teachers are presented in Table 3. As shown in Table 3, apart from 31.1 % of Teachers who had taught Integrated Science for up to three years, the remaining 68.9 % of teachers had taught for at least four (4) years in any particular school.

Table 3: Demographic Characteristics of Integrated Science Teachers

Teacher Information	Freq.	%
Gender		
Male	38	84.4
Female	7	15.6
Years in School		
Less than 5 years	37	75.6
Between 5-10 years	7	15.5
Above 10 years	4	8.9
Years of teaching Integrated Science		
1-3 years	14	31.1
4-6 years	19	42.2
7-9 years	6	13.3
Above 10 years	6	13.3

In terms of gender, male teachers were in the majority (84.4 %) for Integrated Science Teachers and Assistant Heads (Academic). Results of gender disparity in this study is

in agreement with male/female enrolment trends in public universities in Ghana. A study conducted in the University of Ghana, University of cape Coast, Kwame Nkrumah University of Science and Technology, University for Development Studies and University of Education, Winneba by the Baraka Policy Institue (2016) indicated gender disparity with inequitable more male enrolment than females. According to United Nations Development Programme (UNDP) (2022), one in three researchers in science globally is a woman. In Ghana, only 14 % of all students attending university are female and women made up 26% of PhD graduates in 2018. Although our society recognizes STEM as a strengthening field for women, there still a shortage of female students pursuing STEM education.

Fig. 3 represents subject areas of specialisation of Integrated Science Teachers.

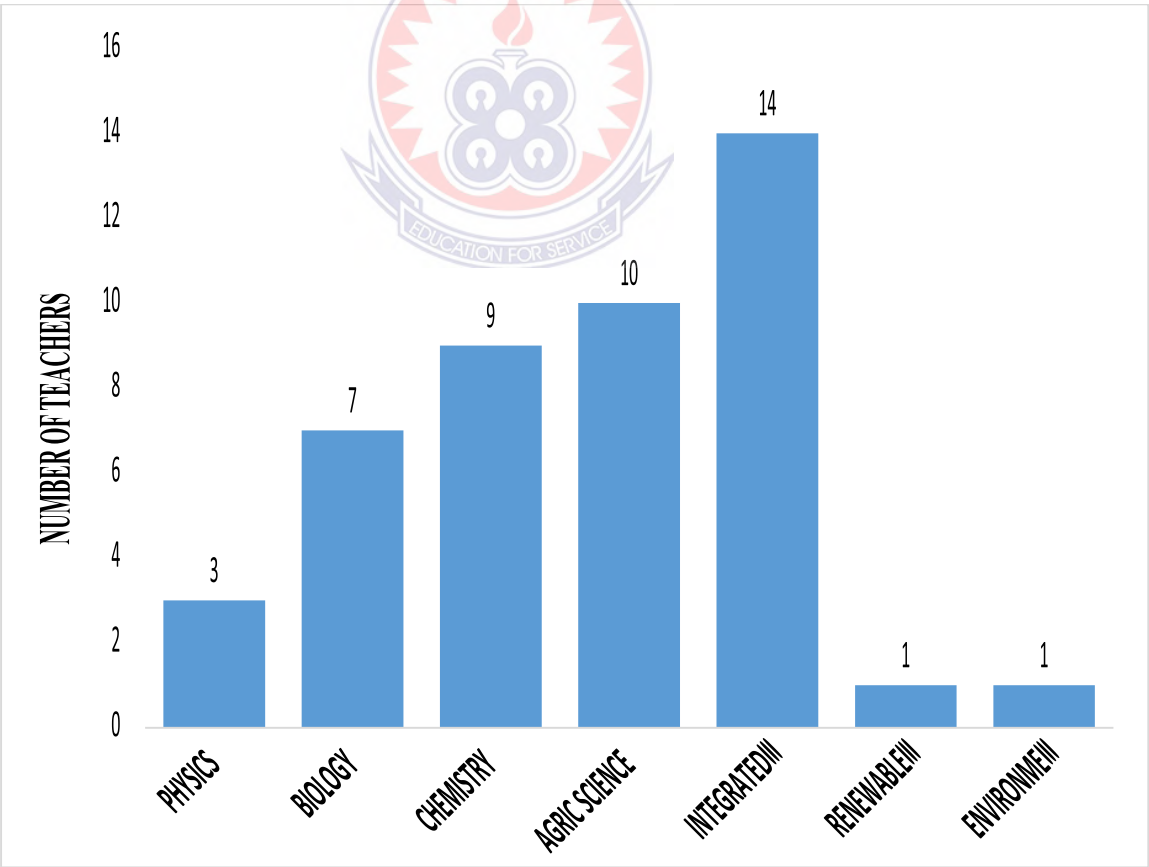

Fig. 3: Areas of Specialisation of Integrated Science Teachers

Integrated Science Teachers in the schools under study comprised tutors with varying backgrounds of specialisation and working experience. Teachers with different subject or diverse course specialisation in Integrated Science, Agricultural Science, Chemistry, Biology, Physics, Renewable Natural Resources and Environmental Science taught in the schools under study.

According to Azure (2015), teachers who specialised in specific branches of science such as Physics, Biology, Chemistry or Agricultural Science may be deficient in some areas in the teaching of Integrated Science. He further argues that the teacher may find it difficult in utilising instructional resources in areas that he or she is not conversant with. Additionally, the lack of professional Integrated Science teachers could adversely affect their ability to use appropriate teaching methodologies.

The study showed that working experience or years of teaching of Integrated Science Teachers ranged from at least one year to more than 10 years. This shows that most of the Integrated Science Teachers had worked for a reasonable period of time to have acquired the necessary experience in teaching and the necessary skills in handling the needs of learners. More years of service or teaching is good because it builds confidence and a positive attitude in teachers and this impacts positively on teaching efficacy (Ualesi & Ward, 2018).

4.3 Availability of Instructional Resources

Research Question 1

What types of instructional resources are available for teaching and learning of Integrated Science in Senior High Schools in Asante Mampong Municipality?

Research question one sought to ascertain the instructional resources available in the teaching and learning of Integrated Science in Senior High Schools in Asante Mampong Municipality of Ashanti Region. Data on common instructional resources were obtained from student focus group discussions and academic staff (Integrated Science teachers, Heads of Science Department and Assistant Heads Academic).

Themes drawn from students focus group discussions and data from Integrated Science Teachers and Heads of Science Department and Assistant Heads (Academics) are presented and discussed.

4.3.1 Students Focus Group Discussions on Availability of Common Instructional Resources

In the focus group discussions, the question

"Which instructional resources are commonly used in your school? In other words, do you have marker boards, graph boards, marker pens and dusters?

All the participants in all the focus groups stated that marker boards, graph boards, marker pens and dusters were available in all the schools.

An example of the answers to this question is as follows:

'' Marker boards, graph boards, marker pens and dusters are common and basic instructional resources for teaching and learning (A, B, C, D and E).”

Responding to the question

“How adequate are these instructional resources? OR Will you consider these instructional resources to be adequate and in good condition?”

participants indicated that unlike marker boards and graph boards which were fixed and immovable, marker pens and dusters which are consumables sometimes became scarce.

“Participants in focus groups were of the view that marker boards in some classrooms were small in size and wished that they would span the entire width of the classroom. Most of the marker boards were in deplorable states and need replacement (A, B,C,D and E).”

Views of focus group participants on the adequacy of graph boards elicited the following response:

“*Graph boards were limited to a few classrooms and mostly in deplorable states and that classes without graph boards were disadvantaged (A, B, C, D and E.”*

Participants also suggested that movable or mobile graph boards should be provided and used until graph boards are fixed in all classrooms.

Although marker pens were expected to be always available, students made the following remark:

> *"Marker pens were readily available shortly after re-opening but become increasingly scarce as the semester progresses (A, B, C, D and E)."*

4.3.2 Views of Academic Staff on Common Instructional Resources available for teaching Integrated Science in SHS in Asante Mampong Municipality

Common instructional resources in this context refer to marker boards, graph boards, marker pens and dusters. The availability, conditions and adequacy of common instructional resources used in teaching Integrated Science in the schools under study are presented in the following sections:

4.3.2.1 Size and Condition of Marker Boards

All the schools under survey used marker boards (Table 4). According to Science HODs and Assistant Heads (Academic), all the schools in the study had adequately-sized marker boards. However, some Integrated Science Teachers in three of the five (3/5) schools (A, C and E) claimed that some classes had smaller marker boards. The data also suggested that there were differences in condition of marker boards in the different schools under survey.

Table 4: Size and Condition of Marker Boards

SHS	Integrated Science Teachers				Heads of Science Department				Assistant Heads (Academic)			
	Size		Condition		Size		Condition		Size		Condition	
	Small	ADQ	DPB	Good	Small	ADQ	DPB	Good	Small	ADQ	DPB	Good
A	3(30%)	7(70%)	5(50%)	5(50%)	0(0%)	1(100%)	1(100%)	0(0%)	0(0%)	1(100%)	0(0%)	1(100%)
B	0(0%)	10(100%)	2(20%)	8(80%)	0(0%)	1(100%)	0(0%)	1(100%)	-	-	-	-
C	1(10%)	9(90%)	6(60%)	4(40%)	-	-	-	-	-	-	-	-
D	0(0%)	10(100%)	3(30%)	7(70%)	0(0%)	1(100%)	1(100%)	0(0%)	1(100%)	0(0%)	0(0%)	1(100%)
E	1(20%)	4(80%)	2(40%)	3(60%)	0(0%)	1(100%)	0(0%)	1(100%)	0(0%)	1(100%)	0(0%)	1(100%)
TOT	5(11%)	40(89%)	18(40%)	27(60%)	0(0%)	4(100%)	2(50%)	2(50%)	1(33%)	2(67%)	0(0%)	3(100%)

SHS= Senior High School; ADQ= Adequate; DPB= Deplorable

Apart from Science HODs who were neutral or indifferent (50 %) about the condition of marker boards, Integrated Science Teachers (60 %) and all (100 %) Assistant Heads (Academics) felt that marker boards were in good condition. Except 60 % of Integrated Science Teachers in school C who thought marker boards were in a deplorable state, teachers in schools A (50.0 %), B (80.0%), D (70.0 %) and E (60.0 %) suggested that marker boards were in good condition. All Science HODs in SHS in Asante Mampong Municipality (SHS A, B, D and E) perceived marker boards to be of adequate sizes. Out of the three, Assistant Heads (Academics) claimed that marker boards were small in SHS D but of adequate size in SHS A and E.

There were however conflicting views among academic staff (teachers, Science HODs and Assistant Heads Academics) and students focus group discussions about the size and condition of marker boards. While students and Science HODs were of the view that marker boards were small and in deplorable states, Integrated Science Teachers and Assistant Heads (Academic) expressed a contrary view. Small and deplorable marker boards will cause a challenge for teachers to present notes or core points for students to effectively copy notes. This situation is likely to slow down the pace of lessons and hence impede lesson delivery in agreement with views reported in literature (Okoji & Olubayo, 2021; Shabiralyani *et al*., 2015). These authors consider appropriate and adequate instructional resources to be requirements for both teachers and students to employ to facilitate effective teaching and learning.

4.3.2.2 Availability and Condition of Graph Boards

Graph boards were available in all schools but were not found in all classrooms. With the exception of Integrated Science Teachers (56 %) who complained about low

availability of graph boards, Science HODs (75 %) and all (100 %) Assistant Heads (Academic) were okay with the *status quo* (Table 5).

This suggests that some classes did not have graph boards. Graph boards were in various states. Availability and condition of graph boards varied in the schools under survey (Table 5). With the exception of SHS B (60 %), teachers claimed that graph boards in the other schools (A, C, D and E) were scarce because availability was 40 %.

Teachers in SHS A and E were indifferent about the condition of graph boards while SHS B and D (100 %) had few graph boards in good condition. Conversely, graph boards in SHS C were in deplorable states. Science HODs in SHS A and D reported the use of deplorable graph boards while SHS B and D had graph boards that were in good condition. According to reports by Assistant Heads (Academic), SHS D and E had graph boards in good condition while SHS A used deplorable graph boards.

Table 5: SHS= Senior High School; AVB= Available; DPB= Deplorable; TOT= Total.

Availability and Condition of Graph Boards

	Integrated Science Teachers				Heads of Science Departments				Assistant Heads (Academic)			
SHS	Availability		Condition		Availability		Condition		Availability		Condition	
	Scarce	AVB	DPB	Good	Scarce	AVB	DPB	Good	Scarce	AVB	DPB	Good
A	6(60%)	4(40%)	2(50%)	2(50%)	0(0%)	1(100%)	1(100%)	0(0%)	0(0%)	1(100%)	1(100%)	0(0%)
B	4(40%)	6(60%)	0(0%)	6(100%)	1(100%)	0(0%)	0(0%)	1(100%)	-	-	-	-
C	6(60%)	4(40%)	3(75%)	1(25%)	-	-	-	-	-	-	-	-
D	6(60%)	4(40%)	0(0%)	4(100%)	0(0%)	1(100%)	1(100%)	0(0%)	0(0%)	1(100%)	0(0%)	1(100%)
E	3(60%)	2(40%)	1(50%)	1(50%)	0(0.0%)	1(100%)	0(0%)	1(100%)	0(0%)	1(100%)	0(0%)	1(100%)
TOT	25(56%)	20(44%)	6(30%)	14(70%)	1(25%)	3(75%)	2(50%)	2(50%)	0(0%)	3(100%)	1(33%)	2(67%)

Data from students focus group discussions and data from academic staff expressed opposing views on the size and condition of graph boards. The availability of graph boards in a few classrooms means that lessons that involve graph work will be difficult to teach. It is clearer and easier to use graph boards to teach students how to interpret graph scales and plot points on graphs using graph boards than using ordinary marker boards. According to Kaspar and Borgerding (2017), unavailability of basic learning resources, , will lead to ineffective teaching and learning and consequently the non-achievement of instructional objectives.

4.3.2.3 Availability of Marker Pens

All Senior High Schools under study in Asante Mampong Municipality used marker pens for teaching (Table 6).

Table 6: Availability of Marker Pens

SHS	Integrated Science Teachers		Heads of Science Department		Assistant Heads (Academic)	
	Scarce	Available	Scarce	Available	Scarce	Available
A	3(30%)	7(70%)	0(0%0	1(100%)	0(0%)	1(100%)
B	5(50%)	5(50%)	1(100%)	0(0%)	-	-
C	1(10%)	9(90%)	-	-	-	-
D	5(50%)	5(50%)	1(100%)	0(0%)	0(0%)	1(100%)
E	1(20%)	4(80%)	1(100%)	0(0%)	0(0%)	1(100%)
Total	15(33%)	30(67%)	2(50%)	2(50%)	0(0%)	3(100%)

SHS= Senior High Schools

However, they were sometimes scarce or unavailable as reported by 33 % of teachers and 50 % of Science HODs. On the contrary all Assistant Heads (Academics) disputed claims that marker pens become scarce or unavailable.

According to Integrated Science Teachers, marker pens were generally available (50 % in SHS B and D to as high as 80 % in SHS E) and 90 % in SHS C. Science HODs in SHS E and D complained of scarcity of marker pens. Assistant Heads (Academic) in SHS A, D and E claimed that marker pens were readily available.

Marker pens and dusters were supplied for teaching of Integrated Science in all sampled schools in Asante Mampong Municipality but availability was perceived differently among students and academic staff. Academic staff indicated rare cases of scarcity while students view scarcity of marker pens and dusters as very common.

According to Bizimana and Orodho (2014), adequate supply and exploitation of physical and material resources among other things, ensure successful teaching and learning. Similar views have been presented by other authors (Arop *et al*., 2015; Igiri & Effiong, 2015; Onwumere *et al*., 2016; Adebule & Ayoola, 2016). According to these authors, physical and material resources make teaching easier and learning more enjoyable because it leads to better understanding, retention and recall of lessons.

4.3.2.4 Availability of Dusters

The availability of dusters in individual schools in Asante Mampong Municipality is presented in Table 7.

Table 7: Availability of Dusters

SHS	Integrated Science Teachers		Heads of Science Departments		Assistant Heads (Academic)	
	Scarce	Available	Scarce	Available	Scarce	Available
A	4(40%)	6(60%)	1(100%)	0(0%)	0(0%)	1(100%)
B	0(0.0%)	10(100%)	0(0%)	1(100%)	-	-
C	6(60%)	4(40%)	-	-	-	-
D	3(30%)	7(70%)	0(0%)	1(100%)	1(33.3%)	2(66.7%)
E	2(40%)	3(60%)	0(0%)	1(100%)	0(0%)	1(100%)
Total	15(33%)	30(67%)	1(25%)	3(75%)	1(33%)	2(67%)

SHS= Senior High Schools

Dusters were unavailable or scarce as claimed by 33 % teachers, 25 % Science HODs and 33 % Assistant Heads (Academic) of schools under study. Availability of dusters in individual schools under survey has been presented in Table 7. Except SHS C, teachers in other schools (A, B, D and E) had easy access to dusters. According to Science HODs in SHS B, D and E, dusters were available but scarce in SHS A. Assistant Heads (Academic) in SHS A and E had enough dusters but relatively scarce in SHS D.

Effective teaching requires writing of notes or core points and diagrams on marker boards. Cleaning with dusters is also inevitable and so unavailability or scarcity of marker pens and dusters are hindrances to effective teaching. This is obviously an impediment to the teaching and learning of Integrated Science because of the numerous terminologies which have to be written on marker boards for students. Shabiralyani *et*

al. (2015) have shown blackboards and marker boards to be important because of the use of the sense of sight in perceiving what is written on them. According to Kaspar and Borgerding (2017), traditional resources such as blackboards, marker boards, marker pens and dusters, although basic, are essential for effective teaching and learning and so their inadequacy is a limitation to knowledge transfer.

The analysed data on common instructional resources revealed that Senior High Schools in Asante Mampong Municipality were endowed differently.

4.4 Availability of Other Instructional Resources

Data on other common instructional resources were obtained from student focus group discussions and academic staff (Integrated Science Teachers, Heads of Science Department and Assistant Heads Academic).

4.4.1 Students Focus Group Discussions on Availability of Other Instructional Resources

Other instructional resources in this context referred to textbooks, audio-visuals, visual aids, real objects and science laboratories.

Responses from focus group discussions were presented under the following themes;

(i) Availability of textbooks

"Does your school provide you with Integrated Science textbooks?" was asked to participants in all focus groups. All the participants in all the focus groups in all the schools noted that they were provided with recommended Integrated Science textbooks and expressed the opinion that

"Recommended Integrated Science textbooks were provided to teachers and students (A, B, C, D and E)".

However, focus group participants indicated that the textbooks provided by SHS were not enough to cater for all students. Participants therefore indicated that:

"Some students buy their own textbooks because recommended textbooks provided by their schools were not enough for all students (A, B, C, D and E)".

(ii) Availability of Science Laboratories

"Do you have science laboratories in your school?" was asked and the following was the response provided by the focus groups:

"Participants in focus groups A, B and C stated that they had science laboratories while those from D and E indicated that they did not have science laboratories."

Participants in focus group in school E in their response to *"Does the school have adequate science equipment at the laboratory?"* indicated that:

"Biology apparatus were locked up in a room but could not be mounted or displayed for use for the lack of a laboratory (E)."

"Does the school have adequate science equipment at the laboratory?"

The answer to the question was

"Laboratories are not properly equipped and that basic equipment such as microscopes, chemicals, test tubes and holders number of stop watches and glasses were inadequate (A, B, C, D and E)."

(iii) Availability of School Farm

"Which crops/vegetables are grown on your School Farm?" was asked and the response from focus groups was

"The school does not have a crop/vegetable farm (B, D and E)".

However, focus groups in two schools had farmlands for crop cultivation and they responded by saying

"The school has a farmland for crop cultivation (A and C)".

A similar answer *"The school does not have an animal farm (A, B, C, D and E)"* was the answer to *"Which animals do you rear in your School Farm?"*

"What farm tools do you have?" was asked and the participants in all focus groups indicated that schools had common farm tools. The answers provided have been presented as

"Rake, mattock, shovel, spade, cutlass, hoe, pick axe and a pair of shears are available for grounds work and occasionally for practical lessons when the topic Farm Tools is taught (A, B, C, D and E)".

(iv) Availability of Visual and Audio-visual Aids

When asked **"***Which visual and audio-visual aids are available for teaching Integrated Science? In other words, does your school have charts, labeled diagrams, projectors and laptop computers for teaching Integrated Science?"*, focus group participants were of the view that

"Charts and labeled diagrams were available or prepared by teachers for use in teaching Integrated Science. Audio-visual aids (projector and laptop computer) were available in the ICT laboratories in all the schools under study (A, B, C, D and E)."

Participants also emphasized that

> *"It is university students on internship who employ these teaching and learning materials in lesson presentations but audio-visual aids were rarely used (A, B, C, D and E)."*

Focus group participants in one school also indicated that

> *"Audio-visual aids (projector and laptop computer) were also used in the science laboratory (B)".*

4.4.2 Views of Academic Staff on Availability of Other Instructional Resources

Other instructional materials used in Senior High Schools in the study area as reported by Integrated Science Teachers, Heads of Science Department and Assistant Heads (Academic) are shown in Table 8.

Integrated Science Teachers with a Likert scale mean value of 3.3 (approximately neutral) suggests that SHS in Asante Mampong Municipality provided some recommended Integrated Science textbooks for teachers while others were purchased by teachers.

Mean Likert scale values of 4.0 and 4.3 by Science HODs and Assistant Heads (Academics) represent the view of adequate provision of textbooks to teachers. On the issue of provision of textbooks to students, mean Likert values of 3.7 by teachers and 4.0 by Science HODs and Assistant Heads (Academics) suggest an appreciable provision of textbooks to students.

Table 8: Rated Means for Availability of Other Instructional Materials

Instructional Resources	Academic Staff		
	Teachers	HODs	AHA
Textbooks for teachers	3.3	4.0	4.3
Textbooks for Students	3.7	4.0	4.0
Audio visual equipment	2.0	3.3	3.0
Visual aids	2.6	3.0	3.7
Internet facility	2.6	3.0	2.7
Science laboratory	3.6	3.3	2.3
School farm	1.6	1.3	1.0

HODs= Heads of Science Department; AHA= Assistant Heads (Academic);

0.0-1.4 = Strongly Disapprove; 1.5-2.4 = Disapprove; 2.5-3.4 = Neutral;
3.5-4.4 = Approved; 4.5- 5 = Strongly approved.

Audio-visual equipment, visual aids and internet facilities were not adequately provided. According to Agangba and Ayiwah (2019), and Reddy and Chowdary (2019), inadequate and ineffective use of audio-visual equipment, visual aids and internet facilities adversely affect teaching and learning. They are of the view that lessons become more interesting and effective when more sense organs are involved. The inadequacy or lack of teaching and learning facilities lead to an uninteresting environment and consequently dullness in the classroom.

Integrated Science Teachers, Science HODs and Assistant Heads (Academics) emphasized that school farms were not available.

Generally, both academic staff and students indicated that other instructional resources such as Integrated Science textbooks, audio-visual equipment, visual aids, internet facility and science laboratory were available. It was revealed that visual aids, audio-visual aids (projector) and laboratory equipment were inadequate while crop and animal farms were unavailable for teaching and learning of Integrated Science.

4.5 Extent of utilisation of instructional resources for teaching Integrated Science

Research Question 2

To what extent are available instructional resources utilized by teachers for teaching and learning Integrated Science in Senior High Schools in Asante Mampong Municipality?

The objective of this research question was to find out the extent of utilisation of instructional resources available by teachers of Integrated Science. Calculated mean from the 5-point Likert of teacher's responses are represented in Table 10. Responses from teachers showed that some instructional resources such as textbooks and facilities at the lab were frequently used during Integrated Science lessons. Instructional resources such as audio-visuals, visual aids, internet facility and real objects were sometimes used but crop and animal farms were not used when teaching crop and animal production respectively as topics in Integrated Science.

Students in the focus group discussion were of a different view about utilisation of instructional resources in teaching Integrated Science. According to the students, with exception of integrated Science textbooks which are mostly used by their teachers, other instructional resources are not utilised during Integrated Science lessons.

Observation made by the researcher revealed that Integrated Science teachers do not utilise available instructional resources in teaching Integrated Science. This observation correlates well with what students in focus groups revealed.

Data on the extent of utilisation of instructional resources were obtained from student focus group discussions and questionnaire responses form Integrated Science Teachers.

4.5.1 Students Focus Group Discussions on Extent of Utilisation of Instructional Resources

What is the extent of utilisation of instructional resources mentioned earlier in our discussion? In other words, to what extent are Facilities in the laboratory, recommended Integrated Science textbooks, audio-visuals (projector + laptop computer), visual aids, crops/vegetable farm, animal farm and real objects?"

Phrases such as never, rarely, occasionally, often and always were used by participants in focus groups to describe the extent of utilisation of instructional resources in schools. Data obtained from focus group discussions have been presented in Table 9.

Table 9: Students focus group responses on extent of utilisation of instructional resources

SN	Instructional Resources	Extent of use in teaching Integrated Science	Focus Groups
1.	Facilities in the laboratory	Never	D
		Rare	E
		Often	A, B and C
2.	Recommended Integrated Science textbooks	Always	A, B, C D and E
3.	Audio-visuals (projector + computer)	Never	A, C, D and E
		Occasionally	B
4.	Visual aids	Rare	A, B, C D and E
5.	Crops and vegetable farm	Never	A, B, C, D and E
6.	Animal farm	Never	A, B, C, D and E
7.	Real objects	Occasionally	A, B, C, D and E

4.5.2 Views of Integrated Science Teachers on Extent of Utilisation of Instructional Resources

Results on the extent of utilisation of instructional resources obtained from Integrated Science Teachers have been presented in Table 10.

Table 10 represents the extent of utilisation of instructional resources in Senior High Schools.

Table 10: Extent of Utilisation of Instructional Resources by Teachers

Use of Instructional Resources in Integrated Science Lessons	Integrated Science Teachers (Rated Mean)
Facilities in science lab	3.8
Integrated Science Textbooks	4.4
Internet Facility	3.1
Audio-Visuals	2.6
Visuals for teaching	3.0
Crop farm	1.6
Animal Farm	1.6
Real Objects	3.2

0.0-1.4 = Strongly Disagree; 1.5-2.4 = Disagree; 2.5-3.4 = Neutral; 3.5-4.4 = Agree; 4.5- 5 = Strongly agree.

Variations in the extent of utilisation of facilities in science laboratory, Integrated Science textbooks, internet facility, audio-visuals, visuals and real objects for teaching depended on their availability and school environment. Results as indicated in Table 10 revealed that, crop and animal farms were not used as instructional resource by Integrated Science Teachers. Internet facilities, audio-visuals, visual and real objects were not adequately used for teaching. However, facilities in science laboratories and textbooks were effectively used by teachers.

From students' focus group discussions point of view, crop (vegetable) and animal farms were not used by teachers to teach topics in Integrated Science. Students felt that

science laboratories were not properly equipped, and internet facilities, real objects, visuals aids and audio-visual equipment (computers and projectors) were not used for teaching. However, students expressed a neutral opinion about the effective use of Integrated Science textbooks.

4.5.2.1 Extent of Utilisation of Science Laboratories

Although teachers agreed (3.8) to the use of science laboratories in teaching, students disagreed. Three schools in the municipality had science laboratories. These schools offered Science and Agricultural Science subjects and therefore offered elective science courses such as Biology, Chemistry, Physics and Animal Husbandry. Although teachers were of the view that facilities in science laboratories were effectively used, students had a contrary view.

Two of the schools did not have established laboratories but used classrooms as improvised laboratories. This situation is similar to reports presented by Livumbaze and Achoka (2017). Conversion of classrooms into laboratories has also been documented by these authors. Although it is better to have an improvised laboratory than none, a concern raised by the authors is the negative impact on learning if poorly equipped. The non-usage or low laboratory practical sessions in integrated Science lessons in the Asante Mampong Municipality has the tendency to negatively affect teaching and learning.

The researcher also observed that, although the schools had reasonable biological equipment, they generally lacked or had inadequate chemistry apparatus and chemicals and physics equipment. It was reported that General Science (elective science) students

were sent occasionally to nearby schools for elective Chemistry and elective Physics practical lessons. However, students were not sent on educational trips for practical lessons in Integrated Science.

Students are mostly concerned about the impact of the laboratory activities and their preferences point more towards greater independent, participatory and interactive learning engagements as noted by Nicol, Gakuba and Habinshuti (2022). This claim is supported by Bileti (2022) who investigated the use of active teaching learning methods in Secondary Schools in Arua District in Uganda and recorded improved students' learning and students' academic performance.

4.5.2.2 Extent of utilisation of Recommended Integrated Science Textbooks

Although teachers noted that textbooks were used in teaching Integrated Science, students disagreed. It is obvious however, that textbooks were used for the teaching and learning of Integrated Science. This is the case because teachers use syllabuses and recommended textbooks to prepare lesson and teaching notes in agreement with Attakumah (2020) who suggested that standardized textbooks should be fully utilised to facilitate learning in schools rather than storing them for safekeeping. Students mostly copy notes provided by teachers and so may not have knowledge about the extent of usage of textbooks by teachers.

4.5.2.3 Extent of utilisation of internet facilities, visuals, real objects and audio-visual aids

Whiles teachers expressed neutrality about the use of audio-visuals, visual aids and real objects for teaching, students on the other hand disagreed. This means teachers felt that

facilities or aids were used, although occasionally, students think they were rarely, occasionally and in some instances never used.

The inadequate use of internet facilities, audio-visuals, visual and real objects will also have negative impact on the teaching and learning of Integrated Science. The findings of this study are similar to reports presented earlier by Issacar and Hesbon (2021) that textbooks, worksheets, computers, chats, projectors, chalk, internet sources and laboratory materials are the commonly used teaching and learning materials to enhance teaching and learning in private secondary schools in Nyarugenge District in Rwanda. However, computers and laboratory materials are not adequately used, although teachers were aware that effective use of instructional learning materials in teaching and learning process improves students' participations, learners' motivations, and improves students' academic outcomes (Issacar & Hesbon, 2021)..

4.5.2.4 Extent of utilisation of School Farm (Crop and Animal Farm)

Teachers and students indicated that crop and animal farms were not used in teaching lessons in Integrated Science. This was the case because all the schools under study in the municipality did not have an animal farm. Videos, simple farm tools and pictures were used to teach crop and animal production lessons in Integrated Science in some of the schools. Students were not sent on educational trips for practical lessons in agricultural topics in Integrated Science. However, elective Agricultural Science students who pursued Animal Husbandry and Crop Husbandry in two of the schools (Schools D and E) were periodically sent on educational trips to visit crop and animal farms in the community for practical lessons.

One out of the five schools under survey had a farmland on which cabbage, carrot and maize were cultivated. Although another school had a farmland, it is seasonal crops such as maize and cowpea that are cultivated. It therefore meant that crop or animal farms are not used for practical lessons in agricultural science-related topics in Integrated Science. The remaining schools did not have a crop farm. The unavailability of crop and animal farms and therefore the inability of teachers to use them as instructional resources to teach Integrated Science will adversely affect teaching and learning.

Similar trends have been reported by Darko, Yuan, Simmons, Abbey, Liu and Kumi (2016) in Senior High School within the Sekondi-Takoradi Metropolis and Awe Senior High School in the Navrongo Municipality of the Upper East Region of Ghana (Diise, Zakaria & Mohammed, 2018).

4.6 Hindrances to the use of Instructional Resources for teaching Integrated Science

Research Question 3

What factors militate against the use of instructional resources for teaching and learning of Integrated Science in Asante Mampong Municipality?

Research question three sought to find out the factors that militate against the use of instructional resources by teachers for teaching and learning Integrated Science. Themes drawn from the responses of Integrated Science teachers included: lack of or inadequate audio-visual aids, class size, lack of sockets in the classroom, nature of WASSCE Integrated Science practical questions, laboratory equipment, competence of teachers in using audio visual aids and cost of producing visual aids and real objects.

4.6.1 Hindrances to the use of Instructional Resources by Integrated Science Teachers

Hindrances to the use of instructional resources by Teachers are presented in Table 11 and categorized under various headings as audio-visual aids, school farm, use of laboratory for practical lessons, use of visual aids and real objects/specimens. Under each category of instructional resources, factors that affect or hinder their utilisation have been ranked (1 being the most important factor that inhibit or prevent their usage with higher digits 2, 3, etc. representing lower impacts or decreasing order of severity).

The main reasons assigned as hindrances to the use of audio-visual aids of selected SHS in Asante Mampong Municipality were the lack of projectors, followed by inadequate sockets in classrooms (not available or faulty) which tied with no internet facility. The next hindrance was power outages which had a similar weighting with competence of teachers to use audio visual aids in teaching. Reasons given for factors that prevent the use of school farm in teaching agricultural practical lessons are lack of crop farm, lack of animal farm and proximity of farm from the classroom.

Class size, the theoretical nature of West African Senior School Certificate Examination (WASSCE) Integrated Science practical questions, poorly equipped

Table 11: Hindrances to the use of Instructional Resources

Study Variable	N	*Rank
Audio-visual aids		
Lack of projectors	39	1
Inadequate sockets in the classroom	32	2
No internet facility	32	2
Power outage	21	3
Competence of teacher in using audio visual aids	21	3
School Farm		
No crop farm	36	1
No animal farm	35	2
Farm is far from the classroom	13	3
Use of laboratory for practical lessons		
Class size	28	1
WASSCE Integrated Science practical questions	26	2
Poorly equipped laboratory	18	3
Far distance from classroom to lab	14	4
Use of visual aids		
High cost of producing visual aids	35	1
Unavailability of visual aids in school	32	2
Competence of teacher to produce visual aids	13	3
Attitude of teachers towards visual aids	7	4
Real objects /specimens		
Cost of real objects	37	1
Non-availability in school environment	26	2
Competence of teachers to effectively use real objects	14	3
Attitude of teachers towards the use of real objects	9	4

***Rank (1, 2, 3 & 4)** = The impact of a factor to inhibit the use of instructional resource; 1 being the most important; 2, 3, etc. representing lower impacts or decreasing order of severity.

laboratories and the least hindrance being long distance from classroom to science laboratories are factors that limit the use of science laboratories. High cost, scarcity of aids in school, competence of teachers to produce or improvise visual aids and personal attitude of teachers in using aids were the factors that prevented teachers from using visual and real objects in teaching.

4.6.1.1 Hindrances to the use of audio-visual aids

The main reasons assigned as hindrances to the use of audio-visual aids of selected SHS in Asante Mampong Municipality were lack of projectors because projectors were not common or available for use for teaching. Although some teachers may be willing to use their laptop computers to show to students downloaded information and videos, large class sizes make it impossible or ineffective. The high cost of projectors and the numerous courses run in senior high schools with accompanying streams in each form resulting in several classes make the use of projectors for lesson presentations impossible. This is in agreement with Tang and Intai (2017) who attributed the inability of teachers to use audio-visual aids in teaching to financial allocation and maintenance of portable hardware for display of the audio-visual aids as major hindrances.

Traditionally, lessons in senior high schools in Ghana are taught using notes and blackboard or marker board summary and so the idea of projecting notes or videos is not akin to the system. Due to this reason, most of the classrooms do not have electric sockets (not available or faulty) for gadgets to be connected to tap electricity to operate. Together with the inadequacy of electric sockets in the classroom is the lack of or poor internet facilities and/or connectivity. Most of the lessons or topics for which audio-visual aids will be required for them to be projected are videos or pictures with

commentaries form the internet. Limited access to internet mostly at and around ICT or computer centres makes it difficult for teachers to get access to such useful information and videos. With this limitation, teachers will have to buy their own internet bundle or data to download videos, power-point or slide shares with their own laptop computers which are also expensive. Challenges encountered in Senior High Schools in this study are similar to those reported in Boa Amponsem Senior High School and Dunkwa Senior Technical High School. Aggrey, Quainoo Jnr and Aggrey (2022) enumerated inadequate provision of such educational resources and lack of internet connections to the laboratories and departments as major challenges.

Power outage is closely related to inadequacy of electric sockets. Erratic power supply and the lack of standby electric or solar generators does not encourage teachers to resort to audio-visual equipment to teach because lessons get disrupted when there is electric power failure. Competence (which had a similar weighting with power outages) and motivation of teachers to use audio-visual equipment is also important. Teachers who do not have adequate skills and knowledge and the willingness to put in effort and time to access and download videos and information for lessons will be reluctant to use audio-visual aids if even they are available. The lack of skills/competencies required for the use of audio-visual aids, poor provision of educational resources, overloaded teaching periods and lack of maintenance of these educational resources have been reported as challenges to the use of audio-visual aids in senior high schools (Aggrey *et al*., 2022).

4.6.1.2 Hindrances to the use of School Farm

The main reasons ascribed as hindrances to the use of animal and crop farms in teaching agricultural practical lessons in senior high schools are lack of crop and animal farms, and the distance from classrooms to farms in the school or community. Moving with students from classrooms to farms is time consuming and more so if done for the several class streams that are taught by a particular teacher. If it involves transport by vehicles it becomes expensive and cumbersome to travel with large class sizes.

This is difficult to undertake because schools do not have crop and animal farms. If they were available students could have been taught after school hours in the form of farm projects or tasks assigned to groups of students as practical assignments. Results in this study is similar to earlier investigations that were done to find out the constraints encountered in teaching of practical agriculture in the Senior High School within the Sekondi-Takoradi Metropolis. Impediments to practical lessons in Agricultural Science included lack of school garden, animal farm, educational trips, demonstration plots, and well-equipped laboratory and most importantly lack of funds (Darko, Yuan, Simmons, Abbey, Liu & Kumi, 2016).

Earlier reports also corroborate challenges reported in the use of farms in teaching Integrated Science in this survey. According to Diise *et al*. (2018), hindrances encountered in trying to deploy project method of teaching agriculture among agricultural science students of Awe Senior High School in the Navrongo Municipality of the Upper East Region of Ghana included inadequate tools/equipment, large class size, short periods allocated to practical lessons and high cost of materials, in decreasing order of severity.

4.6.1.3 Hindrances to the use of Science Laboratories

Large class sizes (average of 40+) makes it difficult for students to be taken through laboratory practical lessons and this is considered the first and most important impediment to the use of science laboratories in the teaching of practical lessons in Integrated Science. It is difficult to move students on time to laboratories for lessons. Although ranked as the least, this becomes more problematic if the distance from the classroom to the science laboratory is far. Much more time is required to move and allow students to settle in the laboratory for practical lessons to commence and as well return to class for other lessons afterward. The seats available are usually few and this leads to overcrowding and the movement of laboratory materials to classrooms for lessons is mostly inconvenient and not safe or inappropriate. This is in agreement with a study by Awan (2015) who enumerated the condition of furniture, apparatus, few worktables, and large class classes as hindrances to effective teaching.

Secondly, the theoretical nature of WASSCE Integrated Science practical questions does not compel or make teachers see the need to take students through rigorous practical lessons. Other reasons are poorly equipped laboratories which lack or have inadequate quantities of common instruments, equipment and chemicals and this makes it difficult to perform simple demonstrations or conduct basic experiments. Asare and Sarfo (2021) consider the lack of the basic forms of equipment, requirements and infrastructure and below average teacher competence for the conduct of practical activities as the main challenges for effective laboratory practical lessons in science. Similar challenges have been reported as hindrances to the use of laboratory practical lessons in other countries. According to Ndihokubwayo (2017), barriers encountered by science teachers in laboratory activities in Rwandan Teacher Training Colleges are

time limitation, material scarcity and lack of improvising skills in their everyday science teaching life. Similar views were shared by Niyitanga, Bihoyiki and Nkundabakura (2021) who also listed lack of training and policy governing the use of practical work and inadequate resources and facilities as hindrances to the use of practical work in the teaching and learning of physics in secondary schools. In Ethiopia, an assessment of the practice and problems in science laboratory activities in secondary schools in Wolaita Zone indicated very low levels of laboratory practical, lack of laboratory rooms, inadequate supply of laboratory equipment, reagents and facilities, absence of trained laboratory technicians and lack of committed teachers (Zengele & Alemayehu, 2016).

4.6.1.4 Hindrances to the use of visual aids and real objects

High cost is considered the major hindrance to the use of visual aids (pictures and diagrams) and real objects or specimens in the teaching and learning of Integrated Science. Aids which are common in school communities at low cost are sometimes used. Common specimens may be collected in the community by teachers or students and used for lessons. However, teachers are mostly reluctant to take students on educational trips to observe teaching and learning materials and so scarcity of such aids in school premises or nearby communities becomes a hindrance for their use. Dalali and Mwila (2022) identified inadequacy of teaching learning materials, lack of seminars and training to teachers for the preparation and usage of visual aid and the tendency of teachers to ignore the use of visual aids in the teaching and learning process similar to challenges reported in this survey.

The attitude and competence of teachers also influence their ability and willingness to use visual aids and real objects in the teaching and learning of Integrates Science. Teachers may produce or improvise visual aids and use them to teach. Teacher trainees on internship are motivated or compelled to use these aids or make improvisations and use them to teach to earn good grades. This study shows that most of the regular teachers do not bother much to use visual and real objects for their lessons. Bawa and Imam (2020) have emphasized the importance of realia in making lessons interesting and easy to understand but cautions over-usage to minimize distraction to students. However, the use of visual aids and real objects is hampered because of the loaded nature of the syllabus and the short time (two and half years and most often less instead of the stipulated three years duration) spent in school. This is in agreement to the views of Bawa and Imam (2020) who consider financial constraints, time constraints and poor maintenance culture as challenges to using realia.

4.7 Observation by Researcher

The researcher used observation (Appendix E, Observation Guide) to assess the extent of utilsation of teaching learning materials in the teaching of integrated Science in the schools under survey. Observation was used to concur or disapprove information or data provided by respondents in the survey.

The researcher noted that four senior high schools (A, B, C and D) in Asante Mampong Municipality offered Agricultural Science but all five schools (A, B, C, D and E) offered Home Economics as an elective programme. Also, three schools (A, B and C) offered Science as an elective programme and so elective subjects such as Biology, Chemistry and Physics were taught in all schools. Senior High Schools D and E which

did not offer General Science but offered Home Economics and Agricultural Science courses and therefore had elective science subjects such as Biology, Chemistry and Physics on their teaching time table. Although Schools D and E did not offer General Science, Agricultural Science, Home Economics and Technical students studied elective Biology, Chemistry and elective Physics. With the exception of SHS E which could be exempted for not having a chemistry laboratory, all other schools were expected to have well equipped Biology, Chemistry and Physics laboratories. Although Senior High Schools A, B, C and D offered Agricultural Science and specifically Animal Husbandry, they did not have animal farms for practical lessons.

The researcher observed that the main hindrance to the use of instructional resources in teaching Integrated Science was influenced by the academic background of teachers. Teachers who do not have holistic training in Integrated Science or pursued BSc Integrated Science or BSc Agricultural Science were not efficient in using some instructional resources in teaching some aspects or topics in Senior High School Integrated Science. This assertion is in agreement with Azure (2015), who observed that teachers who specialised in specific branches of science such as Physics, Biology, Chemistry or Agricultural Science may be deficient in some areas in the teaching of Integrated Science. He further argues that the teacher may find it difficult in utilising instructional resources in areas that he or she is not conversant with. Additionally, the lack of professional Integrated Science teachers could adversely affect their ability to use appropriate teaching methodologies.

It was also observed that teaching experience also affected the effective utilisation of instructional resources. The researcher noted that most of the Integrated Science

Teachers had worked for a reasonable period of time (in some instances up to 10 years) to have acquired the necessary experience in teaching and the necessary skills in handling the needs of learners (Ualesi & Ward, 2018).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS, RECOMMENDATIONS AND SUGGESTIONS FOR FURTHER STUDIES

5.0 Overview

Chapter Five gives a summary of the major findings of the study. Inferences or conclusions have been presented based on the findings of the study. In this section recommendations are proposed for implementation to address existing problems identified from the survey. Suggestions to guide research for further investigations or studies are also recommended.

5.1 Summary of the Major Findings

The study has revealed the following:

1. Courses offered in the schools included Agricultural Science, Business, General Arts, Home Economics, General Science, Technical and Visual Arts.
2. Integrated Science Teachers in the schools surveyed graduated with different first degrees in Integrated Science, Agricultural Science, Chemistry, Biology, Physics, Renewable Natural Resources and Environmental Science.
3. Instructional resources in sampled schools were marker boards, graph boards, marker pens and dusters with varying degrees of availability, adequacy and conditions of use. The extent of availability and use of textbooks for teachers and students, visual aids, internet facility and to a lesser extent audio-visual equipment were different in the schools under study.
4. School farms were lacking in the SHS in the municipality. Although the schools did not have a school farm, hoes, cutlasses, pick axes, shovels, rakes and mattocks

which may have been acquired for ground works could be used as learning resources.

5. Schools offered elective courses in General Science, Home Economics and Agricultural Science and as a requirement needed science laboratories but these were not well equipped.
6. Hindrances to the utilisation of learning resources were inadequate provision of teaching learning materials, large class sizes, lack of internet connectivity, competencies and attitude of teachers, broad scope of Integrated Science, limited time of SHS programme and overloaded teaching periods.

5.2 Conclusions

The following conclusions can be made from the study:

i. Common instructional resources such as marker boards, graph boards, marker pens and dusters were available. Other instructional resources available were Integrated Science textbooks, visual aids, science laboratories, internet facility and audio-visual aids. Crop farms were available in two out of the five schools.

ii. Academic staff and students expressed different views on the extent of utilisation of instructional resources. Generally, textbooks and science laboratories were used regularly. Visual aids and real objects were moderately used. Audio-visuals were sparingly used while crop and animal farms were not used for teaching Integrated Science.

iii. The main reasons assigned as hindrances to the use of audio-visual aids were scarcity of projectors, lack of sockets in classrooms, and attitude and competence of teachers to use audio visual aids. Hindrances to the use of school farm in teaching agricultural practical lessons were lack of crop and animal farms. Factors

that limit the use of science laboratories (in decreasing order of severity) included class size and the theoretical nature of WASSCE Integrated Science practical questions. Hindrances to the use of visual and real objects were high cost, and attitude and competence of teachers to produce or improvise visual aids.

5.3 Recommendations of the Study

Based on the findings of the study, the researcher wishes to make the following recommendations:

1. In schools where learning materials are inadequate, heads of institution, Parent Teacher Associations and stakeholders should support to purchase instructional resources to enhance effective teaching and learning of Integrated Science.
2. Teachers should be trained and encouraged to use available instructional resources in effective ways and to improvise teaching and learning materials to make teaching and learning more effective.
3. School farms should be established in schools to facilitate the teaching and learning of crop and animal production.
4. A Science Centre should be built in the Municipality for use by all Senior High Schools.

5.4 Suggestions for further study

The following are suggested for further studies:

1. Further research should be carried out to involve more schools in Ashanti Region so that recommendations can be made to cover the entire region.
2. A similar study can be done to determine the relationship between the utilization of the teaching and learning resources and academic performance.

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APPENDICES

APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SCIENCE EDUCATION

RESEARCH QUESTIONNAIRE FOR INTEGRATED SCIENCE TEACHERS ON THE USE OF INSTRUCTIONAL RESOURCES IN TEACHING INTEGRATED SCIENCE IN SENIOR HIGH SCHOOLS

NB: This exercise is purely for academic purpose. Responses will be treated with anonymity and views expressed as confidential.

INSTRUCTION

Please tick (√) and/or write where applicable. Where necessary you may tick more than one option.

A. GENERAL INFORMATION

1. Gender Male [ ] Female [ ]

2. Type of School Boys only [ ] Girls only [ ] Mixed [ ]

3. Number of years in present school ……..

4. How many years have you taught Integrated Science at SHS?

A. 1 – 3 [ ] B. 4 – 6 [ ] C. 7 – 9 [ ] D. 10 – 12 [ ] E. >12 [ ]

5. Area of specialisation

……..

B. AVAILABILITY OF COMMON INSTRUCTIONAL RESOURCES

Please comment on the adequacy of the following by ticking the appropriate response in the table below

SN	INSTRUCTIONAL RESOURCES	ADEQUACY	
6.	Size of Marker Boards	Small size [ ]	Adequate size [ ]
7.	Condition of marker boards	Deplorable state [ ]	Good condition [ ]
8.	Graph Boards	Not Available [ ]	Available [ ]
9.	Condition of Graph Board	Deplorable state [ ]	Good condition [ ]
10.	Marker pens	Scarce [ ] Not available always [ ] Always available [ ]	
11.	Dusters	Scarce [ ]	Always available [ ]

C. AVAILABILITY OF OTHER INSTRUCTIONAL RESOURCES

Tick the option provided that suits the instructional resources listed by using the following scale:

5- Strongly approved; 4- Approved; 3 – Neutral; 2 – Disapprove; 1 – Strongly Disapprove

SN	**Availability of Instructional Resources**	5	4	3	2	1
12.	School provides teachers with Integrated Science textbooks					
13.	School provides students with Integrated Science textbooks					
14.	Audio-visual equipment					

SN	**Availability of Instructional Resources**	5	4	3	2	1
15.	Visual aids					
16.	Internet facility					
17.	Laboratory					
18.	School farm					

D. UTILIZATION OF INSTRUCTIONAL RESOURCES

Tick the option provided that best describes the extent of utilization of instructional resources listed by using the following scale:

5- Strongly agree; 4- Agree; 3 – Neutral; 2 – Disagree; 1 – Strongly Disagree

SN	**Utilization of Instructional Resources**	5	4	3	2	1
19.	Facilities in the laboratory for instruction					
20.	Integrated science textbooks					
21.	Internet facility to search information					
22.	Audio-visuals (projector + computer) for teaching					
23.	Visual aids					
24.	Crop farm					
25.	Animal farm					
26.	Real objects					

E. HINDRANCE TO THE USE OF INSTRUCTIONAL RESOURCES

In each section, tick (√) where appropriate as many options to indicate the hindrance to the use of the listed instructional resources

SN	**Hindrance to the use of Instructional Resources**	Tick (√)
27.	**Audio-visual aids**	
	Lack of projectors	
	Lack of/inadequate sockets in the classrooms	
	Power outage	
	No internet facility for video downloads	
	Competence of teacher in using audio-visual aids	
28.	**School Farm**	
	No animal farm	
	No crop farm	
	Farm is far from classroom block	
29.	**Laboratory for Practical lessons**	
	Nature of Integrated Science Practical Questions	
	Class size	
	Distance from classroom to laboratory	
	Poorly equipped laboratory	

30.	**Visual aids**	
	Unavailable in the school	
	High cost of producing visual aids	
	Competence of teacher to produce visual aid	
	Attitude (teacher does not see relevance of regularly using visual aid)	
31.	**Real objects/specimen**	
	Not available in school environ	
	Attitude (teacher does not see relevance of regularly using real object)	
	Competence of teacher to effectively use real object	
	Cost of real object	

APPENDIX B

UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SCIENCE EDUCATION

RESEARCH QUESTIONNAIRE FOR HEAD OF SCIENCE DEPARTMENT ON THE USE OF INSTRUCTIONAL RESOURCES IN TEACHING INTEGRATED SCIENCE IN SENIOR HIGH SCHOOLS

NB: This exercise is purely for academic purpose. Responses will be treated with anonymity and views expressed as confidential.

INSTRUCTION

Please tick (√) and/or write where applicable. Where necessary, tick more than one option.

A. GENERAL INFORMATION

1. Gender Male [ ] Female [ ]

2. Type of School Boys only [ ] Girls only [ ] Mixed [ ]

3. Number of years in present school ……..

B. AVAILABILITY OF COMMON INSTRUCTIONAL RESOURCES

Please comment on the adequacy of the following by ticking the appropriate response in the table below

SN	INSTRUCTIONAL RESOURCES	ADEQUACY
4.	Size of Marker Boards	Small size [ ] Adequate size [ ]
5.	Condition of marker boards	Deplorable state [ ] Good condition [ ]
6.	Graph Boards	Not Available [ ] Available [ ]
7.	Condition of Graph Board	Deplorable state [ ] Good condition [ ]
8.	Marker pens	Scarce [ ] Not available always [ ] Always available [ ]
9.	Dusters	Scarce [ ] Always available [ ]

AVAILABILITY OF OTHER INSTRUCTIONAL RESOURCES

Tick the option provided that suits the instructional resources listed by using the following scale:

5- Strongly approved; 4- Approved; 3 – Neutral; 2 – Disapprove; 1 – Strongly Disapprove

SN	**Availability of Instructional Resources**	5	4	3	2	1
10.	School provides teachers with Integrated Science textbooks					
11.	School provides students with Integrated Science textbooks					
12.	Audio-visual equipment					

SN	**Availability of Instructional Resources**	5	4	3	2	1
13.	Visual aids					
14.	Internet facility					
15.	Laboratory					
16.	School farm					

APPENDIX C

UNIVERSITY OF EDUCATION, WINNEBA

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SCIENCE EDUCATION

RESEARCH QUESTIONNAIRE FOR ASSISTANT HEADS (ACADEMICS) ON THE USE OF INSTRUCTIONAL RESOURCES IN TEACHING INTEGRATED SCIENCE IN SENIOR HIGH SCHOOLS

NB: This exercise is purely for academic purpose. Responses will be treated with anonymity and views expressed as confidential.

INSTRUCTION

Please tick (√) and/or write where applicable. Where necessary, tick more than one option.

A. GENERAL INFORMATION

1. Gender Male [ ] Female [ ]

2. Type of School Boys only [ ] Girls only [ ] Mixed [ ]

3. Number of years in present school ……..

B. AVAILABILITY OF COMMON INSTRUCTIONAL RESOURCES

Please comment on the adequacy of the following by ticking the appropriate response in the table below:

SN	INSTRUCTIONAL RESOURCES	ADEQUACY			
4.	Size of Marker Boards	Small size	[ ]	Adequate size	[ ]
5.	Condition of marker boards	Deplorable state	[ ]	Good condition	[ ]
6.	Graph Boards	Not Available	[ ]	Available	[ ]
7.	Condition of Graph Board	Deplorable state	[ ]	Good condition	[ ]
8.	Marker pens	Scarce Not available always Always available	[ ] [ ] [ ]		
9.	Dusters	Scarce	[ ]	Always available	[ ]

AVAILABILITY OF OTHER INSTRUCTIONAL RESOURCES

Tick the option provided that suits the instructional resources listed by using the following scale:

5- Strongly approved; 4- Approved; 3 – Neutral; 2 – Disapprove; 1 – Strongly Disapprove

SN	**Availability of Instructional Resources**	5	4	3	2	1
10.	School provides teachers with Integrated Science textbooks					
11.	School provides students with Integrated Science textbooks					
12.	Audio-visual equipment					

SN	**Availability of Instructional Resources**	5	4	3	2	1
13.	Visual aids					
14.	Internet facility					
15.	Laboratory					
16.	School farm					

APPENDIX D

UNIVERSITY OF EDUCATION, WINNEBA
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF SCIENCE EDUCATION

RESEARCH QUESTIONS FOR FOCUS GROUP DISCUSSIONS WITH STUDENTS ON THE USE OF INSTRUCTIONAL RESOURCES IN TEACHING INTEGRATED SCIENCE IN SENIOR HIGH SCHOOLS

NB: This exercise is purely for academic purpose. Responses will be treated with anonymity and views expressed as confidential.

A. GENERAL INFORMATION

1. School:

2. Membership of focus Group: **……**

B. AVAILABILITY OF COMMON INSTRUCTIONAL RESOURCES

1. Which instructional resources are commonly used in your school?

   In other words, do you have marker boards, graph boards, marker pens and dusters?

2. How adequate are these instructional resources?

   OR Will you consider these instructional resources to be adequate and in good condition?

C. AVAILABILITY OF OTHER INSTRUCTIONAL RESOURCES

(I) AVAILABILITY OF TEXTBOOKS

9. Does your school provide you with Integrated Science textbooks?
10. Which textbooks are provided?
11. Which Integrated Science textbooks do you buy for studies?

(II) AVAILABILITY OF LABORATORIES

12. Do you have science laboratories in your school?
13. Does the school have adequate science equipment at the laboratory?

(III) AVAILABILITY OF SCHOOL FARM

20. Which crops/vegetables are grown on the School Farm?
21. What farm tools do you have?
22. Which animals do you rear animals in your School Farm?

(IV) AVAILABILITY OF VISUAL AND AUDIO-VISUAL AIDS

23. Which visual and audio-visual aids are available for teaching Integrated Science?

    In other words, does your school have charts, labeled diagrams, projectors and laptop computers for teaching Integrated Science?

D. UTILISATION OF INSTRUCTIONAL RESOURCES

What is the extent of utilisation of instructional resources mentioned earlier in our discussion? The extent of utilisation may be described using words like never, rarely, occasionally or often.

SN	**Instructional Resources**	**Extent of Utilisation**
1.	Facilities in the laboratory for instruction	
2.	Recommended Integrated Science textbooks	
3.	Internet facility	
4.	Audio-visuals (projector + computer) for teaching	
5.	Visual aids for teaching and learning	
6.	Crops and vegetable farm	
7.	Animal farm	
8.	Real objects	

THANK YOU

APPENDIX E

CLASSROOM AND TEACHING OBSERVATION GUIDE

A. GENERAL INFORMATION

1. School Code ……

2. Form ……

3. Academic Programme ……

4. Subject/Topic ……

B. INSTRUCTIONAL RESOURCES AVAILABLE AND EXTENT OF USE DURING LESSONS

Rating Scale:

0= Not used at all (NU); 1= Not frequently used (NFU); 2= Frequently used (FU)

Instructional Resources	AVAILABLE	FU	NFU	NU
Marker Boards				
Graph Boards				
Marker Pens				
Dusters				
Textbooks for Teachers				
Textbooks for Students				
Audio Visual Equipment				
Visual Aids				
Internet Facility				
Science Laboratory				
Crop Farm				
Animal Farm				

Other Specific Observations.....

APPENDIX F

LETTER OF AUTHORIZATION

GHANA EDUCATION SERVICE

In case of reply the number and
date of the letter should be quoted

My Ref. No:GES/ASH/MPG/EP.40/43

Your Ref. No:.....

REPUBLIC OF GHANA

Mampong Municipal Education Office
P. O. Box 216,
Mampong-Ashanti
0248880410
Email:mampongeducationoffice@yahoo.com

29th August, 2022

MISS ASANTEWAA, PATIENCE
UNIVERSITY OF EDUCATION, WINNEBA
FACULTY OF SCIENCE EDUCATION
DEPARTMENT OF INTEGRATED SCIENCE EDUCATION
WINNEBA, GHANA

RE; PERMISSION TO CONDUCT RESEARCH IN SCHOOLS IN MAMPONG MUNICIPALITY

Following your application to the Municipal Education Directorate, Mampong-Ashanti with reference number ***ISED/PG.1/Vol.1/28*** to carry out research on. ***"The Extent of Utilization of Instructional Resources in the Teaching and Learning of Integrated Science in Senior High Schools"***. I am pleased to inform you that you have been granted permission to conduct your research in the selected Senior High Schools – Amaniampong SHS, St. Monica's SHS, St. Joseph Seminary SHS, Opoku Agyemang SHTS. and Kofiase Adventist SHTS from August 2022 to December 2022.

You are duly advised to report to the authorities of the selected Senior High Schools before embarking on the research. I am by this letter requesting the Heads of the selected schools to kindly give the Student Researcher the needed support to enable her conduct her research.

Note that:

1. All ethical issues in research must be duly observed and applied in the selected Schools in this Municipal Education Directorate.
2. All COVID-19 pandemic protocols must be duly observed in the schools.
3. Consent of the learners and teachers must be sought before conducting your research at the selected sites.
4. Present a copy of this clearance to the school of your choice before collecting your data.
5. **On completion of the research project, you are requested to submit one hardcopy of your report to this office.**

I wish you good luck in your assignment.

GABRIEL ANTWI
MUNICIPAL DIRECTOR OF EDUCATION

Cc:

1. The Head of Department, Department of Integrated Science Education, **UEW, Winneba**.
2. The Headmistress, Amaniampong SHS, **Mampong Ashanti.**
3. The Headmistress, St. Monica's SHS, **Mampong Ashanti.**
4. The Headmaster, St. Joseph Seminary SHS, **Mampong Ashanti.**
5. The Headmaster, Opoku Agyemang SHTS, **Apaah Ashanti.**
6. The Headmaster, Kofiase Adventist SHTS. **Kofiase Ashanti.**