

Article

# Effects of Visual Aids in Science Lessons in Some Selected Junior High Schools in Enchi in the Aowin Municipality

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**Abstract:** This study was conducted to assess the effect of visual aids in teaching science lessons in the Junior High Schools (JHS) in Ghana. The quantitative research method was chosen for this study. A Purposive sampling technique was used to select 245 JHS 2 students and seven (7) science teachers (1 from each selected school) from seven (7) selected JHS in Enchi Municipal under Aowin District in the Western North Region of Ghana. The main instrument for data collection for this study was a questionnaire and a test. The data analysis was done using the SPSS statistical package, where a questionnaire was analysed to determine the frequency and percentages of responses from selected science teachers and test analysis was done using a Pair Sample t-test to determine any significant differences between pre-test and post-test of the respondents. This study found that the use of visual aids in teaching science encouraged learners to develop interest and participate actively in the lessons which resulted in improved student performances and developed interest during the lesson. The study recommended that Ghana Education Service (GES) and headmasters at the JHS should endeavour to provide enough visual aids for their schools to enable the teaching and learning of science better and to be learner-centred, practical learning and for learners to develop interest and positive attitude towards learning science to improve performances and appreciate the need to learn science to the highest level for self-development and the development of the country.

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## 1. Introduction

Science is studied in schools from the beginning of school (Primary Education) to the highest level of education has become part of our lives as we try to understand the world and the things within and around it. As science talks about the study of our world and the universe, people are born into the world to understand the things around us for survival. Learning science as a way of problem-solving in our daily lives has helped us to understand ourselves and nature. For example, personal hygiene, eating a healthy diet, taking care of our environment, also understanding natural phenomena like earthquakes, pandemics etc., which cannot be predicted but explained. Science is a way of learning which involves firsthand experience, inquiry, problem-solving, and interpretation of data and communication of findings. Science learning has played an important role in this technological and computer age, which has formed many bases and branches like Physics, Biology, Chemistry, Zoology, Astronomy, Medicine, Astrophysics, Earth Sciences etc. Most of these studies form a natural science. Natural science is one of the branches of science concerned with the description, understanding and prediction of natural phenomena, based on empirical evidence from observation and experimentation [1]. The knowledge acquired from science helps in the development of skills and enhances

knowledge thereby leading to improved creativity in a way that tends to bring new ideas, artefacts and inventions into existence [2]. Learning science in school has improved our quality of life even from a young age in school till now. In basic or primary education from the early grade, learners are taught how to brush their teeth twice daily, how to wash their hands, take a bath, keep their surroundings clean and more which are learnt in basic sciences, and this improves healthy living at a younger age. This has made the study of science very important from the early grades to the highest level of education. From the beginning of school till the time students complete basic education, they should be familiar with the basic principles of science, know how the mind of a scientist works, and understand the world they live in which science has so much influence on and plays such a vital role in human lives. This has helped mankind to understand the environment around him and improve his way of living in it through the knowledge of science into technology.

Science has helped to improve our quality of life and develop individuals and the economy we live in. The knowledge of science brought technology to existence which has also contributed a lot to the development of our world to make the world easy for us to live and understand. Science contributes to technology in at least six ways: (1) new knowledge which serves as a direct source of ideas for new technological possibilities; (2) source of tools and techniques for more efficient engineering design and a knowledge base for evaluation of feasibility of designs; (3) research instrumentation, laboratory techniques and analytical methods used in research that eventually find their way into design or industrial practices, often through intermediate disciplines; (4) practice of research as a source for development and assimilation of new human skills and capabilities eventually useful for technology; (5) creation of a knowledge base that becomes increasingly important in the assessment of technology in terms of its wider social and environmental impacts; (6) knowledge base that enables more efficient strategies of applied research, development, and refinement of new technologies. As such science has kept faith with the rapid changes in technology, the subject needs to be taught with the requisite materials and pedagogical skills to help learners understand well from basic to higher education [3]. Science is the pursuit of knowledge and understanding of the natural and social world following a systematic methodology based on evidence [4]. Science is a dynamic human activity concerned with understanding the workings of the world [5]. A good education allows learners to learn to understand what they are taught so they can contribute their quota of knowledge to the development of society and the world they live in to seek improvement in their daily lives to make life simple and easy. Through learning science, our world has become a global village, making the world smaller. Science contributes to the functioning of democracies and innovation and helps countries to be competitive in a global economy, but science which contributes significantly to knowledge production, is confronted with new challenges. The knowledge of science is used to create new technologies. New technologies often allow scientists to explore nature in different ways and make new discoveries. In today's world, the role of science and technology is indispensable. We need Science and Technology in every sphere of our life to do many things like to treat diseases such as cancer. One of the most important aspects of Science and Technology is that it has solutions to the most difficult problems, the problems which have the potential to become major blockages to the overall growth of the country. Some of these problems could be, health aspects, standard of education, availability of healthy food and safe drinking water, infrastructure etc. All this knowledge of science, in turn, provides favourable conditions for the country's growth and increases healthy competition nationally and internationally. In today's world, more often, we read or hear that developed countries, developing countries, underdeveloped countries, or even third-world countries, all designate the level of development of Science and Technology in other countries, they have an influence on.

We live in a world dominated by science and technology and to be illiterate in science is terrifying and not accepted because no country achieves an industrialized status without paying attention to science. Science and technology do not exist independently of society [6]. As we see science and technology contributing a lot to the development of the world, all comes from the knowledge obtained from learning science in schools. Learning the knowledge of science and applying it helps humans to explore the other planets of the universe. Modern life requires general scientific literacy for every Ghanaian citizen, a requirement that will create a scientific culture in line with the country's strategic program of achieving scientific and technological literacy within the shortest possible time. Science culture should become the common property of every citizen in a country because it opposes superstition and is a catalyst that helps toward faster development [7]. The government of Ghana in its national education development document, Vision 2020 has laid much emphasis on science education. One objective of Vision 2020 is to develop adequate Science and Technology capabilities and to provide infrastructure which will enable industries and other sectors of the economy to provide the basic needs of society [8].

The teaching of science offers students the ability to access a wealth of knowledge and information which will contribute to an overall understanding of how and why things work as they do. Science is able to explain the mechanics and reasons behind the daily functioning of complex systems, which range from the human body to sophisticated modern methods of transport. Students are able to use this knowledge to understand new concepts, make well-informed decisions and pursue new interests. Science is a collaborative and creative human endeavour arising from our desire to understand the world around us and the wider universe [9]. Science instils a sense of intrigue and enables students to develop understanding and form questions based both on the knowledge they already have and the insight they wish to gain in the future. Students who excel in science lessons are likely to develop a strong ability to think critically.

Government policy decisions that affect every aspect of our lives are based on scientific evidence as humans grow up in an increasingly technologically and scientifically advanced world, they need to be scientifically literate to understand issues and be able to live successfully. Many students find science inspiring and interesting but difficult to learn and understand. Most of these learning difficulties come from how science is taught in the classroom by teachers. The methodological approach used by teachers to teach science in our schools is mostly not the best to help students understand simple concepts in science. This has made a lot of students lose interest in learning science and do not continue learning science to the highest level. The proportion of students taking up science is low particularly in the case of physics in comparison to take-up of other science aspects and non-science subjects at the higher level. About 4 to 15 per cent averagely (4% to 15%) of students in a single class in Junior High School (JHS) in Ghana complete their BECE (Basic Education Certificate Examination) to continue to study science electives at the Senior High School (SHS) education. Number of students who study science elective at the SHS level are always the least number compared to other non-science subjects [10]. This number of science students continues to reduce to the minimum number when they continue to the university level because students keep losing interest in learning science as they see it as abstract and difficult to understand. Many young people still elect to opt out of science once it is no longer compulsory [11]. Some of these factors contributing to this were the teacher factor, the approach used to teach science, perceived difficulty and the abstract nature of science.

The teaching and learning of science at the JHS level in Ghana has a Common Core Science Programme from Basic 7 (BS 7) to Basic 10 (BS 10) which enables learners to build on what they have learnt from BS 1 to BS 6 (Primary 1-6), and further develop their knowledge of science as they continue their education to the highest level, but this have not been encouraging at all due to how science is taught in classrooms and some abstract

nature of the subject. General comment often made is that students do not understand what they are taught in the classroom, do not have interest in the subject and their performance are poor during examinations, either class exercise, assignment, quizzes, end-of-term exams and BECE exams.

In Ghana, the JHS science syllabus is designed to help the pupil to:

1. develop a scientific way of life through curiosity and investigative habits
2. appreciate the interrelationship between science and other disciplines.
3. use scientific concepts and principles to solve problems of life.
4. use basic scientific apparatus, materials and appliances effectively.
5. take appropriate measures for maintaining machinery and appliances used in everyday life.
6. acquire the ability to assess and interpret scientific information and make inferences etc.

To achieve these, it bounds down to the duty of the teacher to inculcate into learners to acquire the knowledge needed for further studies in science as preparation for careers in science [7].

The trademark of good teaching is the quality of learning among students. Learners are treated as co-creators in the learning process, as individuals with ideas and issues that deserve attention and consideration [12]. The process of science teaching is the fundamental assumptions about the uniqueness of learners who are different in individual patterns of development and the active nature of the student learning. Effective teaching of science requires sound pedagogical skills, knowledge of the subject matter and classroom practices to support the learning process among all categories of students. Ways by which teachers can induce quality learning in science classrooms are; making science learning active and student-centred using teaching-learning materials (TLMs) as instructional materials to teach. Instructional materials (TLM) are concrete or physical objects which provide sound, visual or both to the sense organ during teaching [13].

To provide quality science education, teachers must facilitate learning in an enabling science classroom. This will provide the foundation for discovering and understanding the world around us and lay the grounds for science and science-related studies at higher levels of education. As stated, the syllabus is a conscious effort to raise the level of scientific literacy of all students and equip them with the relevant basic integrated scientific knowledge needed for their own survival and for the development of the country [14]. The Science Common Core programme Curriculum for BS 7 to BS 10 aimed at developing individuals to become scientifically literate, good problem solvers, have the ability to think creatively and have both the confidence and competence to participate fully in Ghanaian society as responsible local and global citizens [9].

The main objective of teaching science is to develop skills in students which will help them to know the facts, principles of science, its applications, identify objects and to make concepts clear and understandable. Teachers are the only powerful agents for improving the quality of students [2]. This study aims to find out the effects of using visual aids in teaching and learning integrated science lessons at the Junior High School (JHS) level in Ghana, in the Aowin Municipality in the Western North region. Visual aids are devices that help the teacher to clarify, establish, and correlate and co-ordinate precise conceptions, understandings and appreciations and support to make learning more actual, active, motivating, encouraging, interesting, significant and glowing. Visual aids are important in education as they encourage students in the learning process, make the lesson understandable, raise interest in the subject presented, lead to permanent retention of materials learnt, students increase their vocabulary as well and provide direct experience to the students [15]. Learning materials, particularly visual aids, conceived within the

context of quality education; are crucial elements propelling any progressive teaching and learning or academic effectiveness and efficiency [16]. It's important to think of visual aids as essential factors in the teaching and learning of science. The purpose of this study was to assess the effect of visual aids in teaching science lessons in the Junior High Schools (JHS) in Ghana.

### **1.1. Objective of the study**

1. investigate teachers' views on the use of visual aids in teaching JHS science.
2. compare teachers' views regarding the use of visual aids according to experiences.
3. analyze the effects of visual aids in teaching and learning science at the JHS level in the Aowin municipality.

### **1.2. Research Questions**

1. What views do teachers have on the use of visual aids in teaching JHS science?
2. Is there a relationship between teachers' views on the use of visual aids in teaching and learning science according to their experience?
3. What effects do the use of visual aids have on teaching and learning science at the JHS level in the Aowin municipality?

### **1.3. Literature Review on Visual Aids**

The nature of students' perception of science learning is situated on what they see around them and have experience with. The duty of a teacher is to provide an appropriate environment where students will construct his/her knowledge by interacting with their physical and social environment. As teachers are powerful agents for improving student quality, there is a need for teachers mostly science teachers to inculcate the knowledge of science into learners to develop interest, and attitudes and improve performance to continue to a higher level. In traditional classroom teaching, there is hardly any scope for the children to interact with the teacher, teaching-learning materials and teaching-learning environment [17]. This makes teaching and learning very difficult for learners and they mostly rely on rote learning without understanding. Most often, classroom teaching is dominated by the Lecture method of teaching (teacher-centred), where the teacher only involves learners in the lesson through questions and answers. Hardly, will you see teachers using Teaching Learning Materials (TLMs) to teach their lessons, except for some essential aids like chalk, a writing board, a duster and a textbook. Some teachers complain of not having the necessary available items/materials for teaching which they are not ready to improvise, and others think that's time-consuming". Effective classroom teaching and learning is only possible when all improvisation elements are taken care of; the use of ICT and teaching aids appear to be appropriate for adapting to the issue of basic education and innovative proficiency, particularly in the poorest populace segments. Providing appropriate TLMs system could realise the identified goals, learning has now shifted from Response Strengthening to Knowledge Acquisition to Construction of Knowledge by learners [18].

Involving learners in science lessons with the use of TLMs aids them in finding solutions to problems and constructing their own knowledge, which influences the attitude of learners positively. The use of teaching aids in the teaching and learning process makes the educative process more proficient and fascinating to students in this way enhancing the quality of education [18]. The Common Core Programme (CCP) in Ghana places emphasis on the engagement of learners in classroom activities and projects (in and outside the classrooms), which can involve individual or group tasks which all

learners are required to complete by the end of Basic 10 [9]. The CCP project provides learners with contexts to demonstrate creativity and inventiveness in various areas of human endeavour. A considerable amount of literature spanning many decades highlights the impact of taught curriculum on students' decision to take science [16]. Years ago, emphasis was placed particularly on the relevance of the science curriculum to students' lives. Students regard the science taught in schools to be overloaded with content and not generally relevant to working life. Increased emphasis on socio-scientific issues in the science curricular reforms of 2020 in Ghana was to provide the foundations for discovering and understanding the world around us and lay the grounds for science and science-related studies at higher levels of education. [17], however, suggest there has been no major impact on the uptake of post-compulsory science courses. The aspect that may influence the uptake of science is the perception that science is a difficult subject. The perception of science being difficult is entwined with the notion of student self-efficacy and, as there is an increased likelihood that students will make science-related choices if they have high expectations of success in science [18].

The availability of enthusiastic and well-qualified teachers has been identified as one of the most effective factors that influence young people's perceptions of science [19]. There has been an increasing amount of research on the ways that teachers influence attainment and interest in the classroom. A study claimed students' interests are engaged and sustained by teachers who make lessons fun either through their methods of presentation of the material or the organisation of the work [20]. The quality of teaching and learning provision are the most important influences on students' experiences and outcomes of schooling [21]. The way teachers regulate the academic environment including material covered, approaches to learning and communication with students play an important role in student attitude to school [22]. The way teachers interact with their students rather than subject content knowledge is an important factor in getting students interested in science [23]. The best way of learning and developing interest in science is for the teacher to induce quality learning in the classroom by making science learning active, and student-centred and use of TLMs to teach science. These strategies for teaching science will involve students in practical lessons to find solutions for themselves to improve their performance.

Research postulated that TLMs are aids used by the teacher to teach effectively and for learners to learn effectively [24]. Teaching and Learning Materials (TLMs) in science may be defined as the instructional materials, equipment or devices which help a teacher in the effective realization of his teaching objectively by calling upon the auditory and visual senses of his students [15]. This research explores the teachers' opinions on the use of Visual Aids (e.g., pictures, animation videos, projectors and films) as an approach and a motivational tool in enhancing students' attention and interest in learning science. The aids which use the sense of vision are called Visual Aids. For example; actual objects, models, pictures, charts, maps, flashcards, flannel board, bulletin board, chalkboard, overhead projector, slides etc. Visual aids arouse the interest of learners and help the teachers to explain concepts easily [25]. Visual aids are those instructional aids which are used in the classroom to encourage students' learning process. Visual aids are those sensory images which inspire and support student learning. "Visual aids are any devices which can be used to make the learning experience more real, more accurate and more active" [25]. Researchers showed that students taught with visual aids performed better than those taught with the traditional method [26]. Other research has shown how the physics teachers in Federal Capital Territory (FCT) secondary schools in Nigeria were using instructional aids during the teaching and learning process. The results showed that there was a significant difference in the academic performance of students learning by using visual aids as they performed better than those who did not use visual aids during the teaching and learning process [27]. Visual aids are those devices which are used in classrooms to encourage students' learning process and make it easier and more

interesting. Visual aids are the best tool for making teaching effective and the best dissemination of knowledge [25]. Research revealed that the attitudes of the respondents to the use of visual aids in teaching science were found to be positive in general. They said visual aids are perceived by respondents to be effective in the teaching and learning of science, particularly in arousing interest, explaining scientific facts and illustrating scientific principles, laws and theories [28]. Visual learning aids such as pictures, drawings or dynamic videos were designed to facilitate learning which had an impact on the teaching and learning process. The sense of sight helped learners to learn effectively. Thus, visual aids were important tools in the teaching and learning process, since students were observing physically and practically on the visual aid related to the topic. Failure to prepare and use visual learning aids leads to poor academic performance in secondary schools [29]. Thus, the Tanzania curriculum puts considerable effort into the teaching and learning process where the educational materials to facilitate the teaching and learning process are provided in order to achieve the educational goals [30]. The government understands that for curriculum to be successful, preparation and production of teaching and learning aids should be handled with the greatest care in order to enhance the teaching and learning process.

Research has indicated the psychology of visual aids as under, 1% of what is learned is from the sense of TASTE, 1.5% of what is learned is from the sense of TOUCH, 3.5% of what is learned is from the logic of SMELL, 11% of what is learned is from the logic of HEARING and 83% of what is learned is from the sense of SIGHT. Also, people generally remember, 10% of what they READ, 20% of what they HEAR, 30% of what they SEE, 50% of what they HEAR and SEE, 70% of what they SAY and 90% of what they SAY as they DO a thing. So, there is no doubt that technical devices have a greater impact and dynamic informative system [32]. Researchers argue that 83 per cent of our learning is achieved through the sense of sight, 11 per cent comes from the sense of hearing, 3.5 per cent through the sense of smell, 1.5 per cent through the sense of touch and another 1 per cent through the sense of taste. This implies visual aids are important in the teaching and learning process because 83 per cent of learning is through the sense of sight. What learners see in the classroom is easily remembered, manipulating what they see in the classroom makes them active and easy to understand.

Visual aids arouse the interest of learners, change their attitude positively towards learning and help the teachers to explain the concepts easily. The use of visual aids in teaching makes teaching and learning easy for both teachers and learners. Visual aids are those instructional aids which are used in the classroom to encourage teaching teaching-learning process. Any device which by sight and sound increase the individual s' practice, outside that attained through reading labelled as an audio-visual aid" [34]. Visual aids are those instructional devices which are used in the classroom to encourage learning and make it easier and more motivating [35, 36]. Material like models, charts, film strips, projectors, radio, television, maps etc. called instructional aids [36]. Visual aids are effective tools that "invest the past with an air of actuality." Visual aids distribute the learners with true knowledge and display the abstract nature of a concept for learners to understand. They demand the mind through the visual and auditory senses. Visual aids help teachers establish, explain, connect, and associate ideas and concepts to make the process of learning more interesting, enjoyable, and effective [37]. They stated that some benefits visual aids provide for teaching and learning include:

- Helping students retain information for a longer period of time
- Helping inspire students to study more effectively
- Providing an example to think about concepts
- Increasing the student's vocabulary
- Helping students gain a proper view of topics and concepts
- Providing hands-on experience for students
- Creating an atmosphere of interest

- Making the process of teaching easier for teachers [37].

When teachers use visual aids as teaching aids, it is one of the aspects which root participation of students in the lesson because when students look at a visual model or aid, it is measured as a kind of contribution. The use of visual aids encourages body movement and it may strengthen control [38]. There is a famous Chinese proverb which says “One sighted is worth, a hundred words” it is a fact that we take knowledge through our intellect. Another proverb says “If we hear we forget, if we see we remember, and if we do something we know it”, this means that the use of visual aids makes the teaching-learning process more effective by making learners see the reality of what to learn. Visual aids stimulated thinking and cognize” [39]. The use of visual aids in the teaching-learning process has multifarious values [40]. Visual aids give a chance to speakers to make a more professional and consistent performance.

The teaching career is full of limitless opportunities to enrich the academic survives of students, while some ideas and educational goals will be easy for students to hold, others will need you to think productively to ensure that important learning aims are met. Visual aids in teaching is one mode to enhance lesson plans and give students additional ways to process subject information [32]. Visual aids are devices that present a unit of knowledge through auditory or visual stimuli both with a view to aid learning [41]. They concretise the information to be obtainable and help in making learning practice apple real, active and vital. They supplement the work of the teacher and help in the research of the textbooks. The great educationist Comenius has said: that the foundation of all learning consists of representing clearly to the senses and sensible objects so they can be appreciated easily [41]. Examples of learning resources include visual aids, audio aids, real objects and many others. Visual aids are designated materials that may be locally made or commercially produced. They come in the form of illustrations, wall charts, exemplified pictures, symbolic materials and other two-dimensional items. Films, likewise, are a general teaching/learning resource. In addition to helping students remember important information, teaching/learning resources have other returns.

A major goal of all teaching is for the students to be able to retain as much knowledge of the topic as possible, particularly the main points. Good learning resources can help solve certain language barrier problems as they provide accurate visual images and make learning easier for the student [33]. Instructional aides have no value in the learning process if they cannot be seen or heard. Tapes of speeches and sounds should be confirmed for correct volume and quality in the actual environment in which they will be used [34]. Visual aids must be visible to the whole class. All calligraphy and illustrations must be large and adequate to be seen easily by the students farthest from the aids. Colours, when used, should provide clear contrast and easily be visible. The efficacy of aids can be enhanced by proper sequencing to build on former knowledge. Visual aids (instructional materials) play an important role in making science teaching meaningful and significant [42]. It helps to understand what, how and why the science study is required. To appreciate the benefits of visual aids in teaching, basic schools need to adopt effective methods for using and managing their visual aid resources. Students of the school level think in terms of concrete materials. The learning process itself is based on primary or secondary experiences [42].

Martin argues that the use of practical investigations promotes constructivist teaching principles. He provides various examples of practical activities that can be utilised within the science class to provide learners with the opportunity to investigate cause and effect, a principle that is very important in science [43]. The use of visual aids during practical activities allows learners to actively take part in the scientific method and enables them to hone their investigative skills such as hypothesis and variable formulation, and observation and recording of data, which are essential for science [44].

Many researchers have made use of visual aids tool to assist comprehension of difficult scientific concepts. A study found that the use of scale models as visual aids could

be effective in teaching difficult and abstract chemistry concepts. Through building molecular structures or using models to explain complex and integrated processes, learning about structures that cannot be seen or are completely unknown to learners is facilitated. The process of building molecular structures and the availability of life-size models of relatively small components enable learners to visualise these abstract concepts in ways that facilitate understanding [45]. Visual aids in the form of graphics could provide learning support in science for learners who were taught in a language that was not their mother tongue [46]. The researchers found that graphics provided support by serving as a visual source that enabled learners to infer the meaning of words without having to disengage from the reading activity. Purposefully selected graphics that contain clear, descriptive text in the form of captions have been found to be very effective in such contexts [47]. Researchers indicated that the use of visual aids such as the Roundhouse diagram helps learners to understand concepts. In this diagram, a learner puts a concept in the centre of a circle and then divides the circle into seven segments. In each of these segments, the learner draws an icon that she/he associates with each of the underlying concepts. These icons then make up the main concept in the middle of the circle. This can be useful as a possible study method to teach learners how to use visual aids more effectively than, for example, merely summarizing [48].

The import of visual aids in the study of science proves effective reinforcing agent by increasing the probability of the reoccurrence of the responses associated with learners. The experiences are so much connected and associated with the relevant use of aids like pictures, animation videos, projectors and films for learning, teaching, computer-assisted instructions etc. are known for their role in providing adequate well-controlled reinforcement to the learner in the attempt of self-learning or instruction. These varying strategies are seen to help improve students' attitudes and performance.

## 2. Materials and Methods

This study chose a quantitative research method. The population for this study included all Junior High school (JHS) students in Ghana, but because of financial constraints and travelling difficulties, the study sampled only seven (7) JHS in Enchi Municipality in the Western North region of Ghana under Aowin District. These schools are; Enchico Demonstration JHS, Enchi Methodist JHS, Enchi Presbyterian JHS, Commey Memorial JHS, Enchi SDA JHS, Enchi Catholic JHS, and Enchi Anglican JHS. The sampled population for this study was 245 JHS 2 students and 7 science teachers, 1 from each selected school. The researchers chose only JHS 2 students for the study because they have already studied some concepts (introduction) under "Solar system" as one of the topics in the JHS science syllabus. A purposive sampling technique was used to select the respondent for the study. Purposive sampling was used as all the selected students for the study are JHS 2 students, using the same science syllabus and the selected teachers are their science teachers.

**Table 1. Number of students and teachers selected for the study**

Name of schools	Enchico Demonstration JHS	Enchi Methodist JHS	Enchi Presbyterian JHS	Commey Memorial JHS	Enchi SDA JHS	Enchi Catholic JHS	Enchi Anglican JHS	Total
No of student(s)	45	40	22	38	25	43	32	245
No of teacher(s)	1	1	1	1	1	1	1	7

The data collection instrument was facilitated through a questionnaire and test. All selected science teachers were sampled to answer questionnaires with closed-ended

questions. Ten (10) questionnaire items were set to obtain science teachers' opinions on the effectiveness of the use of visual aids for teaching science lessons. The questionnaire contained four types of Likert-scale (strongly disagree =1, disagree = 2, agree = 3, and strongly agree = 4), in which selected teachers were allowed to choose the appropriate one as a response. The merit of using a questionnaire includes reach ability where many respondents can be reached more easily [37]. The result of a questionnaire can usually be quickly and easily quantified by either a researcher or through the use of a software package [38]. The questionnaire was created by the researcher to suit the nature of the research questions.

The selected students in this study were allowed to take a test (pre-test and post-test) to find out the effects of the use of visual aids on students' performance, attitudes and interest in science learning. The test items set for the students contained 15 test items which were multiple choice questions set on the topic "Solar System" for both pre-test and post-test containing the same test items. The researcher chose the topic because all the selected students who are JHS 2 or basic 8 students have already treated an introduction to this topic in JHS 1 (Basic 7). The "solar system" is considered one of the abstract topics in the JHS science syllabus because the concepts are not found or seen in our environment unless the use of pictures and videos. Most science teachers teach this topic using lecturing or a traditional approach because of a lack of teaching-learning materials (TLMs) which makes it difficult for learners to understand this concept easily.

Selected science teachers were allowed to use an Overhead projector (as a visual aid) to teach the topic "Solar System". An overhead projector is a small machine designed to project an image onto a small screen or whiteboard, and this was used as TLM to show the structure and formation of the solar system. Before the lesson, a pre-test was given to selected respondents/students to answer on the topic "solar system". After thirty (30) minutes of pre-test, science teachers were allowed to teach the topic solar system using the visual aid. During each lesson, students were shown some pictures and videos of the structure and arrangement of the planets in the solar system on the projector (the planetary system), the formation of artificial satellites and natural satellites, the differences between natural and artificial satellites, and the uses of satellites. Students in groups were allowed to identify and describe what they saw on the projector, which helped them to share ideas. Students were also allowed to operate the computer or work with the computer to control variables to understand the concepts shown on the projector as pictures and videos. Each lesson taught in each school lasted for forty-five (45) minutes.

After the taught lesson, a posttest containing the same test items on the pre-test was given to respondents (students) to answer and responses were collected immediately after the test. The two responses from the pre-test and post-test were analysed and compared to find out the significant differences, to determine the effects of the use of visual aids on students learning performance in science lessons. The quantitative data entry and analysis were done by the researcher using the SPSS software package. The questionnaire data was edited, coded and analysed into frequencies and percentages with interpretations, and test data was analysed using a Pair Sample t-test to find any significant differences.

### 3. Result and Analysis

The collected data for questionnaires and tests were evaluated and analysed through percentages and Two Sample t-tests (Independent t-test). Descriptive statistics of the pre-test versus post-test in terms of their performance were compared using a paired sample t-test. The questionnaire items were answered by selected science teachers selected for the study and test items were answered by selected students from the selected schools. The data response analysis for questionnaire outcomes and tests are shown in the Tables below.

**Table 2. Distribution of paired sample t-test between the pre-test and post-test results**

Scores	Paired sample statistics			r	Sig.
	N	mean ± sd	St. Error	Pre & post test	Pre & post test
Pre-test	245	5.20 ± 1.706	0.109	0.678	< .0001
Post-test	245	12.56 ± 1.449	0.093		

( $t = -89.458$ ,  $CI = -7.517, -7.193$ ).  $r =$  correlation;  $sd =$  standard deviation.

Overall, pre and post-test data were obtained from 254 study participants. Paired sample t-test was computed to establish the difference between the pre-test results and the post-test results. For this study,  $p < .05$  was deemed statistically significant.

From Table 2, the mean score for the pre-test result was documented as  $5.20 \pm 1.706$  with a recorded standard error of .109. Concerning the post-test score, the mean  $\pm$  standard deviation was recorded as  $12.56 \pm 1.449$  also with a reported standard error of .093. It was evinced from the reported results that students performed better or scored satisfactory marks in the post-test following the interventions (visual aids) which was used to teach the lessons.

The Pearson Product Moment Correlation ( $r = 0.678$ ) showed a strong positive correlation between the pre-test scores and the post-test scores. The corresponding coefficient of determination ( $R^2 = 0.46$ ) denoted that about 46% of the variations in the scores of the post-test were influenced by the use of visual aids as an intervention introduced by the researcher to teach the lesson. Further, there was a statistically significant association ( $p < .0001$ ;  $t = -89.458$ ) between the pre-test scores and the post-test scores. This is an indication that the improved scores obtained by the study participants in the test may be influenced by the use of visual aids in teaching. Visual aids are devices that present a unit of knowledge through auditory or visual stimuli both with a view to aid learning [25]. Good learning resources can help solve certain language barrier problems as they provide accurate visual images and make learning easier for the student [33]. In this context, it is necessary for science teachers at the basic schools to provide appropriate visual aids for teaching science lessons so students can see and remember what they learn easily. What students see as real or image as a picture is easily recorded in the brain and easy to remember. Visual aids in teaching are one mode to enhance lesson plans and give students additional ways to process subject information [32]. This implies that science teachers must use visual aids as TLMs to teach their lessons to improve students' performances.

**Table 3. Science teachers' responses on the use of Visual Aids to teach science**

No	Items	SD (%)	D (%)	A (%)	SA (%)
1	I use lecture approach to teach my lessons more than other approaches	0(00)	0(00)	4(57.1)	3(42.9)
2	My lesson is always learner-centred because materials are available to use for teaching	3(42.9)	4(57.1)	0(00)	0(00)
3	my lesson is always teacher-centred because materials are not available for teaching	0(00)	0(00)	4(57.1)	3(42.9)
4	I involve students in my lessons always	2(28.6)	5(71.4)	0(00)	0(00)
5	Students always develop an interest in my lessons due to the traditional method/lecture I use to teach	1(14.3)	6(85.7)	0(00)	0(00)
6	Students' involvement and performance in my lessons are low when I use my regular teaching/lecture approach	0(00)	0(00)	6(85.7)	1(14.3)
7	The use of visual aids encouraged my students to participate and develop an interest in the lesson	0(00)	0(00)	2(28.6)	5(71.4)
8	The use of visual aids encourages students to be curious to find solutions to problems themselves	0(00)	0(00)	2(28.6)	5(71.4)
9	The use of visual aids improved students' performance during the lesson	0(00)	0(00)	1(14.3)	6(86.7)

10	Using visual aids in teaching is the best approach and must be encouraged for teaching science lessons	0(00)	0(00)	5(71.4)	2(28.6)
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*SD (Strongly Disagree) = 1; D (Disagree) = 2; A (Agree) = 3; SA (Strongly Agree) = 4*

Responses from science teachers from the questionnaire shown in Table 3 prove that 57.1% agree and 42.9% strongly agree with the statement that “*I use lecture approach to teach my lessons more than other approaches*”, this shows that 100% which means all the teachers agree that they use lecture approach to teach science lessons. Science teachers’ response shows that 42.9% strongly disagree and 57.1% disagree that “*My lesson is always learner-centred because materials are available to use for teaching*”. This shows that 100% of the teachers disagree that the lessons they teach are learner-centred. About 57.1% agree and 42.9% strongly agree with the statement that “*my lesson is always teacher-centred because materials are not available for teaching*”. This shows a total of 100% of science teachers agree that their lessons are always teacher-centred because materials are not available for teaching science lessons. All the science teachers disagree 100% with the statement “*I involve students in my lessons always*”, indicating that 28.6% strongly disagree and 71.4% disagree, which implies that science teachers do not involve their students in their lessons, students are only involved in lessons when the teacher asked questions in class. The “*Students always develop an interest in my lessons due to traditional method/lecture I use to teach*”, the responses show 14.3% strongly disagree and 85.7% disagree making a total of 100% disagree with it, implying that their students do not develop an interest in their lessons because they use traditional method (lecture) to teach science lessons. To this statement “*Students’ involvement and performance in my lessons are low when I use my traditional method/lecture approach to teach*”, responses given indicate that 14.3% strongly agree and 85.7% agree, which implies that students’ involvement, interest and performance in their science lessons are very low whenever they use traditional method/approach to teach.

All the selected science teachers agree 100% to this statement that “*The use of visual aids encouraged my students to participate and develop interest in the lesson*”, which indicates 28.6% agree and 71.4% strongly agree to it. This implies that when these science teachers used visual aids to teach the lesson, it made their students participate and develop interest in the lesson. Responses to this statement “*Use of visual aids encourages students to be curious to find solutions to problems themselves*”. This showed 28.6% agree and 71.4% strongly agree making 100% totally agree to the statement. This implies that the use of visual aids during the lesson made students to be curious and solve their own problems. Science teachers’ responses to this statement “*The use of visual aids improved students’ performance during the lesson*”. This indicates about 14.3% agree and 86.7% strongly agree making 100% of the teachers agree that the use of visual aids in teaching improved their students’ performances. Responses to the statement “*Using visual aids in teaching is the best approach and must be encouraged for teaching science lessons*” indicated about 71.4% agree and 28.6% strongly agree, also making 100% of the teachers totally agree that the use of visual aids in teaching is the best approach and must be used to teach science lessons, and this will encourage students’ participation in the lesson.

The analysis made from Table 3 implies that learners fully participated in the lesson with the use of visual aid in learning, their attitudes, performance and interest in the lesson was increased and there were consistencies in the questionnaire responses from the science teachers.

#### 4. Conclusion and Recommendation

The main objective of this study is to establish whether the use of visual aids in teaching science improves students’ interest and performance at the JHS level. During this study, data collected from science teachers and JHS 2 students in Enchi Municipality showed that the use of visual aids in teaching developed students’ interest, and attitudes, and improved students’ performance during the lesson. Science teachers’ responses from

the questionnaire specified that science teachers are fond of using traditional methods/lecture approaches to teach science lessons. It was shown that science teachers do not use TLMs to teach their lessons to involve students in activities, always making students' listeners (passive) but not participants (active) in lessons. It was evident that most schools do not have enough teaching materials, some do not have at all, and those having some teaching materials available are outmoded and cannot be used to teach. According to student's post-test results, after science teachers applied the intervention (visual aids) to teach the topic "solar system", students/participants developed interest, changed attitudes positively towards the lesson and improved their performance during the lesson, which they performed better in the posttest result than the pre-test result.

Science, as we know, is a practical subject which needs to be taught with relevant teaching-learning materials (TLMs) to explain the reality of nature. As said by [1], science is a way of learning which involves firsthand experience, inquiry, and problem-solving, interpretation of data and communication of findings. According to [15], TLMs are aids used by the teacher to teach effectively and for the learners to learn effectively. The duty of a science teacher is to provide an appropriate environment where the students will construct their own knowledge by interacting with the materials provided by the teacher for learning. As TLMs are very important in teaching and learning science to make learning easier, visual aids as a sample of TLM are instructional devices which are used in the classroom to encourage learning and make it easier and motivating [25]. Visual aids as a type of TLM distribute the learners with factual information and exhibit the abstract nature of a concept for learners to understand easily. This implies that science teachers at basic schools must use visual aids to teach science so students have experience with the materials around them to improve their learning performances.

The Ghana Education Service (GES) should endeavour to provide TLMs, specifically visual aids for basic schools to make the study of science more interesting and practical for learners to develop interest and continue to the highest level. It is recommended that GES and headmasters at the basic schools should provide the necessary TLMs for their schools to enhance the teaching and learning of science, enable teaching science as learner-centred, practical learning, and for learners to develop positive attitude and interest towards science to appreciate the need to learn science to the highest level for self-development and for the development of the country.

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