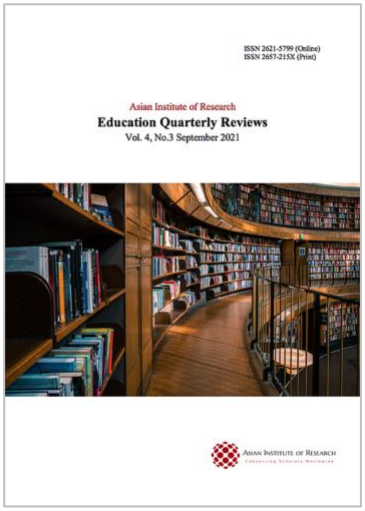


# Education Quarterly Reviews

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# Using Quality Teaching and Learning Resources for Effective Integrated Science Education among Senior High Schools in Ghana

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**Abstract**
The study examined the use of quality teaching and learning resources and how these affect the teaching and learning of Integrated Science. A total of 172 randomly selected second year Senior High School (SHS) students and 25 Integrated Science teachers purposively sampled served as the subjects for the study within six districts in the Central Region of Ghana. Questionnaires were used to collect the students' and teachers' needed data. This study's key findings revealed a lack of teaching and learning materials and the stereotyped nature of Integrated Science teachers' methods of teaching. It was noted that access, selection and usage of good and quality teaching and learning materials and methods influenced learning outcomes of students in SHS Integrated Science. However, it was observed that both government and private school teachers used similar teaching methods in delivering the Integrated Science content. It was concluded that for successful teaching and learning of Integrated Science, the challenges should be addressed by SHS education stakeholders. As a result, the paper recommended possible solutions that would ameliorate the challenges hindering the teaching and learning of Integrated Science.

**Keywords:** Integrated Science, Instructional Resources, Methods of Teaching, Senior High School, Teaching and Learning

## 1. Introduction

Strides in human development and the progress made by human society over the past years highlight the role that science and technology play in meeting the challenges of an ever-transforming society. Thus, for people to appreciate this role played by science, teachers should be able to make its delivery more appealing to students to enhance their interest. In Ghana, Integrated Science is taught at the Junior and Senior High schools as a compulsory subject. However, many students have problems with the learning of Integrated Science, thereby affecting their

performance, due to the teaching approaches employed by the teachers (Adu-Gyamfi, 2014). Since 1990, educators have made frantic efforts to proffer solutions to the problem of under achievement of students in Integrated Science (Adu-Gyamfi, 2014; Ivowi, 1995; Okebukola, 1997; STAN, 1992). In order to eliminate students' academic deficiencies, it is expedient that needs assessment is conducted in the teaching and learning of Integrated Science. Thus, in assessing these needs, the teachers and students will be positively involved in finding ways of achieving better teaching and learning of Integrated Science.

According to Stanley, Slate and Jones (1999), there are many factors in the school set up that affect academic performance negatively. These include the poor attitude of some teachers and students, inadequate textbooks and materials for teaching and learning, poor learning and teaching methods, negative perception about the subject and poor maintenance culture. The problems of students are not peculiar to any one school, but a general phenomenon. Evidence shows that science teachers do not have sufficient time to learn new teaching methods to teach their subjects (Azure, 2015). This case is no exception for the Ghanaian SHS (Adu-Gyamfi, 2014; Quansah, Sakyi-Hagan, & Essiam, 2019; Yeboah, Abonyi, & Luguterah, 2019). Sadly, decades of efforts to increase science teaching standards have had just a minimal effect in classrooms (Azure, 2015).

The time students spend studying Integrated Science has significantly declined while more content has been added to the curriculum. Learners' achievement on national assessments, which increasingly aim to measure both content knowledge and critical scientific thinking, reflects this lack of devotion to science (Adu-Gyamfi, 2014; Anamuah-Mensah, Mereku & Ghartey-Ampiah, 2008). In the Ghanaian SHS, Integrated Science is taught as a core subject so that every student would have an opportunity to learn some amount of science. However, the performance of students in the subject leaves much to be desired. For instance, students' performances in WASSCE for the past ten years have been abysmally poor (Entsuah-Mensah, 2004). This observation is not new to any Ghanaian science teacher as every SHS remedial class has a chunk of students registering for Integrated Science aside English and Mathematics. At the national and international levels, poor performances of students continue to be a matter of concern (Anamuah-Mensah, Mereku & Ghartey-Ampiah, 2008).

The reasons accounting for this observation are not farfetched. Okhiku (2005) observed that poor performance in Integrated Science is caused by the poor quality of teachers, large class sizes, and heterogeneity in terms of students' ability levels, ill-equipped laboratories and over loaded Science syllabuses. This list is however, not exhaustive. Sert, Diken, and Darcin (2008) explained that regarding the concepts taught in science in comparison with other subjects, Science has more interrelated topics emanating from all the natural sciences (i.e., Physics, Chemistry, Biology). This implies that Integrated Science has elements of the other Science concepts subsumed in it. This unique property of Integrated Science makes it typical and hence, a student is good in Integrated Science if and only if he/she has a firm grip of the rudiments of the pure Science subjects (i.e., Chemistry, Biology and Physics).

## 2. Statement of the Problem

It is incumbent on teachers to provide high-quality instruction and learning in Integrated Science to students so that the students will comprehend fundamental scientific conceptions and function correctly in their environment (Azure, 2015). With time, these will reflect in the scientific knowledge of the entire citizenry. The curriculum of Integrated Science encompasses the core science disciplines of physics, chemistry, biology, and agricultural science. The quality of content knowledge possessed by students and the competency of the teacher are some or the factors that impact quality teaching and learning of Integrated Science (Anamuah-Mensah, Ananga, Wesbrook, & Kankam, 2017). One major factor is inadequate teacher preparation, especially with respect to pedagogical techniques, inconsistent and inappropriate instructional materials (Anamuah-Mensah, Ananga, Wesbrook, & Kankam, 2017). Poorly supervised and monitored teaching in the classroom is also a significant problem. Another critical issue is the student's motivation, since motivation can be impacted by several factors, including classroom size, equipment, lack of respect for the instructor, interest, and attitudes of students (Adu-Gyamfi, 2014; Anamuah-Mensah, Ananga, Wesbrook, & Kankam, 2017; Quansah, Sakyi-Hagan, & Essiam, 2019; Yeboah, Abonyi, & Luguterah, 2019). It is believed that adequate and proper use of quality instructional materials is necessary to

enhance successful Integrated Science teaching and learning. In scientific investigation, learners could apply the five senses if they are taught using appropriate and enough quality instructional materials and teaching methodologies (Adu-Gyamfi, 2014; Opara & Etukudo, 2014; Sakyi-Hagan, & Essiam, 2019). If textbooks are not enough, pupils are forced to study books while teachers explain the concepts to them, in place of teaching activities using an Integrated Science curriculum (Azure, 2015). Children lose the opportunity to become personally invested in their learning due to lack of activities in the teaching and learning of Science (Adu-Gyamfi, 2014; Borich, 2007). That prevents students from gaining any control over their knowledge and understanding (Idiaghe, 2014). Thus, for effective teaching and learning of science, it is very imperative to stress the importance of using quality instructional resources. Consequently, these outcomes arise because as learners participate in hands-on science activities with the materials, they gain a greater understanding of scientific conceptions, which improves their learning and performance. From the foregoing, it is clear that, the challenges associated with the inability of teachers to have access to and use quality and appropriate instructional materials for effective Integrated Science education among Senior High Schools in Ghana prompted this research.

## 3. Literature Review

### *3.1 Theoretical Framework*

#### 3.1.1 Theories on Instructional Material

The instructional resources used by teachers have a correlation with the learning outcomes of their students, according to instructional material theories. Higher learning skills, quality techniques for learning and performing classroom tasks, and a positive attitude toward learning are among these outcomes. Furthermore, these hypotheses assume that educational materials have the ability to improve the highest order of academic skills in students because they show students how to obey rules/principles and elaborate on concepts in a simple, step-by-step manner, both of these factors help solve novel problems by assessing the circumstance and developing a technique (Gagné, Wager, Golas, & Keller, 2005). According to Gagne et al., teaching and learning resources can be used to promote higher-order learning capabilities in learners through self-teaching or directed learning. This means that the instructional materials for guided discovery learning primarily consist of "eliciting results" and "providing input on performance correctness," as well as "providing learning guidance." Many of Gagne's concepts have far-reaching consequences for high school teachers in Ghana. Many of these concepts accentuate the development of critical thinking and problem-solving skills in learners. The theory, on the other hand, has little to do with whether or not students should think critically about what they're learning or how they can solve a problem on their own. However, it is believed that the aim of educational materials and technology is to stretch students' imaginations and inspire them to creativity and problem-solving capabilities. Similarly, Lev Vygotsky, believed teaching learning resources have the ability to improve learners' higher-order thinking capacities, which is essential in problem-solving activities (Vygotsky, 1978).

#### 3.1.2 Sociocultural Theory of Teaching, Learning, and Development

The second theory that guided this research is the sociocultural theory of teaching, learning, and growth. This theory is largely based on Lev Vygotsky's seminal works, and suggests that human minds do not evolve as a result of any predetermined cognitive constructs that emerge as one matures (Vygotsky, 1978). Human minds, on the other hand, evolve as a result of continuous contacts with the social material environment, according to this theory. According to Vygotsky, people learn from each other and utilise their interactions to make meaning of the resources they work with (Vygotsky, 1978). These interactions are incorporated in 'cultural instruments,' which learners should show mastery in so as to produce specific knowledge and expertise to be able to solve various challenges and, as a result, become proficient in a particular profession. A picture, a model, or a pattern for solving an issue in the classroom are examples of these tools. Human language, on the other hand, is the ideal multi-level tool, combining culturally evolved concepts, sounds, melodies, and communication principles. Using such resources to learn isn't just for the sake of the mind's growth. Rather, this type of learning contributes to the development of new, more complex mental functions. To the extent that they learn complicated techniques like

human language, infants not only get the ability to communicate, but also discover totally new aspects of their thoughts, such as better self-control and attitude. The way this tool is organised (for example, the semantic, pragmatic, and syntactic constructs of language) is what creates, shapes, and forms new facets of the child's mind. Cultural instruments, it's worth noting, aren't just static 'stuff,' but embodiments of specific forms of behaving in human societies. To put it another way, they reflect the purposes and meanings of objects as discovered through cultural practices: In human cultures, they are "objects-that-can-be-used-for-certain-purposes." As a result, a child can only appropriate them by acting on and with them, that is, only by consciously reconstructing their sense and purpose. Such a process of cultural instrument restoration is initially only achievable through cooperation and engagement with other individuals who already have knowledge of a specific cultural tool. A quick description of the sociocultural method is offered here to show that while Gagne's instructional resources help integrate instruction, learning, and cognitive development, the sociocultural method facilitates this confluence and requires no extra help. According to this theory, instructional materials promote cognitive development by mediating learners' reasoning through instruments, and such mediation is the bedrock of mental development (Vygotsky, 1978).

### *3.2 Empirical Literature*

#### 3.2.1 The concept of Teaching and Learning Resources

Teachers use a variety of educational materials in the teaching and learning process, which are referred to as teaching and learning resources. Charts, models, textbooks, maps, the internet, and electronic and audio-visual learning resources such as a tape recorder, radio, cassette, TV, laptops, cell phones, overhead projectors, computers, and classroom improvised materials are just a few examples. Writing resources such as rubbers, pens, crayons, exercise books, chalk, notebooks, drawing books, rulers, pencils, workbooks, slates, and paper supplies are examples of additional learning resources (Blazar & Kraft, 2017; Yeboah, Abonyi, & Luguterah, 2019). Besides, these are technical materials or resources such as a science laboratory with the necessary equipment like a test tube, beaker, volumetric flask, capacitor and insulators. These resources are very important in doing simple demonstrations and practical works. Students need these resources at an individual and classroom level (Ministry of Education, 2003).

Educational tools and aids used in schools to facilitate learning and teaching are teaching and learning materials (Machaba, 2013; Yeboah, Abonyi, & Luguterah, 2019). They are resources and methods used by teachers to apply instructions and offer learners with the achievement of learning objectives during learning activities, which include active learning and measurement. They aid in the concretization of a learning experience, making learning more engaging, energetic, and interesting. Audio, visual, audio-visual, and realia are only a few examples. Textbooks and visual resources were shown as wall charts. As a result, audio learning materials are those that only use the sense of hearing, such as tape recorders and radios. As a result, audio-visual learning materials incorporate both visual and auditory elements, such as computers, movies, and television. Learners should be equipped with problem-solving skills and critical analytical thinking through the materials, which should provide them with the necessary information, skills, and abilities to grow and support institutions (Saad & Sankaran, 2020).

Most countries in Africa experience a shortage of teaching and learning materials with the difference in availability between rural and urban schools (Quansah, Sakyi-Hagan, & Essiam, 2019; Yeboah, Abonyi, & Luguterah, 2019). World Bank (2012) found out that many African countries do not have enough resources to meet the demand for education. This was in a report by all the Sub-Saharan Conference on Education for All, as opined by Obara and Was (2020). The self-discovery of both instructors and learners is aided by teaching and learning resources. They improve child-centered teaching and learning approaches by involving students (Machaba, 2013). Academic success is aided by the use of educational materials. According to the data reported by Ashiono, Mwoma, and Murungi (2018), employing ICT during classroom instruction boosts learners' interest in learning, leading to improved cognitive recall. The results presented by Lyimo, Too, and Kipngetich (2017) assert that teaching learning resources can significantly enhance teaching efficiency, help to identify distinctive requirements for various students, and enrich lesson plans, all of which have an advantageous influence on learners' and school's

achievement. Regardless of how well-staffed a school is, without adequate teaching and learning materials, the school's basic aims, such as teaching and studying Integrated Science in order to achieve outstanding results, can be severely hampered (Saad & Sankaran, 2020). Instructional resources of many forms can be used to encourage development since they excite, stimulate, and hold the attention of Science students.

3.2.2 The Influence of Teaching and Learning Resources on Student Learning

Ibeneme (2000) described teaching resources as those used for sensible reasons such as the teacher and students' demonstration in the class situation. Oluwagbohunmi and Abdu-Raheen (2014) explained that teaching resources simplify explanations and comprehensible subject matter to students. Also, Ajayi and Ayodele (2001) emphasised the significance of instructional materials' availability in attaining effectiveness in the school system's teaching and learning process and supervision (Yeboah, Abonyi, & Luguterah, 2019).

Television and the internet bring learners' attention to the way they appear and to how they sound, which leads to a greater focus on visuals and sounds. Our educational system wouldn't be what it is now without multiple learning tools, such as books, audio and video recordings, as well as the internet. The purpose and function of teaching and learning materials is to help the educational process look more interesting and interesting, to aid in active learning, to aid in development of diverse abilities, and to result in a wider adoption of preferred values and attitudes in learners. To achieve the following objectives, it is critical to clearly identify the circumstances and techniques for utilizing teaching and learning materials in the classroom. A good resource and utilise Science laboratory provide students with the opportunity to learn practical Science. Careful selection of teaching and learning resources contributes to nurturing concepts from Science basic ideas. They also help to download the abstract concepts to an understandable process (Odhiambo, 2007). The effective implementation of curriculum calls for providing adequate and appropriate facilities, equipment and teaching and learning resources for Integrated Science.

Institutions should guarantee that teaching and learning materials are utilised and made accessible to all students, according to Moodley (2013), for learners to be actively involved in the learning and teaching of Integrated Science. Research has shown that the availability of learning resources can have a substantive effect on curriculum implementation since learners remember 90% of what they say, see and do. They also help to download the often-abstract concepts to an understandable process (Maina, 2015).

According to UNESCO (2004), science students require learning resources in forms that are tailored to their specific needs. Students in an inclusive context would require additional materials beyond those offered by the school. Thus, Integrated Science teachers should use locally available resources to promote learning, based on inclusivity (Moodley, 2013). Using local craftsmen to maintain the devices can also assist to alleviate the problem and allow instructors to deliver more effectively. This may improve the retention of learners who are physically challenged in public institutions.

Momoh (2010) investigated the impact of instructional materials on learner achievement in the West African Senior School Certificate Examinations (WASSCE). The resources available for instruction were linked to learner performance in WASSCE. Instructional materials have a considerable impact on student outcomes and retention, according to his findings.

In Kenya, a Government Report on the National Conference of Education for All observed that pupils lack desks and chairs in most primary schools in Kenya. The absence of these has diverse effects on learning (ROK, 1992). Ministry of Education, Science and Technology (2010) observed an inadequate provision of teaching and learning resources for learners with disabilities. The limited availability of curriculum support materials also limited the teachers' ability to employ various content teaching and learning activities for effective curriculum delivery.

Because of their unfavourable learning environment, which is marked by insufficient educational materials and teaching staff, students from public schools fall behind their private primary school peers in terms of achievement (Ongaki & Musa, 2014). According to them, from 2016 to 2018, Gilgil Sub County's overall

achievement was 230.18, 227.81, and 230.16, which is below the national average. Insufficient instructional resources resulted in abstract teaching and passive learning, culminating in low performance (Wambua & Murungi, 2018). With the advancement of technology and new forms of communication, more effort is being put into teaching and learning tools. Consequently, learners in different parts of the world have benefited from this expansion.

According to Bukoye (2018), there is a very substantial beneficial relationship between learning materials and academic performance. Bukoye investigated whether schools with enough resources may provide better results than schools with lesser resources. This backed up the findings of Okongo, Ngao, Rop, and Nyongesa (2015), who found that schools owned by individuals performed well because they had adequate learning and teaching resources.

Accordingly, Adalikwu and Iorkpilgh (2013), opined that the volume and value of learning and teaching resources have an impact on students' performance. The researchers discovered that learning centers with enough facilities, such as textbooks, are better positioned to get good exam marks than schools with inadequate amenities. As a result, poor performance might be linked to a lack of training and learning resources and tools. Parents, sponsors, and the community must continue to emphasize the upkeep and growth of corporeal facilities in learning centers. This is due to the fact that the lack of such amenities obstructs the learning process. The importance of school amenities in relation to quality Science learning was demonstrated by Ndirangu and Udoto (2011). Lecture halls, classrooms, administrative blocks, auditoriums, labs, playgrounds, special rooms such as a clinic, conference halls, learners' hostels, employees' quarters, canteen, kitchen, and toilets are among the physical facilities.

Ndirangu and Udoto (2011) go on to say that having an adequate supply of high-quality physical materials makes learning more productive. Academically, unattractive school buildings, a lack of playing fields, congested classrooms, and an environment devoid of artistic splendour can all contribute to a terrible performance. According to Figueroa, Lim, and Lee (2016), the physical and institutional constraints of the school preclude a society of achievement. To effectively conduct educational programs, the Ministry of Education, Science and Technology (2014) emphasizes the importance of providing enough and appropriate teaching amenities for Integrated Science learning and teaching.

3.2.3 Effective Use of Teaching and Learning Materials in the Science Class

Integrated Science is a necessary element of our everyday lives. It's a college course that emphasizes analytical, environmental, and other mental-processing skills. Integrated Science is a required core subject at the elementary and secondary levels of school. This aims to promote scientific literacy while also guiding the country towards economic growth and prosperity (Tella, 2008). Science is widely acknowledged to be difficult, unintelligible, and uninteresting to some individuals. It is, nevertheless, the major means of enhancing students' logical and higher-order thinking abilities.

According to the Third International Mathematics and Science Study-Repeat, it is an unsettling observation among Filipino kids that they are weak in science (TIMSS-R, 2011). Ghana is not an exception. Thus, students' errors in Integrated Science education are not simply a consequence of ignorance, lack of knowledge, and situational accidents; most students' mistakes are not due to unsureness, carelessness, or unique situational conditions, as was assumed at the beginning of the behavioristic theory of education. Rather, student errors are the outcome or the product of previous experiences in the Science classroom. The extensive remark that numerous students execute poorly in school Science put much effort into the necessity of improved instruction resources. According to Diaz (2016), the student taking up higher Science lacks the prerequisite knowledge and skills. More specifically, they lack conceptual knowledge in Integrated Science. Killpatrick et al. (2001) posited that the students need conceptual understanding for learning Sciences successfully because it enables them to learn new ideas by connecting them to what they already know. This connection helps them to remember, use, and reconstruct those ideas when they need them. Further, Killpatrick et al. (2001) added that students need conceptual understanding to support the Integrated Science concepts as a foundation in solving a scientific problem.

Nowadays, learning Integrated Science has been given the major focus of teachers' efforts. Different strategies and techniques are highlighted for the students to be scientifically proficient. At present, in the Philippine educational system, learning materials are highly regarded as tools for improving students' achievement. Thus, Dahar (2011) stresses that the use of appropriate learning material has a strong relationship with senior high students' academic performance. Learners' involvement in science courses and learning was influenced by the classroom environment inclusivity, according to a study by Leone, Wilson, and Mulcany (2010) on strategies to improve Science instructions for learners in short-term tools in Washington, DC, USA. Learners were able to actively participate in a learning environment that was all-encompassing. This meant that a wide range of educational materials and resources were required. Their willingness to participate in classroom activities was boosted by the employment of educational materials. According to Leone et al. (2010), instructional materials assisted learners in displaying a good attitude towards classroom activities, creating favorable learning environments, and involving learners in activities. It also encouraged them to be curious about the area and piqued their interest in learning more.

In the Tao Te Ching, a book by an ancient Chinese philosopher and writer, Laozi states that when you offer someone a fish, they will eat it for a day. teaching someone how to fish enables them to live on a steady diet for the rest of their lives (Saad & Sankaran, 2020). Resources and facilities are scarce in Africa, making it difficult for students to achieve basic literacy skills (Machaba, 2013). In South Africa, Jojo (2019) discovered that a lack of crucial school materials was linked to poor educational outcomes in Integrated Science. The quality of education is improved by the availability of teaching and learning materials. The lack of books, references, and other academic resource materials, according to Ashiono et al. (2018), is one of the primary issues that contributes to poor performance in many Tanzanian schools. Many Tanzanian schools rely heavily on donors for teaching and learning materials, according to this author. The flow of donor cash is blocked at the time, resulting in a lack of instructional materials. A principal role of schools is to cultivate learners who are capable of successfully and effectively applying their scientific aptitudes, information, and skills for the benefit of both humanity and the nation's industrial growth. As a result, the education sector plays a critical role in aiding the process of developing the workforce required to transform Kenya into a globally competitive country. As a result, the education sector as a whole offers a wide range of learning materials to encourage full engagement in learning and maximize competence acquisition.

Tactile, auditory, and visual components, according to Silverman (2006), aid learners in processing information by minimizing the contribution of visual materials to learning. The majority of studies agree that most learners absorb new knowledge by visualizing the entire subject. There are numerous advantages to using visual learning methods. Visual elements, for example, aid learners in having clear thoughts and ideas, comprehending topics through connections, and integrating knowledge with earlier learning. It also aids the teacher in recognizing student misconceptions. Visual learning also allows for new ways of thinking (Foliaki, 2012). Visual resources, according to Cubillas (2020), are more effective than spoken descriptions in conveying concepts and material to visual pupils. They are significant improvements in Science classroom learning. The addition of diagrams, films, visual representations, charts, maps, pictures, and diagrams to the course content aids learners in easily absorbing it (Kurgatt & Omuna 2016).

Makokha and Wanyonyi (2015) looked into the lack of learning materials accessible and how educators teach Integrated Science abilities using talk and chalk strategies. Teachers conclude that insufficient learning materials are to blame for students' poor performance in Integrated Science skill development. As a result, learning environment experiences have a substantial impact on student performance, as stated by Onchera and Manyasi (2013), who found that extensive observation of what occurs in the classroom is required to provide additional insight into why students achieve the outcomes they do.

*3.3 Objectives*

1. Examine the difference in access to quality teaching/learning materials between the selected schools
2. Explore students’ views on the TLMs used by Integrated Science Teachers

*3.4 Research Questions*

1. What is the difference in access to quality teaching/learning materials between the selected schools?
2. What are students' views on the TLMs used by Integrated Science Teachers?

## 4. Methodology

The researchers investigated the utilisation of quality teaching and learning resources for effective Integrated Science education among selected Senior High schools in Ghana using a quantitative research approach, especially a cross-sectional descriptive survey methodology. The goal of utilising a descriptive survey method was to elicit information from teachers about the availability of high-quality teaching/learning materials and to learn about students' perceptions of the TLMs utilised by Integrated Science teachers. The reason for using a cross-sectional descriptive survey design is that it is more cost-effective. Furthermore, findings are obtained more quickly. Sampling enables for a broader range of information to be collected, as well as a higher level of work quality because more accurate data may be collected under the right conditions.

Questionnaires were used to collect the students' and teachers' needed data. Samples were drawn from six Senior High schools in the Effutu, Agona West and East municipalities of the Central Region. All the selected schools were co-educational with boarding and day students. In all, one hundred and ninety-seven (197) participants were selected using a simple random sampling approach from the six schools to participate in this research. Of the 197 participants, 172 were students and 25 were Integrated Science teachers. The researchers explained the purpose of the study and emphasised that the participants will remain anonymous.

The data gathered were uniformly entered using SPSS. In analysing the data, the researchers also employed quantitative data analysis methods. The frequency count was used to tally data and responses obtained were also converted to percentages. Bar charts were used to correlate the results obtained as well.

## 5. Results and Discussion

### *5.1 Background Analysis*

**Effutu and Agona West Municipals, and Agona East District in the Central Region of Ghana**

Data obtained for the research questions were analysed using frequency counts, percentages, and graphs to ascertain information on students' access to teaching and learning resources availability and usage. The following shows the general characteristics of the participants for this study.

Table 1: Gender distribution of students' school attendance rate

| Gender | Frequency | Percentage (%) |
|---|---|---|
| **Students** | | |
| Male | 84 | 49 |
| Female | 88 | 51 |
| **Total** | **172** | **100** |

Gender distribution of students showed school attendance rate for females is higher than that of the males. Again, we see a higher number of female teachers in the total participants.

Table 2: Residence status of students

| Residence Status | Frequency | Percentage (%) |
|---|---|---|
| Day | 45 | 26 |
| Boarding | 127 | 74 |
| **Total** | **172** | **100** |

Residence status of students shows many respondents (74%, n=127) were boarders. A plausible reason why students indicated studying Integrated Science thrice a week. It was noted that day students were usually occupied with house chores which makes it impossible to have enough time to study.

Table 3: Students' programmes of study

| Programme of Study | Frequency | Percentage (%) |
|---|---|---|
| Science | 13 | 8 |
| Agric | 11 | 6 |
| Home Economics | 21 | 12 |
| General Arts | 78 | 45 |
| Business | 34 | 20 |
| Visual Arts | 12 | 7 |
| Others | 3 | 2 |
| **Total** | **172** | **100** |

Students' programmes of study showed few students (14%, n=24) were Science bias. Majority of the students offer General Arts programmes (45%, n=78).

Data on the number of years (%) teachers have taught in their respective schools are presented in Figure 1. The number of years (%) teachers have taught in their respective schools show a much lower experience with almost half of the teachers indicating an experience below 5 years.

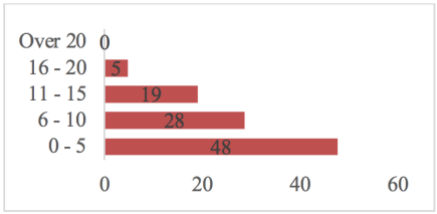


Figure 1: Number of years (%) teachers have taught in their respective schools

*5.2 Analysis of Research Questions*

**Research question 1: What is the difference in access to quality teaching/learning materials between the selected schools?**

This section presents the results of respondents' access to quality teaching and learning resources among the selected schools and how it affects the teaching and learning of Integrated Science.

Table 4: Students' responses on TLMs that were available in their schools.

| TLMs/Schools | A | B | C | D | E | F | Total |
|---|---|---|---|---|---|---|---|
| Audio | 1 | 2 | 0 | 1 | 0 | 0 | 4 |
| Textbooks and Ref. Materials | 18 | 26 | 30 | 29 | 34 | 11 | 148 |
| Audiovisual | 1 | 6 | 4 | 3 | 2 | 0 | 16 |
| Visual | 0 | 0 | 1 | 1 | 0 | 0 | 2 |
| Others | 0 | 1 | 0 | 1 | 0 | 0 | 2 |
| **Total** | **20** | **35** | **35** | **35** | **36** | **11** | **172** |

From Table 4, a great number of students from various schools indicated textbooks and reference materials as available teaching and learning materials in the school. Textbooks and reference materials had 148 (86.5%) of the responses. Textbooks and reference materials are just basic materials for teaching and learning; therefore, it is not strange that we have majority of the students mentioning it. Textbooks and reference materials alone are not enough for effective teaching and learning of Integrated Science. The least available TLM in the various schools in the visual aid. The above therefore indicates that the schools did not have adequate Science TLMs like Visuals 2 (1.2%), and Audio-visuals 16 (9.4%) which play a very important role in the effective teaching and learning of Integrated Science. The same question when posed to the teachers also confirmed what their students said, where 12 (57%) of them said the main TLMs available were textbooks and reference materials, with only 3 (14%) and 6 (29%) going for audio and visuals. This really could have a very negative impact on the teaching and learning of Integrated Science since the subject is more practically based and needs audio, visual and audio-visual for effective teaching and learning of the subject.

Figure 2 presents a graph indicating the available teaching and learning materials of the selected schools based on 36 variables measured using the observation schedule. The schools were rated as having good/adequate, average/inadequate or none/bad materials.

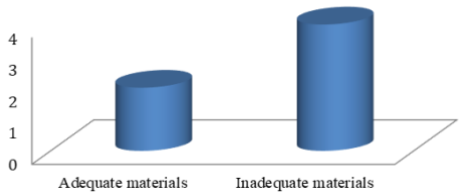


Figure 2: TLMs Rating of all the Selected Schools Against the Number of Schools

Figure 3 indicated that the most common teaching and learning material used in school by the teachers is the textbooks and reference materials (86%) while audio-visual materials are the least (2%).

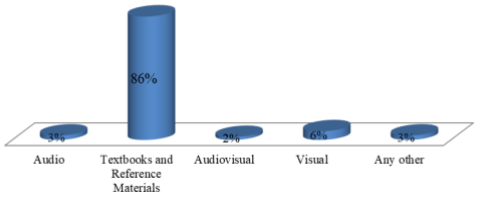


Figure 3: Students' View on TLMs often Used by Science Teachers

**Research question 2: What are students view on the TLMs used by Integrated Science Teachers?**

The students were asked of their views on the TLMs their teachers used in the teaching and learning of Integrated Science. Their responses were as seen in Table 5

Table 4: Students View on TLMs used by Integrated Science Teachers

| **Views on TLMs used by teachers** | **Frequency** | **Percentage (%)** |
|---|---|---|
| Very useful | 11 | 6.40 |
| Useful | 69 | 40.12 |
| Satisfactory | 78 | 45.35 |
| Not useful | 14 | 8.14 |
| **Total** | **172** | **100.00** |

From Table 5, 46.6% of the respondents were happy with the TLMs used by their teachers and therefore said they were useful, 14 (8.1%) of the student respondents were not happy with the TLMs their teachers were using and said it is not useful. A great number, 78 (45.3%), indicated satisfactory for the TLMs their teachers used. The above shows that some of the students' needs were not being met by the use of mainly textbooks and reference materials.

The teachers were asked in the interview whether those materials were easily accessible. Fifty (50%) said the materials were easily accessible whiles the other 50% also said the materials were not easily accessible. In an interview, the teachers were asked how they were making use of the TLMs to achieve their teaching and learning objectives. They responded that they use them when the need arises but not frequent. Eshiet (1987) was of the view that adequate provision and use of instructional materials is an important method that Science teachers can use in promoting skills' acquisition in consonance with the objective of developing manipulative skills in learners.

## 6. Conclusion

The teaching and learning of Integrated Science have been an important and necessary subject in our national educational endeavour. The effective teaching of Integrated Science encourages students in an active learning process. However, achieving effective teaching and learning of Integrated Science can be fraught with many challenges. In this study, we identified major students' needs in the teaching and learning processes of Integrated Science in two Municipalities and a District in the Central Region of Ghana. The study revealed that students' foundational problems with science concepts at SHS 1 are among the main challenges they face at the SHS 2 level. Inadequate background knowledge about major Integrated Science concepts will negatively impact students' attitudes towards their learning. It was evident that most teachers limit their teaching to lecturing without any better understanding of the subject. There were no adequate TLMs for teaching and learning, and if there were, most teachers did not use them. In totality, it can be concluded that an experimental or activity-based approach is an innovative method to change teaching and learning practices in Integrated Science classrooms. This would foster positive classroom interactions, promote positive attitudes towards science and provide opportunities for developing thinking skills.

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