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POST GRADUATE SCHOOL FOR SOCIAL AND EDUCATIONAL SCIENCES
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RESEARCH AND DOCTORAL TRAINING UNIT FOR SOCIAL SCIENCES AND EDUCATIONAL ENGINEERING
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THE INFLUENCE OF THE USE OF INSTRUCTIONAL MATERIALS ON BIOLOGY STUDENTS' ACADEMIC PERFORMANCE IN SOME HIGH SCHOOLS IN THE MFOUNDI DIVISION

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Option: **Curriculum and Evaluation**

Speciality: **Curriculum Developer and Evaluator**

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Bachelor's degree in Animal Biology and Physiology

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DECLARATION

The project entitled “influence of instructional materials on biology students’ performance in some high schools in the Mfoundi division” has been written by the researcher Muban Marcus (Matricule: 20v3109). This project is my endeavour, and all borrowed ideas have been acknowledged and referenced.

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CERTIFICATION

This is to certify that the Dissertation titled: **"The Influence of the use of Instructional Materials on Biology Students Performance in Some High Schools in the Mfoundi Division"** was carried out by **MUBAN Marcus** under my supervision and submitted to the University of Yaoundé 1 in fulfilment for the award of a Master's Degree in Curriculum Development and Evaluation.

Name: Pr. NDI Julius NSAMI

Signature: ……

Date: ……

DEDICATION

To my parents,

Mr Tita Benson Muban and Mrs Tita Esther Ambit

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I sincerely extend my profound gratitude to the following persons for their immeasurable efforts, encouragement and advice that have driven me to realise this project.

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LISTS OF ACRONYMS

ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
BAT	Biology Achievement Test
BATIM	Biology Achievement Test for Instructional Materials
CAI	Computer-Assisted guidance
CVI	Content Validity Index
Ha	Alternative Hypothesis
Ho	Null Hypothesis
IBM	International Business Machines
ICT	Information and Communication Technology
IM	Instructional Materials
RHO	Research Hypothesis
SPSS	Statistical Product and Service Solution
STM	Science, Technology and Mathematics
TLR	Teaching Learning Resource

ABSTRACT

Like other science subjects, biology is a practical-oriented discipline that seeks to develop a learner's scientific inquiry and problem-solving skills, which can be achieved with the help of instructional materials. This study aimed to assess the use of instructional materials on students' performance in biology in selected high schools in the Mfoundi Division. The aim of the study was further divided into four specific objectives as follows: to assess the use of realia on student's performance; to assess the use of graphic material on students; to evaluate the use of Mock-ups and models in teaching on student's performance; to assess the use of film projector in teaching on students' performance. This study was guided by two theories: Piaget's theory of cognitive development and Gagne theory of instruction. The research method used was a quantitative-cross-sectional survey. Simple random and stratified sampling techniques were used to select our sample population of 300 participants. Data were collected using questionnaires, and the data were analyzed using SPSS version 21 software. Use of instructional material (realia, graphic material, mock-ups and model and film projector) in teaching biology significantly affects students' performance. This indicated that instructional materials promoted students' participation in biology lessons. The results of the finding also affirmed that students' academic engagement had a significant influence on the students' performance in biology. And finally, the results of the findings established that instructional materials in biology had increased the students' lesson retention in biology and therefore contributed highly to students' performance in biology.

Key words: instructional materials, performance, accessibility, usability, engagement and retention.

RÉSUMÉ

Comme d'autres matières scientifiques, la biologie est une discipline axée sur la pratique qui cherche à développer chez les apprenants des compétences de recherche scientifique et de résolution de problèmes, qui peuvent être obtenues à l'aide de matériel didactique. Cette étude visait à évaluer l'utilisation du matériel didactique par les étudiants. performances en biologie dans des lycées sélectionnés du département du Mfoundi. Le but de l'étude a été divisé en quatre objectifs spécifiques comme suit ; évaluer l'utilisation de realia sur les performances des élèves ; évaluer l'utilisation de matériaux graphiques sur les performances des élèves ; pour évaluer l'utilisation de.Maquettes et modèles dans l'enseignement sur la performance des élèves ; évaluer l'utilisation du projecteur de film dans l'enseignement sur la performance des élèves. .cette étude a été guidée par deux théories : la théorie du développement cognitif de Piaget et la théorie de l'instruction de Gagné. La méthode de recherche utilisée était une enquête quantitative transversale. .Des techniques simples d'échantillonnage aléatoire et stratifié ont été utilisées pour sélectionner notre échantillon de population de 300 participants. Les données ont été recueillies à l'aide de questionnaires et les données ont été analysées à l'aide du logiciel SPPSS version 21. .l'utilisation de matériel didactique (realia, matériel graphique, maquettes et modèles et projecteur de film) dans l'enseignement de la biologie a un effet significatif sur les performances des élèves. .cela indiquait que le matériel didactique favorisait la participation des étudiants aux cours de biologie. Les résultats de la découverte affirmaient également que l'engagement scolaire des étudiants avait une influence significative sur les performances des étudiants en biologie. .et enfin, les résultats de la découverte ont établi que le matériel didactique en biologie avait augmenté la rétention des cours des étudiants en biologie et avait donc fortement contribué à la performance des étudiants en biologie.

Mots clés : matériel didactique, performance, accessibilité, convivialité, engagement et rétention

CHAPTER ONE: INTRODUCTION

Science remains a potent tool for the overall advancement of every nation. It holds the key to restructuring the past, understanding the present and projecting into the future of a nation (Shuaibu, 2017). Science is a great enterprise that nations depend on to advance technologically and economically. Gardner (2020) science, therefore, is receiving much emphasis in education because of its significance and relevance to life and society. As a branch of science and a prerequisite subject for many fields of learning, biology contributes immensely to the nation's technological growth (Ruban & Reis, 2006). Biology is a natural science focused on studying life and living organisms, their structures, functions, growths, evolutions, distribution in space and time etc. It is a field of science that, if effectively taught and learnt, will equip students with basic knowledge essential for all development forms.

Effective biology instruction will also contribute to improving agriculture, which is one of the strongholds of the nation's economy. Selected teaching methods in biology education should support learning biology, learning to do biological science and learning about biological science for instruction to have a long-lasting effect (Raheem, 2016). Jeronen, Palmberg and Yli-Panula (2017) maintain that several biological topics, such as ecology, cell theory, osmosis, metabolism and so on, require approaches promoting experimental problem-solving and process-based skills. It is therefore important to implement instructional methods which include both autonomous learning and instructional activities (such as independent study, critical thinking, and discovery learning), which enable the teacher to vary the level of openness of experimental tasks. Central to the achievement of this feat is the effective use of instructional materials. Comparably, biological field-based activities, for example, fieldwork and field trips (instructional materials), provide students with authentic and interactive experiences and experiential learning opportunities (Moses, 2020). These increase students´ interest, enhance their learning and improve their engagement in field-based activities and play an essential role in learning biological concepts, which include cells, taxonomy, tissues etc.

Instruction which refers to the act of imparting knowledge by giving procedures to be followed, is an inherent part of general and special education (Osamor & Odebisi, 2019a). Relatedly, biology instruction for high-achieving students is important because it will allow them to comprehend their environment's living and non-living components and beyond (Stephen & Isaac, 2013). They include

but are not restricted to charts, models, preserved specimens of plants and animals, microscopes, culturing equipment, diagrams, flow charts, quadrant, etc. It is also in line with the National Policy on Special Needs Education (2014) objectives, which recognized the strategic place high achieving learners occupy in terms of national economic and technological growth. One of the areas in which high-achieving learners have the potential to excel, according to Gardner (2020), is naturalistic intelligence – marked by an unusual and persistent interest in the study of nature. Therefore, there is no gain in saying that effective Biology instruction will improve the nation's economic and technological advancement.

Erickson (2005) notes that for science instruction to be effective, every student (including high-achieving students) must be given an opportunity to handle the materials of science and experience science personally. Instructional materials refer to any accumulation of animate and inanimate objects as well as human and non-human resources that a teacher may use in teaching and learning situations to facilitate desired learning objectives (Raheem, 2016). Instructional materials include cardboard paper, real objects, CD ROM, CD ROMs, charts, radio, DVDs, test tube holders, clinostat, reptile hooks, models, diagrams and pictures. They are assets used in instructional activities which promote active learning and assessment (Adelodun & Ashiru (2015). The term embraces all materials and physical means like a spatula, porter etc.; a teacher could be used to engender effective instruction to enhance students' achievement of educational objectives. Instructional materials are tools which assist teachers in making lessons explicit to learners because they are used to transmit information, ideas and notes to learners in clear-cut manners. They include materials such as a tripod stand, bunsen burner, plant press, DNA model, measuring cylinder, funnels, cylinders, etc.

Effiong and Igiri (2015a) opine that instructional materials are locally made tools (which include improvised materials like Mosquito net, wooden ring/iron, thread and needle) or imported tools (such as aspirator and clinostat) that help to facilitate the teaching/learning process. There is no gainsaying that instructional materials help to make the learning process easier, and it is highly recommended that teachers should use them for better instruction. It is evident that today's age is the age of science and technology, and the teaching and learning programmes have also been affected by it. Therefore, it is apt to suggest that using instructional materials can enhance learning achievement. Similarly, in the words of Adelodun and Ashiru (2015), while proposing the need for instructional materials in the instruction of high-achieving learners, they state that instructional materials can be described as educational inputs of utmost importance to the teaching of any subject in the school curriculum.

These materials play a very important role in the instruction process. They also enhance how well students can memorize (Effiong & Igiri, 2015a). Especially at this time, education based on oral teaching alone cannot be the key to successful pedagogy; therefore, teachers should use instructional materials to make the teaching-learning process interesting and long-lived.

In a study conducted by Abdu Raheem (2016) to determine the effects of instructional materials on secondary school students' academic achievement in social studies, instructional materials had a significant influence on the academic achievement of a secondary school student and were required to enable students to acquire better knowledge and skills. Furthermore, Osamor and Odebisi (2019a), in a study of the effect of instructional materials on the academic achievement of biology students in senior secondary, revealed that instructional materials utilized in the teaching and learning of Biology enable students to make more achievements, unlike situations where instructional material used is inadequate. Relatedly, Moses (2020), in his findings, revealed a significant relationship between the availability of instructional materials, accessibility of instructional materials, utilization of instructional materials and academic performance of students in Biology.

Background of the Study

The background of this study consists of the historical background, contextual background, conceptual background and the theoretical background.

Historical background

When the Journal of Biological Education was first published in 1967, biology was still the Cinderella of the three school sciences in many countries. Most selective secondary school biology courses readily betrayed their origins as an unconvincing coalition of botany and zoology. In England, entries for A-level zoology (8,091) and botany (4,740) in 1962 jointly exceeded those for biology (8,172). At the sixth form level, biology curricula were dominated by the needs of intending medical students, with an emphasis on the dissection of animal 'types', together with plant morphology and taxonomy, rudimentary physiology, biochemistry and histology. In the non-selective secondary modern schools, biological education was often limited to socially- or economically-directed courses such as Human Biology, Health Education, Physiology and Hygiene.

Traditionally, much biology was taught and assessed in ways that did little to promote students' curiosity. In addition, the subject was perceived as being descriptive, requiring little in the way of mathematics and lacking opportunities for laboratory-based experiments. However, change was already well underway by the time the Journal of Biological Education appeared. The two decades on either side of 1960 brought a worldwide interest in curriculum renewal that led to attempts at reform in both the developed and the developing world. In Anglophone Africa, the African Primary Science Project was one of three projects sponsored by the Education Development Centre.

Reforms was made on the biology curriculum. Although many of the reforms were initially directed at selective systems of secondary schooling or at the upper levels of high school education and, in many cases, were only partially successful, they were of seminal importance for much that was to follow in the field of biology education, especially for elementary or primary education and for the development of courses that sought to integrate or combine the three basic school sciences. The reforms also promoted an inquiry approach to teaching and encouraged the institutionalisation or expansion of biology education as a field of teaching and research within higher education. Today, many countries school systems are mainly or entirely non-selective and co-educational.

Contextual background

In Cameroon, biology is a component of a statutory national curriculum and botany and zoology are no longer subjects for examination at GCE or A-level. Biological topics form part of the education of all children from 5-16, and equal opportunities legislation ensures that curriculum discrimination between boys and girls is no longer permitted. School biology is now universally regarded as a subject that seeks to promote curiosity about the natural world, knowledge of the structure and function of living organisms, an understanding of genetics, evolution and the inter-relationships of living organisms, and an insight into the nature of scientific investigation including a critical approach to evidence. Students are also required to display a much wider range of competencies than hitherto.

In the Cameroon context, various high schools use instructional materials at their disposal. Thus, some schools will have more instructional materials than others, depending on the financial strength of each institution. Also, the utilization of these materials depends on the disposition and skills of the teacher to use these instructional materials. The use of instructional materials is encouraged by the government as stated in law No98/004 of the 14 April 1998 section 25, which says that the education

provided in schools shall consider scientific and technological advancement and shall be tailored in terms of content and method to national and international economic scientific, technology, social and cultural trends. The scheme of work for advanced-level Biology is designed in such a way that teaching should be done with the use of instructional materials.

Tambo 2012 recounts that learning materials are now available to some extent in Cameroon, some of which include television that can be used to teach spelling and pronunciation. Most schools in the Buea municipality has started using learning materials to ease understanding of students and to motivate them while other schools are still neglecting the use of these learning objectives to increase performance as a result when absent lead to failure of test and exams of students especially in subjects like Mathematics and Geography.

The survey done by Tateng 2007 on learning materials in Africa, he recounts that Cameroon is among the African countries in central Africa that are making progress in the use of these materials for example communication and information technology (ICT), these materials were introduced in the educational sector by Terry in 2001 which he says the best way for effective learning is to provide real object such as flashcards, radio, and computer with internet to support classroom teaching, also textbooks, photograph, chart is also used to facilitate learning.

Conceptual background

Instructional material: According to Akanbi (2018), instructional materials are aids "designed to enrich the teaching and learning processes and hence contribute to better learning. Adesola et al. (2022) defined instructional materials as any animate materials or inanimate objects as well as human and nonhuman resources that a teacher may use in teaching and learning situations to facilitate desired learning outcomes. Similarly, Mustapha et al. (2022) defined instructional materials as teaching and learning materials that are used by a teacher to assist in providing information for the attainment of required learning experience. Therefore, instructional materials are all the things or materials that may be used by a teacher as part of instructional process in order to deliver effective and successful teaching that can facilitate positive students' learning outcomes. Thus, they are all materials intentionally used by a teacher to impact students' learning during instruction. Instructional resources are materials that assist instructors in making the learning of concepts clear and understandable by students. They reduce oral teaching, increase learners' engagement, interest, and motivation toward learning sciences (Tuimur & Chemwei, 2015).

According to Olatunde-Aiyedun (2021, as cited in Ajemba et al., 2021), instructional materials include, modern textbooks, equipment, consumables like chemicals and reagents, models, charts etc. and the physical learning environments, which include the science classrooms and laboratories. Similarly, Adesola et al. (2022) gave examples of some instructional materials to include, cardboard paper, real objects, CD ROM, CD ROMs, charts, radio, DVDs, test tube holders, clinostat, reptile hook, models, diagrams, and pictures. Matazu (2022) identified prints, textbooks, magazines, newspapers, slides, photos, workbooks, and electronic media as examples of instructional resources. Instructional materials comprised locally made tools (such as improvised materials like mosquito net, wooden ring/iron, thread, and needle) or imported tools (e.g., aspirator and clinostat) that help to facilitate the teaching/learning process (Chukwunazo et al., 2022; Effiong & Igiri, 2015). They could also be print or non-print objects.

Academic performance: Academic performance is the measurement of student achievement across various academic subjects. Teachers and education officials typically measure achievement using classroom performance, graduation rates and results from standardized tests. Factors influencing high academic achievement include: attendance to lectures, early revision, prioritization of learning needs, deep learning, learning in small groups, mind mapping, learning in skills lab, learning with patients, learning from mistakes, time management, and family support. Academic performance is the outcome of students' effort in examinations. Students' academic performance is determined by a number of factors (Eze et al. 2016). Academic performance is measured by the average marks of the students.

According to Narad and Abdullah (2016) academic performance is the knowledge gained which is assessed by marks by a teacher and/or educational goals set by students and teachers to be achieved over a specific period of time. They added that these goals are measured by using continuous assessment or examinations results. Academic performance has been defined and explained by several authors. According to Narad and Abdullah (2016) academic performance is the knowledge gained which is assessed by marks by a teacher and/or educational goals set by students and teachers to be achieved over a specific period of time. They added that these goals are measured by using continuous assessment or examinations results.

Arhad, Zaidi and Mahmood (2015) also indicated that academic performance measures education outcome. They stressed that it shows and measures the extent to which an educational institution, teachers and students have achieved their educational goals. Similarly, Yusuf, Onifade and Bello (2016) opined that academic performance is a measurable and observable behaviour of a student within a specific period. He added that it consists of scores obtained by a student in an assessment such as class exercise, class test, mid-semester, mock examination, and end of semester examination. Again, Martha (2009) emphasized that academic performance of students is defined by a student's performance in an examination, tests, and in a course work. Willcox, (2011) define academic performance as the level of knowledge shown in an area or subject compared to the norm, and it is generally measured using the grade point average.

Biology: Biology as one of the science subjects is the study of living things which include plants and animals. It is a fascinating study that ranges from microscopic-cellular molecules to the biosphere, encompassing the earth's surface and its living organisms (Sarigin, 2010). Biology is a core subject that is mandatory in all secondary schools in cameroon as it is a pre-requisite to the study of many courses relevant to sciences which include the following; Medicine, Pharmacy, Biochemistry, Agriculture, Anatomy, Physiology, Botany, Zoology, Micro-biology, Cell Biology, Ecology, Entomology, Immunology, Molecular biology, Evolutionary, Genetics and population dynamic among others (Baike 2000).

Biology is an important subject in science where several topics in biology such as ecology, cell theory, metabolism, osmosis, and so on, require approaches promoting experimental problem-solving and process-based skills (Jeronen et al., 2017). According to Ogbuze and Okoli (2020), nearly all science and arts students choose biology as they enroll for senior secondary class. Reason being that biology serves as a prerequisite subject for many fields of study (Adesola et al., 2022) and professions such as medicine, nursing, pharmacy, microbiology, biomedical technology, biochemistry, and other related disciplines. Thus, it contributes immensely to the national development. Also, Matazu (2022) stressed that biology is a very important subject for technological development. The subject is fundamental for individual well-being, development of good living environment and acquisition of functional scientific attitudes.

Theoretical background

This study adopted two theories Jean Piaget's theory of cognitive development and Gagne's theory of instruction (Gagne's nine events of instruction).

Jean Piaget's theory of cognitive development

Jean Piaget (1896-1980), a Swiss psychologist, is best known for his pioneering work on the development of intelligence in children. His studies have had a major impact on the fields of psychology and education. In his work Piaget identified the child's four stages of mental growth. In the Sensorimotor Stage, occurring from birth to age 2, the child is concerned with gaining motor control and learning about physical objects. In the Preoperational Stage, from ages 2 to 7, the child is preoccupied with verbal skills. At this point the child can name objects and reason intuitively. In the Concrete Operational Stage, from ages 7 to 11, the child begins to deal with abstract concepts such as numbers and relationships. Finally, in the Formal Operational Stage, ages from adolescence to adulthood, the child begins to reason logically and systematically. This research make use of the fourth stage of piaget's theory of cognitive development which is the formal operational stage.

At this stage, individuals perform concrete operations on things and they perform formal operations on ideas. Formal logical thinking is totally free from perceptual and physical barriers. At this stage, adolescents can understand abstract concepts. They are able to follow any specific kind of argument without thinking about any particular examples. Adolescents are capable of dealing with hypothetical problems with several possible outcomes. This stage allows the emergence of scientific reasoning, formulating hypotheses and abstract theories as and whenever needed (Miller, 2011).

From his observation of children, Piaget understood that children were creating ideas. They were not limited to receiving knowledge from parents or teachers; they actively constructed their own knowledge. Piaget's work provides the foundation on which constructionist theories are based. Constructionists believe that knowledge is constructed and learning occurs when children create products or artifacts. They assert that learners are more likely to be engaged in learning when these artifacts are personally relevant and meaningful (Constructivism, n.d.).

Educational Implications An important implication of Piaget's theory is adaptation of instruction to the learner's developmental level. The content of instruction needs to be consistent with the developmental level of the learner. The teacher's role is to facilitate learning by providing a variety

of experiences. "Discovery Learning" provides opportunities for learners to explore and experiment, thereby encouraging new understandings (Kafia & Resnick, 1996). Opportunities that allow students of differing cognitive levels to work together often encourage less mature students to advance to a more mature understanding.

Gagne's theory of instruction (Gagne's nine events of instruction)

Educational psychologist Robert Gagne developed positions that evolved into a theory that is based not only on the standards of behaviorists but also on cognitive theories and the theory of information processing (Domou & Kameas, 2016). His mode of instruction consists of a taxonomy of learning outcomes, conditions of learning, and nine events of instruction (Ullah et al. 2015). These nine events follow a design process that reflects a variety of learning situations, which is why this model is among the most used ones in the development of elearning products (Gutierrez, 2018).

Gagné posited that not all learning is equal and each distinct learning domain should be presented and assessed differently. Therefore, as an instructional designer one of the first tasks is to determine which learning domain applies to the content. Essential to Gagne's ideas of instruction are what he calls "conditions of learning": internal conditions deal with what the learner knows prior to the instruction, external conditions deal with the stimuli that are presented to the learner, e.g. instructions provided by the teacher. The first step in Gagne's theory is specifying the kind of outcomes to be achieved. He categorised these outcomes into five types: verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills. The second step is to organize appropriate instructional events. Gagne's "Events of Instruction".

Problem statement

Developing students' interest in science and technology is one of the objectives of science education. With global scientific and technological advancement occurring rapidly, declining students' achievement in science subjects is a worldwide concern that has led to science education reform efforts on an international scale (Ozcan & Genc, 2016; Torres & Vasconcelos, 2017). Much has been said about secondary school students' poor performance in science, generally and biology in particular. Okoye and Okeke (2007) noted that performance in biology has been declining over the years. However, in spite of the relevance of biology, the manner of teaching and learning of the subject as well as the students' academic performance have become sources of concern for all stakeholders (Ajemba et al., 2021; Ezeh et al., 2021; Matazu, 2022; Umar et al., 2020). The records

of students' academic achievements in biology in both internal and external examinations have remained abysmal over the years (Umar et al., 2020). Thus, by implication, quite a number of students have been failing to meet the minimum requirement to further their studies in disciplines that required credit in biology. Many studies have attributed the poor achievement of students in biology to many factors such as lack of effective teachers, large class size, poor teaching methods, and lack of basic laboratory facilities among others.

Today's society depends on the development of science and technology (Uzunboylu & Tugun, 2016). Teachers are expected to devise ways to improve interest and achievement in science and science-related disciplines. No nation can afford to neglect science education at any level of education and hope to thrive in any field of human endeavour. Science education is vital for useful living in any society. It is at the Centre of producing resources necessary for socio-economic, scientific and technological development needed for the advancement of any nation. Olatoye (2002) believed that science education lays the foundation for work in science-related fields by giving the students necessary information about certain knowledge, skills, and attitude. In spite of the desire for technological development, coupled with the fact that Biology is a very vital subject for technological development and as such, its teaching and learning as well as students' academic performance have become a source of concerns to all stakeholders. This study is therefore undertaken to investigate the influence of instructional materials on students' academic achievement in Biology in secondary schools in Mfoundi Division. Therefore, this study investigates the extent to which teaching using Realia, Graphic Material, Mock-ups and models, and Film Projector affects secondary school students' achievement in Biology.

Purpose of the study

The purpose of this study is to assess the influence of the use of instructional materials on students' academic performance in Biology in high schools in Mfoundi Division.

Specific objectives

Specifically, this study seeks to:

- Examine the effects of using Realia on high school students' academic achievement in Biology.
- Explore the effects of using Graphic Material on high school students' academic achievement in Biology.

- Investigate the effects of using Mock-ups and models on high school students' academic achievement in Biology.
- Examine the effects of using Film Projector on high school students' academic achievement in Biology.

Research questions.

- What are the effects of using Realia on secondary school students' academic achievement in Biology?
- To what extend does the use of Graphic Material affects secondary school students' academic achievement in Biology?
- What are the effects of using Mock-ups and models on secondary school students' academic achievement in Biology?
- To what extend does the use of Film Projector affects on secondary school students' academic achievement in Biology?

Research Hypothesis

The following hypothesis were tested at p=.05

H_{a1}: The use of Realia in teaching statistically significantly affects secondary school student's academic achievement in Biology.

H_{O1}: The use of Realia in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

H_{a2}: The use of Graphic Material in teaching has a statistically significant effect on secondary school student's academic achievement in Biology.

H_{O2}: The use of Graphic Material in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

H_{a3}: The use of Mock-ups and models in teaching has a statistically significant effects on secondary school student's academic achievement in Biology.

H_{O3}: The use of Mock-ups and models in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

H_{a4}: The use of Film Projector in teaching has a statistically significant effects on secondary school student's academic achievement in Biology.

H_{O4}: The use of Film Projectors in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

Scope of Study

This research was carried out in Mfoundi Division in the Centre Region of Cameroon. This division is made up of 7 subdivisions namely Yaounde 1, 2, 3,4,5,6 and 7. The target population of this study are the high school students. This study focuses on instructional materials use in the teaching of biology and how these instructional materials affect students' academic performance. This study is delimited to upper sixth students in the selected schools in Mfoundi Division.

Significance of the study

Since it is the role of the Ministry of Secondary Education (MINESEC) to provide instructional resources to all public secondary and secondary schools in Cameroon, it is hoped that, the findings of this study will be useful. The findings of this study may be useful in improving on the policies that govern the allocation and disbursement of funds in secondary schools. Policies may be reviewed at different levels in the education sector, to increase on the allocation of funds. This may lead to increased supply of instructional materials to public schools thus improving acquisition of biology concepts.

This study will provide learners with systematic and scientific basis for worthwhile functional and productive learning experience and activities naturally leading from abstract to concrete ideas. It will help the leaners to have access and make use of the learning materials available to them.

The findings of this study might also be of benefit to the, guardians and donors. They could willingly be involved in provision of instructional materials. This would form a strong educational bond between students, teachers and their/guardians when the students see their participation in ensuring acquisition of biology skills.

In addition, the study might also help in upgrading the policies governing biology instruction. It may help teachers and school heads to put more emphasis on the use of biology instructional material during instruction of biology. This would help in attaining set biology objectives, increase students' involvement in biology activities, thus improving performance and development of positive attitude towards this discipline. The study will be of immense benefits to the government, ministry of

education, and the educational policy makers and administrators as it will emphasize the important of instructional materials in lesson delivery.

Furthermore, it is anticipated that data collected from this study would add more information and knowledge to the existing literature about biology instructional material. Researchers and other educationists can benefit from this data and add to what the researcher would have started. Researchers can as well identify gaps in this study which they would like to fill.

Definition of terms

Realia: According to Eshiet (2009), realia are real objects use in the learning units as teaching facilities, such as real specimens of plants or animals and real machines or tools as they are known to exist or used in life situations.

Graphic Material: Graphic materials are materials used for instruction characterized by their vivid nature, can be clearly described and are able to effectively present message in which it is designed for. According to Achuonye (2004), graphic materials are arts by which we express ideas in lines, pictures, sketches, and diagrams; it includes materials which inculcate facts and ideas clearly and succinctly through a combination of drawing, words and pictures.

Mock-ups and Models: Models are scaled representation of real materials such as skeletal objects, or objects use in fascinating learning and retention of concepts learnt (Gbamanja, 2008).

Film Projector: Film Projector and Video Player Projector, are utilized to project motion pictures. Black-and-white and colour educational films available. There are also motion pictures that are both sound and silence. The availability of videotape has expanded the options for the use of motion pictures, as they can now be seen on a monitor or projected onto a screen using a video projector or a digital projector for group viewing.

CHAPTER II: LITERATURE REVIEW

This chapter presents the relevant literature for this study. Its present the conceptual framework, review of literature by research objectives, theoretical framework and empirical studies relating to the research.

Conceptual framework

Biology is a branch of science that deals with the study of living organisms and the interdependent relationship between living organisms and their immediate environments. Sarigin (2010) on the other hand sees Biology as a fascinating study that ranges from microscopic cellular molecules to the biosphere, encompassing the earth surface and its biotic components. Biology is broad in scope and can be broken down into several specialized subbranches like Anatomy, Cell Biology, Genetics, Physiology, Ecology, Evolution just to mention a few. This is one of the reasons why Biology is introduced to students at senior secondary school level of Nigerian educational system as a preparatory ground for human development, where career abilities are groomed, potentials and talents are discovered and energized (FRN, 2009). This is because Biology is a prerequisite subject for the study of some professional courses such as medicine, pharmacy, veterinary medicine, agriculture, and many others. Hence, biology is a very important subject for national development.

Teaching biology as science requires not only theoretical but also practical skills through the use of instructional resources. With them, hands-on and critical thinking skills are developed in students. Their use in teaching build-up professional skills in them (Sonmez & Hakverdi-Can, 2012). Instructional resources innovatively support teachers to interchange the pedagogical model when teaching, and this ensures the production of professionally experienced teachers (Sasson et al., 2020). Besides, Instructional resources enable teachers to create methods of assessing students' performance (Arop et al., 2015). Therefore, as a biology teachers is a valuable fact as they create in them not only practical but also assessment skills. The use of Instructional resources in teaching allows teachers to specify class activities, thus ease the assessment of students' conceptual understanding as noted by Mukuka et al. (2020), who agreed that through class exercises, students' conceptual understanding is assessed. The types of instructional resources used in biology instructional methods are those instructive materials that aids instructors in effectively delivering biology lessons. They include print and non-print materials that aid instructors in involving students in the classroom activities.

Instructional Material

According to Akanbi (2018), instructional materials are aids "designed to enrich the teaching and learning processes and hence contribute to better learning". Adesola et al. (2022) defined instructional materials as any animate materials or inanimate objects as well as human and non-human resources that a teacher may use in teaching and learning situations to facilitate desired learning outcomes. Similarly, Mustapha et al. (2022) defined instructional materials as teaching and learning materials that are used by a teacher to assist in providing information for the attainment of required learning experience. Instructional materials are materials which assist teachers to make their lessons explicit to learners. They are used to transmit information, ideas and notes to learners (Ijaduala 2020). Usman and Adewumi (2016) state that instructional materials can be referred to as the widely variety of equipment and materials used for teaching/learning by teachers to stimulate self-activity on the part of the pupils. According to Faize and Dahan (2011) instructional materials are print and non-print items that are designed to impact information to students in the educational process. Instructional materials include items such as prints, textbooks, magazines, newspapers, slides, pictures, workbooks, electronic media, among others.

According to Nolan (2022), instructional materials are learning aids that employ both sight and sound to impart meanings to students and enhance their educational experience. According to Abdullahhi (2010), instructional materials are tools locally made or imported that help to facilitate the teaching/learning process. Obanga (2005) view them as materials things which are used to composed ported that could make tremendous enhancement of intellectual use impact the instructional materials. Instructional materials are those channels of communication which promote the effectiveness of instruction and help the teacher to communicate ideas effectively to student (Ali, 2012). Instructional materials include all the substantial resources that a teacher can use to implement instruction which facilitates students' achievement. It should be noted that it is not all lessons or topics that can be effectively taught without the use of instructional material (Olumorin,Yusuf, Ajidagba & Jekayinfa, 20 10). According to Awolaju (2015), instructional materials play a key role in concretizing learning of science in general. Instructional materials make learning meaningful and help to improve students' level of comprehension of the abstract or difficult concepts. According to Umoru (2016). instructional material enhances, facilitate, and make teaching and learning lively and concrete.

Instructional materials are tools, instruments and resources used in educational lessons to facilitate the achievement of stated objective. Instructional materials are tools locally made or imported that help to facilitate the teaching-learning process (Abdullahi 2010). According to Obanya (2001), instructional materials are didactic materials things which are supposed to make learning and teaching possible. In support of these views, Agina-obu (2005), described instructional materials as concrete or physical objects which provide sound, visual or both to the sense organs during teaching.

Instructional materials are materials that assist in deeping students. Egunjobi (2009) conceptualized instructional material as aids which make it easier for the teacher to impart knowledge and skills to the learners. The researcher stressed that teaching materials and facilities save time, make learning more effective and promote interest for both teacher and the learners. (Ricardo, 2008) viewed instructional materials as tools used to supplement the written or spoken word in the transmission of knowledge, attitude and idea and to emphasize, clarify or vitalize the instruction. Silver (2010) asserted that instructional material is written and pushed text books and related core materials (including those specific material which is used by the teacher for classroom instruction) needed by a state or local education authority or agency, for use in primary and post primary schools instruction including specifically requested teachers' editions of such materials. He further lamented that teaching aids or instructional materials consist of carefully planned and selected resources to facilitate teaching leaning process, instructional materials are all the object, things, peoples used to promote the teaching learning of biology.

Okoye and Olu (2008) opined that, instructional materials are all the tools that can be used by the teacher to provide help and encouragement to learners and learning activities. 12 Such materials bring together man and materials in systematic co-operation to effectively solve educational problems. Adesanya (2011) viewed realia like text books, chalkboard, models, comics chart, and other non-projected tools which brings about efficacy and efficiency in the teaching and learning process and invariably, promotes and enhance the achievement of instructional objectives. While, Abdullahi (2012) referred to instructional materials to mean all those resources used to supplement the normal learning process of seeing, reading and writing.

Therefore, instructional materials are all the things or materials that may be used by a teacher as part of instructional process in order to deliver effective and successful teaching that can facilitate

positive students' learning outcomes. Thus, they are all materials intentionally used by a teacher to impact students' learning during instruction.

Classification of Instructional Materials

Instructional materials for teaching are classified differently by scholars. Shuaibu (2011) lamented that, instructional materials are being classified into three major categories namely: visual materials; audio materials; and audio-visual materials

Visual Materials; Visual materials involve the use of visual perception in the development of skills and understanding which include: Three dimensional material objects, models and specimens, Three dimensional material objects, models and specimen, Three dimensional material objects, models and specimens, Printed materials textbooks, workbooks, journals, newspapers, magazines, newsletters, Boards, chalkboard, bulletin boards, flannel or flat boards, Still pictures: non-projected (photograph illustrations) and Graphics: charts, graphs, maps, globes, posters, diagrams

Audio Materials: Audio materials convey messages through sound productions which include the following, Radio, record player and tape recorder. Audio

Visual Materials: e.g. motion pictures, television, computer, video tape/cassette, AVD/MP3/CD Players etc.

The instructional materials (teaching aids) are classified into graphic materials, still pictures, motion pictures, audio materials, three dimensional materials, computer aided and computer managed instructions (Dike, 2008) Instructional materials can further be classified as follows, print and non-print, visual, audio and audio visual

Instructional material uses in teaching biology

There are many different types of instructional materials available these days, we have Visual aids, Audio aids and Audio-visual aids. Visual aids are the ones that appeal to the sense of vision. Example are pictures, photos, models and charts. Audio aids involve the sense of hearing example of such aids are: radio, tape recorders, audio files and mp3 (Bosibori et al.,2015).

Ong' amo et al. (2017) attested that there are different instructional resources in the schools' environments for teaching biology. Moreover, those are present in diverse varieties that Science teachers can readily use. Effiong et al. (2015) found them to be materials that include chalkboards, diagrams, models, digitals tools, written texts, pictures, and recording videos, among others. Belachew (2020) classified texts in two versions that can be used in science education like traditional texts that are universally used as textbooks, standard references, and conceptual change texts. Okpechi and Denwigwe (2017), in their study, listed several biology instructional resources that, among others, include different types of projectors like "film loop projector, slide projector, micro projector, overhead projector, and opaque projector.

Musah and Umar (2017) classified instructional resources used in biology instructional methods in different categories like material resources, human resources, and physical resources. Arop et al. (2015) categorized types of resources used in biology instructional methods into three main types: Visual, audio, and audiovisual resources. Iji et al. (2014) attested that instructional materials could be made from industries, or by teachers, or students made from locally available materials through the concept of materials improvisation.

Categories of instructional materials used in teaching biology

Instructional materials in Biology teaching can be functional by complementing each other. They can be categorized as visual equipment, aural equipment and both visual and aural equipment. A categorization according to primary groups can be as follows: Written materials: They are the most used materials used in educational environments.

Written materials are easy to be accessed and carried (Course textbooks, supplementary books, magazines, newspapers, guides, brochures, teacher handbooks etc.).

Pictures and graphs: They are the most widely teaching materials used in making the verbal messages meaningful and concrete for students (maps, globes, film strips, slides, teaching boards and graphs).

Realia and models: These are the use of real objects and models for teaching purposes (Bringing different species of plants into the classroom or inviting an expert on a specific subject to class, body and organ models, cross-section of a leaf etc.).

Visual and aural devices: radio, voice tapes, CD, computer, VCR, smart board, tablet and telephones are among these materials.

Projectors: OHP, slide projector, tablets, smart boards Television programs and videos: They are the materials through which the events and objects from real life are brought into classroom environment in the most realistic way.

Computer software and internet: They are the materials which provide the highest communication with students. They are very effective in drawing the attention of students, presenting information, having students do exercises and repetitions, providing feedback and assessing students' performance. Visual and audio features can be used in combination (sound, picture, motion pictures, and animations). Today internet is full of materials for using in science teaching. If it is chosen well, they can really be useful on students' learning.

Other equipment: Writing board, revolving boards, individual learning sets, CDs, package software, collections can be counted in this category. Smart Boards and Smart Phones must be mentioned among today's equipment.

Principles of instructional materials preparation in teaching biology

In addition to all examples, teachers who can use the available equipment and materials choosing the necessary ones consciously should have the skills to prepare and develop materials suitable for the situation and the students when necessary. However, this process should not be handled haphazardly. Some basic principles should be observed. These principles can be listed as:

- Instructional materials should be simple, plain and comprehensible.
- Instructional materials should be chosen and prepared in accordance with the learning outcomes of the lesson.
- Instructional materials should include important and brief information rather than all the information related to the subject of the lesson.
- Visuals to be included in Instructional materials (picture, graph, color etc.) should be used to emphasize the important points of the material, and overuse should be avoided.

- The written texts and visual-audio elements used in Instructional materials should fit the pedagogical features of the students and be consistent with the students' real lives.
- Instructional materials should give students opportunity to do exercise and practice.
- Instructional materials should reflect the real life as much as possible.
- Instructional materials should be appropriate for the access and use of each student.
- Instructional materials should be simple for students to use, not for teachers to use easily.
- Instructional materials to be used again over time should be durable and they should not be damaged by being used only once.
- Instructional materials prepared should be flexible enough to be improved and updated easily (Şahin & Yıldırım, 1999).

Important of instructional material in the teaching of biology

The use of biology instructional resources has diverse importance not only for biology teachers' education but also for all kinds of students, and their use becomes fruitful, especially when students manipulate the used materials. For instance, Adebule and Ayoola (2016) affirmed that instructional resources use in teaching raises students' level of discovery and stimulates students to learn more as they see what they are taught.

Johnson and Cotterman (2015) found that the use of video clubs increased the students understanding of their science subject content. Technology related instructional resources are more imperative for training pre-service science teachers, as they afford the required technology skill essential for a qualified teacher of this digitalized world (Oren, 2017).

Arokoyu and Chimuanya (2017) attested that the teaching process becomes less stressful for both teachers and students when instructional materials are used. Therefore, identifying available instructional materials at schools, especially at higher learning institutions, is of imperative need as learning by hands-on and observation of instructional resources raise students' level of memory and enhance learning achievement.

Olayinka (2016) confirmed that there is an excellent achievement for students taught with instructional resources comparing to those educated without any teaching material. The difference

is because instructional materials ease the communication between teachers and students and promote active teaching and learning, thus facilitate understanding of concepts that become complex by words only.

The use of instructional materials can enhance the learning achievement of students (Cronbach, 2009). The used of instructional material can appeal to the individual attention by creating interest that will help the learner achieve direct effort. Teacher problem of motivation is essentially of the arranging situation with instructional materials in which the learner will goals he or she wanted attain. Brown (2015) summarized the role of instructional materials as follows. It promotes meaningful communication and effective learning. They ensure better retention by making the inaccessible accessible, they provide a common experience upon which late learning can be improved. They stimulate and motivate student to learn.

Use of equipment in Biology education is very effective in students' gaining cognitive, affective and psychomotor behaviors. Particularly during laboratory works, affective and psychomotor gains come to the fore. It has been stated that the exotic atmosphere of the laboratory, the smell od acids and bases in the environment, the presence of some experimental tools, or animal and plant samples in some laboratories can motivate students and stimulate their creativity and discovery skills (Bahar, 2003). However, as building an exotic laboratory is costly, it needs effective experience.

Teachers use different instructional materials to motivate learners to learn more effectively. Cronbac (2015), opined that the use of instructional materials during teaching and learning process can appeal to the individual's attention among students by creating interest in order to attain the goal for the learner. He also noted that the use of instructional materials can facilitate the decision of a person towards learning by taking the right actions. Learning is facilitated when learners make use of their sense organs for seeing, hearing, and touching. (Morenfolia, 2013) pointed out that instructional materials are normally chosen to meet the teaching requirements of an approved curriculum.

Carpenter and Olson (2012) in his research report stated that instructional materials enhance teaching learning processes and that it improves the students' cognitive achievement. Nwike and Catherine (2013) stated that students learn and perform better when they are taught with instructional materials because using instructional materials gives the students the chance to view, feel, listen and touch the material during teaching, which help to arouse the students' attention and interest on the process of

teaching and learning. The cognitive domain of learning should develop knowledge and intellectual skills. It also includes the recognition of specific facts and concepts that help to develop abilities and skills of the learners (Bulduk, 2016; Umutlu, 2017). Therefore, the importance of teaching using charts, videos and real specimens in teaching and learning of mammalian skeletal system concepts in secondary schools cannot be over

Adeyeni (2010) stated that visual instructional materials include all materials, a teacher could use during the lesson to aid learning and retention. He further stated that in order to meet individual difference in the classroom; the teacher must employ various types of instructional materials that appeal to different senses. Adesanya (2011) affirmed that visual instructional materials like text books, rock type, television, radio and other projected and non-projected tools can brings about effectiveness and efficiency in the teaching and learning process and invariably, promotes and enhance the achievement of instructional objectives.

Also, most educators generally and equally agree that the creative use of variety of instructional materials will increase the probability that student would learn more, return better and bring about the skills they are expected to perform (Adewoyin,2011). Apart from their ability to process meaningful sources of information, instructional materials help the teacher with the means of extending his horizon of experience as well as providing the teacher with rich sources of procuring communicative materials which could be produced jointly by the teacher and the students (Osalusi, 2012).

Furthermore, several researches have been conducted to test the value of instructional materials and other sensory devices. These researches here proved that instructional materials when properly used in teaching learning situations can accomplish a lot of complex tasks (Lowenstein, 2012). The instructional materials also offer real experiences in giving the teacher basis for thinking and understanding. They supply concrete basis for conceptual thinking and therefore reduce meaningless responses of students (Ismail & Aleem, 2013). At the same time, they overcome the limitations of time, space and size by helping the students to understand things that are too small or too big, or too slow or too fast (Adeniyi, 2011).

Students' academic performance

There is no consensus among educators about the best way to measure students' academic performance, which they consider as one of the most challenging tasks (Chiekem, 2015). The complexity of the challenge is that various approaches can be used to determine learning outcomes, including academic performance (Carini et al., 2006; Lamas, 2015). For instance, while some studies associate student academic performance with examination or assessment outcomes (Odeh et al., 2015), others relate it to success in completing planned learning goals (Bossaert et al., 2011). Some researchers have alluded academic performance to assessment indicators like learning aptitude, academic success achieved through mental abilities, and function of intelligence (Brown et al., 1989; Peng & Kievit, 2020; Yahaya et al., 2012). Other literature refers to student academic performance as grade point average (GPA) of students' scores achieved in a course or feedback on mastery of content in a subject (Ahmad, 2014; Allen, 2005; Mushtaq & Khan, 2012). The diversities in assessment approaches of students' academic performance have exemplified challenges that confront educators in measuring academic performance.

According to (Khan, Ullah, 2021; Ullah, 2020), the performance is the outward demo of thoughtful notions, services, thoughts, and information of an individual that grades signify the achievement score of students. According to Kobal and Musek (2001), academic performance represents the arithmetical scores of students' knowledge and the degree that he gains in schoolwork and the educational system. The achievement score of students may be achieved efficiently if all the factors affect students' educational presentation. Achievement outcome has been considered as a function of two characteristics, "skill" and "will "and these must be considered "and these must be considered individually because keeping the will alone may not assure success if the skill is lacking.

In all educational systems, performance is considered one of the significant factors of students' learning. Cai and Cao (2019) assert that academic performance is not only about students' performance in school, but should also include all aspects of their knowledge, competence and literacy development. Academic performance in a narrow sense refers to the measured performance of students through examinations at a certain study stage. In empirical studies of academic performance, a considerable number of researchers adopt such definitions of academic performance, especially in empirical studies of primary and secondary school students, researchers often define academic performance as students' examination results, for example, Bao (2008), Ye (2013), Chen

(2015), Li (2016), Li and Chai (2018) all define academic performance as a definition of a learner's the performance of teaching and learning assessments, such as final examination results, achieved by the person in school.

Wang (2021) believed that academic performance can be equated with academic achievement. In a study of personality traits and academic achievement of secondary school students, Zhao and Guo (2012) measured academic achievement using students' midterm and final grades in language, mathematics, and foreign language subjects. Through an empirical study, Tang (2016) found that preschool education can improve students' future academic achievement (in the case of mathematical literacy) and can also promote educational equity. Minkowski (2015) believes that academic performance contains values, analytical problem solving and social skills, among others, and Bowie (2015) believes that academic performance value added is divided into three dimensions: core competencies, citizenship, and professionalism possessed.

Use of instructional material and student's academic performance

The use of instructional materials is crucial in the teaching and learning of biology. Matazu (2021, as cited in Matazu, 2022) posited that meaningful teaching and learning can only be attained when there is appropriate and efficient availability and utilization of both human and material resources. More so, Ajemba et al. (2021) stated that the quality of knowledge a student receives largely depends on the quality of teaching/learning resources available, because students learn fast when instructional materials are applied in the implementation of the teaching.

According to Matazu (2022) there is a strong connection between use of instructional materials and students' performance in biology. Munnir and Musa (2020) also reported a similar result for physics. Ahmed et al. (2012) contend that secondary school students performed poorly in biology because instructional materials are not adequately use and sometimes might be available but are not adequately use. Nuhu et al. (2021) lamented that mastery of biology concepts might not be fully achieved without the use of instructional materials. Relevant and appropriate instructional materials help to arouse and sustain interest and help to concretize ideas and stimulate the imaginations of the students, thus enhances achievement of students in a subject (Mustapha et al., 2022).

For effective teaching of science subjects, the use of instructional materials to enrich instruction is very vital (Chukwunazo et al., 2022). According to Matazu (2022), instructional materials played an essential part in the teaching-learning processes among which are, as follows:

- Improving students' memory levels.
- To make the teaching-learning process easier.
- To increase the rate of assimilation of students.
- Serve as instruments for teachers to utilize in correcting incorrect impressions and illustrating ideas that students cannot easily forget.
- Assist in giving the body of knowledge under debate a sense of actuality.
- It personalizes teaching and stimulates teachers' inventiveness.
- Allow students and teachers to participate in concrete learning activities that develop the concept of self- evaluation.

For a science teaching to be effectively delivered, every student must be given an opportunity to handle the materials of science and experience science individually. Hence, it is practically impossible to teach science without instructional materials. This is because they constitute an important component in the teaching and learning environment (Ajemba et al., 2021; Matazu, 2022; Sodangi et al., 2022). They can be regarded as the vehicle that carry messages or information from a transmitting source (teacher) to the receiver (learner). Instructional materials are needed in teaching and learning of biology for students to acquire scientific process skills such as observing, measuring, classifying recording experimenting, analyzing inferring, etc.

Salaudin et al. (2020) expressed that secondary biology students cannot fully understand most of the concepts of biology when taught without instructional materials. As a subject of life and living things, biology must be taught practically and not only theoretically for it to be meaningful, understood and appreciated by students. Biology teachers should therefore expect to lay emphasis on the understanding of biology and not on collection of information or memorization. Similarly, Ajemba et al. (2021) stated that the quality of education a student receives largely depends on the quality of teaching/learning resources provided, thus, students learn fast when instructional materials are applied in the implementation of the teaching. Therefore, "teachers, who are to implement the curriculum, are expected to use a wide range and quality instructional materials for effective and efficient teaching and learning in the classroom activities" (Matazu, 2022).

Review of literature by research objective

Used of realia in the teaching and student's performance

The word realia", sounds a little bit too scientific, it means, using real items found in the world around us to help teach students. In education, realia are objects from real life used in classroom instruction by educators to improve students' understanding of other cultures and real-life situations. A teacher employs realia to strengthen students' associations between words for everyday objects and the objects themselves. In many cases, these objects are part of an instructional kit which includes a manual and is thus considered as being part of a documentary whole by librarians. Harmer, (2006) posited that realia are also used to connect learners with the key focal point of a lesson by allowing tactile and multidimensional connection between learned material and the object of the lesson. They are best utilized for simple objects lending themselves to classroom settings and ease of control with minimum risk of accident throughout the student object interaction.

Realia can be seen as materials or teaching aids which is used to illustrate the teaching-learning process and make instruction more comprehensive to the learner. According to Enohulean, (2015) professionally qualified science teacher no matter how well trained would not be able to put his ideas into practice if the school settings lacks the equipment and materials to translate potentials into reality. Wugep and Angbo (2010), review that Realia resources include both human activities and materials. Without human resources, teaching and learning of practical skills in biology will not take place effectively, on the other hand, human resources will not alone communicate learning.

Realia, one of the real objects, are among the educational inputs that play a vital role in the teaching and learning processes. Ricardo (2008) viewed realia as tools used to supplement the written or spoken word in the transmission of knowledge, attitude and idea and to emphasize or clarify, the instruction. Okoye and olu (2008) opined that realia are one of the tools that can be used by the teacher to provide help and encouragement to learners and learning activities. Such materials bring together man and materials in systematic cooperation to effectively solve educational problems.

According to Ibe-Bassey (2005), Utim and and Ikot (2008), the use of realia materials is an important tool in teaching of biology. They also noted that, learning is facilitated when the learners make use of at least three of the sense organs which include seeing, hearing and as well as touching. Realia materials are developed or acquired to assist or facilitate teachers in transmitting organized knowledge, skills and attitude to the learners with an instructional situation (Nwachukwu, 2006).

Teachers often make use of textbooks, charts, models, graphics, realia as well as improvised materials (Awotua Efebo, 2001). The success in the skill and knowledge acquisition in an instructional material adequacy and effective utilization of the available material (Olaitan and Augusiobo 2004).

Selection and use of Realia that related to the basic contents of a course or a lesson, helps in-depth understanding of such a lesson by the students in that they make the lesson attractive to students and arrest their attention and thus, motivate them to learn effectively. Savoury (2009) maintain that using realia in class interaction will limit an imagination and stimulates the mind which will interned encourage creativity by involving the sense. Realia saves time as recognition of objects is immediate and so cuts out the need for lengthily explanations and drawing funny picture on the board.

Udoh (2009) agreed that using Realia in schools by teacher makes learning to become real, he also added that the utilization of realia during the teaching and learning of biology encourage practical education and discourage rote learning. Real objects make education to be more equal and practical to all learners.

According to Sunday, (2007) Realia are objects from natural source which help in the teaching and learning of Biology. It is very relevant in learning of science subject like biology, because the use of relia makes students to have interest in the learning of biology. Realia eliminate distortion in students' knowledge on the topics being taught. He identifies the relevant of realia in the teaching and learning of Biology to include:

Use of Graphic material in the teaching and student's performance

Graphic materials represent charts, graphic, posters and diagrams, cartoons, comics, maps and globes graphic materials help students to visualize what is thought verbally. Graphic materials belong to the two- dimensional material and proportional relationships that may exist among variables in a phenomenon. Graphic materials are used to compress information, to focus and captivate attention, to vary stimuli presented and as an aid to recall. Graphic materials when properly produced can help in attaining all processes in the information processing model of learning.

According to Jurich (2001), the use of graphic materials such as pictures in teaching provides individual students with a tool to connect new words to a known meaning. This facilitates understanding and memorization.

Interestingly, Dash and Dash (2007) observe that graphic materials are simple to use as they can be shown, hung on the wall, touched and handled by every child. They are usually easily available and can be procured from local environment or produced by teacher. Moreover, Hilmi and Sim (1997) assert that, these graphic materials can be of great variety of size, shape or color, with local interest or appeal. They can also be adapted to the needs of a variety of subjects.

Use of Model in teaching and students performance

Models are representation of an idea, object, event, process or system. Model is a very important teaching aid for science teaching. Model has a three-dimensional effect on the mind of the students. They are the replica of the real subject matter (Ismail & Aleem, 2013). Sometimes clay, paper, plaster of Paris and varieties colour can be added to make suitable models of different objects.

Models and modelling play a crucial role in science practice. One justification for their inclusion in science teaching is that they contribute to an 'authentic' science education, where teaching reflects the nature of science as much as possible. Models helps in simplification of complex ideas this is by clarifying the structure of a complex phenomenon by reducing it to simpler and more familiar terms. Models allow learners to ask questions and a help teacher to interpret the representation observed through questions. In addition to that, Iwu et al. (2011) maintain that models such as specimens are particularly useful in enabling effective teaching of science concepts as it makes the science teachers work easier. According to Akram et al. (2012) models present simplified form of abstract and complex concepts so that learners can easily understand.

Use of Film projector in teaching and student's performance

Biology can be realized using film projector in teaching Biology in secondary schools. Thomas (2001) defined film projector as a frame of photographic transparencies. Projector newer is a representation of manageable real events in which the learner is an active observer engaged in learning behaviour or in applying previously acquired skills or knowledge. A Slide is a roll of transparent film usually 16mm or 35mm in size, containing images designed to be viewed from a filmstrip projector that appeal to the sense of the learner thereby facilitating learning. The uses of filmstrips in classroom teaching and learning situations have been in existence. Slides and filmstrips pictures provide fascinating challenges to students' achievement in Biology.

Accordingly, Dash and Dash (2007) perceive that projected aids as those visual aids where a bright light is passed through a transparent picture by means of lens and enlarged picture is shown or projected on the screen or the white wall. Projected visual aids include silent motion picture and filmstrips, computer graphics, epidiascope, magic lanterns, macro projections, and projection with the opaque and overhead projectors (Wilson and Brent, 2005). In relation to projected visual aids, Abdullahi (1998) surmise that a lighted screen has advantage of attracting student's attention and teachers should therefore select and project visuals for the sole purpose of sustaining the attention of their students. He further adds that projected visual aids may be used as substitutes for the real things, in particular, those that are either too far away, too dangerous or too big to be brought in to class room or too small to be seen by the human eye or inaccessible because of their cost or importance.

McArdle (2015) explains that projected visual aids are useful for large groups of people because everyone in the audience can see them properly. On this matter, Barnes (2013) stated that film projectors facilitate teacher interaction with learners. In support of this, Boor (2013) explains that when projected media materials are used in teaching, they improve interaction between teacher and learners and give instructions a more scientific base through providing a framework for systematic instructional planning.

Theoretical framework

Jean Piaget's Theory of Cognitive Development (1896-1980)

Jean Piaget (1896-1980), a Swiss psychologist, is best known for his pioneering work on the development of intelligence in children. His studies have had a major impact on the fields of psychology and education. In his work Piaget identified the child's four stages of mental growth. In the Sensorimotor Stage, occurring from birth to age 2, the child is concerned with gaining motor control and learning about physical objects. In the Preoperational Stage, from ages 2 to 7, the child is preoccupied with verbal skills. At this point the child can name objects and reason intuitively. In the Concrete Operational Stage, from ages 7 to 11, the child begins to deal with abstract concepts such as numbers and relationships. Finally, in the Formal Operational Stage, ages from adolescence to adulthood, the child begins to reason logically and systematically.

From his observation of children, Piaget understood that children were creating ideas. They were not limited to receiving knowledge from parents or teachers; they actively constructed their own knowledge. Piaget's work provides the foundation on which constructionist theories are based.

Constructionists believe that knowledge is constructed and learning occurs when children create products or artifacts. They assert that learners are more likely to be engaged in learning when these artifacts are personally relevant and meaningful (Constructivism, n.d.).

An important implication of Piaget's theory is adaptation of instruction to the learner's developmental level. The content of instruction needs to be consistent with the developmental level of the learner. The teacher's role is to facilitate learning by providing a variety of experiences. "Discovery Learning" provides opportunities for learners to explore and experiment, thereby encouraging new understandings (Kafia & Resnick, 1996). Opportunities that allow students of differing cognitive levels to work together often encourage less mature students to advance to a more mature understanding (Crossland, 2016). One further implication for instruction is the use of concrete "hands on" experiences to help children learn. Additional suggestions include:

- Provide concrete props and visual aids, such as models and/or time line;
- Use familiar examples to facilitate learning more complex ideas, such as story problems in math;
- Allow opportunities to classify and group information with increasing complexity; use outlines and hierarchies to facilitate assimilating new information with previous knowledge; and
- Present problems that require logical analytic thinking; the use of tools such as "brain teasers" is encouraged.

Huitt and Hummel (1998) asserted that only 35% of high school graduates in industrialized countries obtain formal operations and many people do not think formally during adulthood. This is significant in terms of developing instruction and performance support tools for students who are chronologically adults, but may be limited in their understanding of abstract concepts. For both adolescent and adult learners, it is important to use these instructional strategies:

- Use visual aids and models;
- Provide opportunities to discuss social, political, and cultural issues; and
- Teach broad concepts rather than facts, and to situate these in a context meaningful and relevant to the learner.

Table 1: Teaching Students Beginning to Use Formal Operations (Adolescence)

Principles	Application
Continue to use many of the teaching strategies and materials appropriate for students at the concrete operational stage.	-Use visual aids such as charts and illustrations, as well a simple but somewhat more sophisticated graphs and diagrams. -Use well-organized materials that offer step by step explanations.
Give students an opportunity to explore many hypothetical questions.	-Provide students opportunities to discuss social issues. -Provide consideration of hypothetical "other worlds."
Encourage students to explain how they solve problems.	-Ask students to work in pairs with one student acting as the problem solver, thinking aloud while tackling a problem, with the other student acting as the listener, checking to see that all steps are mentioned and that everything seems logical.
Whenever possible, teach broad concepts, not just facts, using materials and ideas relevant to the students.	-Use lyrics from popular music to teach, so as to reflect on social problems, and so on.

Educational Implications of Piaget's Theory

Piaget's theories have had a major impact on the theory and practice of education (Case, 1998). First, the theories focused attention on the idea of developmentally appropriate education—an education with environments, curriculum, materials, and instruction that are suitable for students in terms of their physical and cognitive abilities and their social and emotional needs (Elkind, 1989). In addition, several major approaches to curriculum and instruction are explicitly based on Piagetian theory (Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984), and this theory has been influential in constructivist models of learning (Berk, 2001) summarizes the main teaching implications drawn from Piaget as follows:

A focus on the process of children's thinking, not just its products. In addition to checking the correctness of children's answers, teachers must understand the processes children use to get to the answer. Appropriate learning experiences build on children's current level of cognitive functioning, and only when teachers appreciate children's methods of arriving at particular conclusions are they in a position to provide such experiences.

Recognition of the crucial role of children's self-initiated, active involvement in learning activities. In a Piagetian classroom the presentation of ready-made knowledge is deemphasized, and children are encouraged to discover for themselves through spontaneous interaction with the environment. Therefore, instead of teaching didactically, teachers provide a rich variety of activities that permit children to act directly on the physical world.

A deemphasis on practices aimed at making children adultlike in their thinking. Piaget referred to the question "How can we speed up development?" as "the American question." Among the many countries he visited, psychologists and educators in the United States seemed most interested in what techniques could be used to accelerate children's progress through the stages. Piagetian-based educational programs accept his firm belief that premature teaching could be worse than no teaching at all, because it leads to superficial acceptance of adult formulas rather than true cognitive understanding (May & Kundert, 1997).

Acceptance of individual differences in developmental progress. Piaget's theory assumes that all children go through the same developmental sequence but that they do so at different rates. Therefore, teachers must make a special effort to arrange classroom activities for individuals and small groups of children rather than for the total class group. In addition, because individual differences are expected, assessment of children's educational progress should be made in terms of each child's own previous course of development, not in terms of normative standards provided by the performances of same-age peers.

Gagne's theory of instruction. (Gagne's nine events of instruction)

Gagne (1985) in Gagne, et al (2005) contended that instruction must consider the whole set of external factors such as environment, resources and management of learning activities which interact with internal conditions such as state of mind that the learner brings to the learning task, previously learned capabilities, and personal goals of the individual learner. Gagne's internal factors that other instructional designers did not consider are highly important set of factors that can affect academic performance of learners in one way or another. This is indicated by Reiser et al (2007) who comment: "Gagne's description of the various types of learning outcomes and the events of instruction remain cornerstones of instructional design practices. In his research, Gagne stipulated that instruction may be conceived as a deliberately arranged set of external events designed to support internal learning processes.

Gagne "described which instructional events were particularly crucial for which type of outcome, and discussed circumstances under which particular events could be excluded" (Ibid.). This implies that the events of instruction are not sequential and must not be followed in order of appearing but teachers may use them in a particular point and time, depending on classroom setting, nature of the topic, nature of the learners and many other variables that differentiate learning situations. Gagne's events of instruction involve nine activities namely Gaining attention, informing the learner of the objective, stimulating recall of prior learning, presenting the stimulus, providing learning guidance, eliciting performance, providing feedback, assessing performance and enhancing retention and transfer (Hanson and Asante, 2014; Ahmed, 2011; Gagne, et al 2005; Reiser and Dempsey, 2007; Joyce and Weil, 1996 & Tuckman and Monetti (2011). The Nine Events of Instruction are further elaborated in the light of existing theoretical framework:

Gaining Attention: Attention is defined by Slavin (2009 p. 160,) as "active focus on certain stimuli to the exclusion of others." Learner's attention in the teaching/ learning transaction is very important ingredient for effective learning, yet it is a limited resource. In order for effective learning to take place, students must give up actively attending to other stimuli, shifting their priorities so that other stimuli are screened out. Some basic ways of commanding attention of the learners include the use of novelty as is often done with animation, a demonstration or some unexpected events (Gagne, et al, 2005). Slavin (2009, p. 160 suggests that additional ways to gain students attention in class include usage of cues that indicate "this is important" by raising or lowering voice to signal that critical information is about to be imparted, application of gestures, repetition and body position, introducing lesson with demonstration in order to engage students' curiosity and informing the learners that what follows is important.

Informing the learner of the objective: Objectives tell students what final performance is expected, a state which provides expectancy and curiosity among the learners. Gagne et al (2005) has it that "presenting students with learning objectives communicates an expectation of the knowledge and/ or skills they are expected to perform." It also argued that "students cannot tell when they have accomplished a learning task and experience the satisfaction of that accomplishment unless they know what final performance is expected of them" (Slavin, 2011). Therefore, this calls upon teachers in the instructional processes to clearly state specific objectives that their learners are intended to meet.

Stimulating recall of prior learning: Prior learning is the fundamental pillar of the idea of "from known to unknown." Tuckman and Monetti (2011) contend that "it is the old information and the new information combined that enables an attentive, expectant student to achieve mastery of a task." Slavin (2011) maintains that "new learning invariably builds on prior learning" and maintains that the success of new learning will depend on three factors: whether the necessary prior learning has already taken place, the student knows what prior learning to try to remember and apply and that the student can remember the necessary prior learning.

Presenting the stimulus: Stimulus (stimuli in plural) is an environmental condition that activates the senses. The senses of the learners must be activated for effective learning to take place (Slavin, 2009). It is "an activity or information that presents the content of what has to be learned" (Reiser et al. 2007). In an attempt to present the stimulus, "the teacher must determine what new stimulus information is required by an objective and how to present that new stimulus information so that students can perceive and retain it (Tuckman & Monetti, 2011).

Providing learning guidance: Guidance is an important practice that affects students' life and particularly their academic performance. Nyaga, Oundo and Kamoyo (2014) argue that guidance and counselling services contribute to better growth of students' academic competence. They call for educational institutions to strengthen these services for holistic development of students and provide adequate physical and human resources that are crucial in promoting the provision of guidance and counselling services. Furthermore, they argue that employment of adequate numbers of professionally well-trained persons for guidance and counselling is of prime importance if guidance and counselling services need to excel in schools. Tuckman and Monetti (2011) have it that "to properly combine old and new information and to make it possible for the result to be entered into long-term memory, students must be given help or guidance." They also advise that teachers must plan the technique they will use to guide the learners in a given task and how they will present these techniques. "The essence of learning guidance is to provide support for learners in making connection between what they know and what is being learned" (Gagne, et al (2005).

Eliciting performance: This has to do with "opportunity to practice or otherwise perform what has been learned" (Reiser et al, 2007). "People learn to do well what they practice (Kauchak & Eggen, 2008). This suggests that students need to demonstrate to themselves and to their teachers that the new learning has occurred (Tuckman and Monetti, 2011). This is in harmony with Thorndike's law

of exercise which states that if one exercises, the effect increases (Schunk, 2004). The teacher therefore, needs to elicit the learners to practice what has been taught in class in order to increase permanence in learning.

Providing Feedback: According to Kauchak and Eggen (2008), feedback means information about existing understanding that we use to enhance future understanding." He also postulates that feedback that follows performance closely in time affects behaviour far more than delayed feedbacks. This suggests that teachers need to give immediate feedback on what students have performed. Slavin (2009) views feedback in a mutual perspective when it refers to both information students receive on their performance and information teachers receive on the effect of their instruction. Effective instruction is therefore enhanced by feedback.

Assessing Performance: Evaluation is an act of paramount importance in the teaching-learning transaction. "No period of practical teaching is complete without some form of evaluation" (Farrant 1999). Assessment is "an opportunity to demonstrate what has been learned" (Reiser et al, 2007). According to Hammill (1986) assessment is the act of acquiring and analyzing information about students for some stated purposes, usually for diagnosis of specific problems and for planning instructional programs. Purposes for assessing students include screening students to find those who need special assistance, to diagnose their problems, to identify their instructional needs, to document their progress in special programs and to provide information for use in research projects.

Enhancing Retention and Transfer: At this stage of Gagne's nine instructional events, learning knowledge and skills have been learned and what follows is to enhance retention and transfer of learning. While retention is all about preventing forgetting and enhancing the learner's ability to recall the knowledge or skills at the appropriate time, transfer of learning sets some variety of new tasks for the learner, tasks that require the application of what has been learned in situations that differ substantially from those used for the learning itself (Gagne, et al (2005). This suggests that ability to recall is not enough. What is needed is ability to transfer ability to perform similar tasks

while learning can take place without teaching, effective learning is a result of effective instructional design. Unless teachers design their instructional activities properly, effective learning will be minimal or may not take place at all. Therefore, Gagne's nine events of instruction need to be incorporated in the process of instructional design and actual teaching.

Empirical studies

Idongesit and Ekukinam, (2019) examined the effect of improvised technological instructional media on students' performance in some selected primary science concepts. A pre-test and post-test, non-randomized experimental design was adopted for the study. The population comprised of 3,368 primary six pupils from 48 public primary schools in Akwa Ibom State while 219 primary six pupils from two schools formed the sample for the study. A t-test statistical analysis revealed that there is no significant difference of the post-test performance of intact classes exposed to improvised science equipment and those not exposed to the standard equipment, indicating that pupils benefited equally from the standardized and improvised equipment with t-calculated score of 1.34 below the t-critical 2.92. The reviewed study is similar to the present study because both studies adopted experimental design; the reviewed study was however conducted in primary schools while the present study was conducted in secondary schools.

Awolaju (2015) conducted a research study on instructional materials as a correlation of Biology students' academic performance in Osun state, Nigeria. The researcher used stratified and simple random sampling to sample a: total of 100 students (50% males, 50% female) for the study. A 30-items test instrument with four options multiple choice named Biology Achievement Test (BAT) was used for data collection. The result of the study revealed a significant difference in academic performance of the students taught Biology using instructional materials and those taught using conventional method. Also, Adeyemi and· Olayeye (2010) investigated the effect of student involvement in production of instructional material on their academic performance in Biology and they reported that a significant difference existed between students taught biology without instructional materials and those taught using locally produced instructional materials.

Odo (2015) carried out a study on the effects of students improvised instructional materials on students' achievement in physics. Five research questions and five null hypotheses guided the study. The study employed a non-equivalent quasiexperimental research design. The sample for the study comprised of 149 SSII students in Obollo Afor Education Zone of Enugu State. Data were analyzed using mean, standard deviation and the Analysis of Covariance (ANCOVA). The results of the study revealed that students taught physics using student' improvised instructional materials performed better than students taught using conventional materials; While both studies were conducted in

secondary schools using SS 2 students, the reviewed study however used physics as a subject while the present study used economics as a subject.

Bui and McDaniel (2015) investigated the influence of outlines and illustrative diagrams in enhancing learning. In a study which involved 144 undergraduate 25 students carried out at Washington University in St. Louis, the researchers made students listen to a 12-minute lecture about car brakes and pumps after dividing them into groups and expose them to either skeletal outline, an outline diagram, or no learning aid at all. When students' understanding and retention of the taught concept was tested at the end of the lecture, it was found that illustrative diagrams were instrumental in bringing better performance among students. Bui and McDaniel (2015) concluded that illustrative diagrams describe components in close details are very efficient in helping students build coherent mental representations which leads to better students' performance.

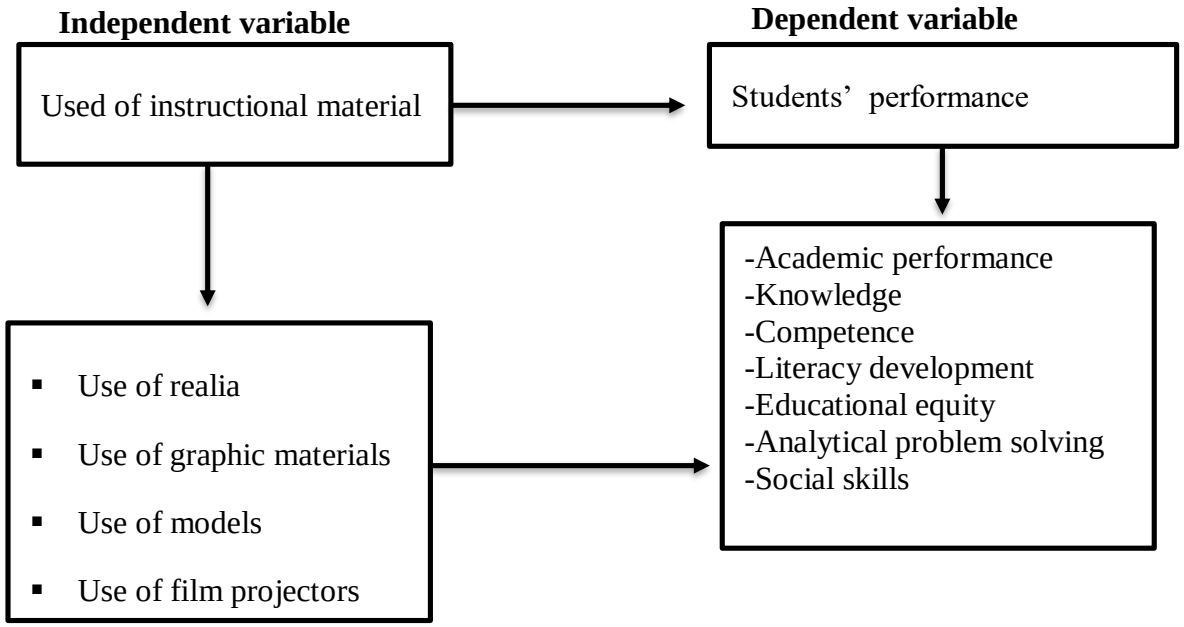
Perry (2013) conducted a research on rural high schools in Southeast Ohio. She hoped to examine the effects of visual media on achievement and attitude in biology classroom. Through the study, it was revealed that teachers in the schools continuously use visual aids at varying degrees which was linked to improvement of students' engagement, attention and attitudes to the subject. On the other hand, the researcher found no positive correlation between the use of videos and students' performance. However, she suggested if students can pay attention and focus better in class, then videos could be a positive and useful teaching strategy. This is because increase in students' attention positively affects lesson delivery and students learning.

A research conducted by Quarcoo-Nelson et al, (2012) to investigate the impact of visual aided instruction on students' achievement in Physics showed that when appropriate audio-visuals are integrated into the curriculum to complement the traditional method, higher learning outcomes in terms of achievement scores would probably result. In a study, senior high school students taught with the audio-visual aided instruction achieved better than students taught with the traditional method. To improve teaching in Ghana schools Quarcoo-Nelson et al, (2011) suggested that teachers need to explore different varieties of audiovisual aids to use in their teaching. After Ghana, the following are empirical studies related to visual aids and students learning in Uganda.

Conceptual frameworks

From the review of related literature, a conceptual framework is design to show the relationship between the use of instructional material in the teaching of biology and students' academic performance. The conceptual framework is based on the relationship between the independent variables and the depend variables.

Figure 1: Conceptual Framework



CHAPTER THREE: METHODOLOGY

This section discusses the research methodology used for collecting and analyzing data. It reveals the processes used to collect data from the field. The section opens with a description of the research design and how the study was carried out. Next, we discussed the study area, the population of the study, the target population, and the accessible population from which our sample size was derived. We then received the sample and the sampling techniques that were employed. The data-gathering tools and methods for validating them were discussed. The processes for administering the instruments were also discussed, data analysis techniques elucidated, ethical considerations, and reiteration of the hypothesis.

Research Design

A descriptive survey design was employed for this study, and a regression prediction design was used to gather data. Using descriptive design designs and regression analysis, you can predict results and elucidate the effect of independent variables on the dependent variable. Researchers use the regression test to predict the effect of two or more variables or sets of scores (Creswell, 2012). According to Mbua (2003), a research design is a strategy that details information on a certain issue and should be gathered and processed. It is a broad framework that describes the steps that will be taken to collect the data needed to respond to the research question or hypothesis. Amin (2005) claims that a research design outlines the steps the researcher will take, from writing or creating the hypothesis to the final data analysis. Data is gathered using a quantitative approach to ascertain whether and how strongly the two variables affect each other (pedagogic supervision and teaching and learning process). At the end of this research, quantitative data was collected and analyzed, and the findings were generalized to the entire study population. With prediction design, researchers aim to predict outcomes by employing specific factors as predictors rather than merely associating variables. Therefore, prediction studies are valuable because they aid in predicting or anticipating future behaviour. For instance, the recruitment and retention of many teachers in an educational.

Area of Study

A research area is a physical site that is the locality, topography, and history where the research project is being conducted. This study was conducted in the Mfoundi Municipality of the Centre Region of Cameroon. The Mfoundi Municipality was purposively sampled. Mfoundi division is

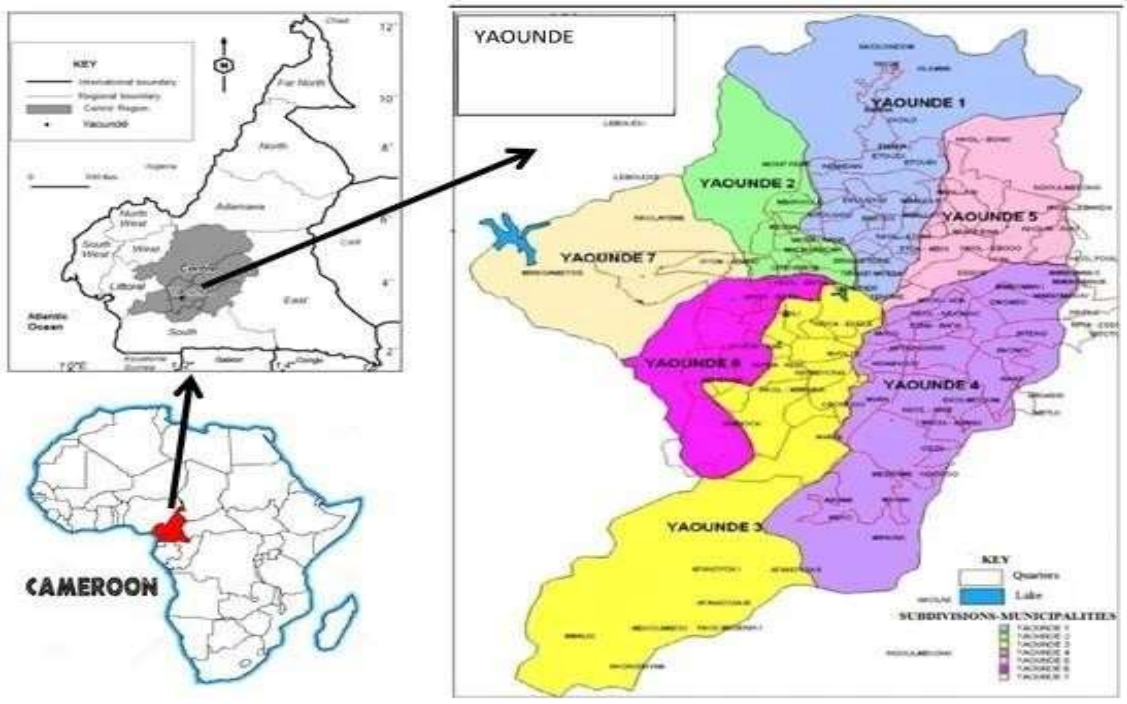
a department of Centre region in Cameroon. The department covers an area of 297 km2 and as of 2005 had a total population of 1,881,876. The department forms the Yaoundé capital and greater area. The department was created following Decree No. 74/193 of the March 11, 1974 separating it from the department of Méfou (today itself divided into Méfou-et-Afamba and Méfou-et-Akono).

The department has only one urban community: However, each of the 7 current boroughs has an urban borough council, elected headed by an urban borough mayor. The urban community covering the entire department makes it a community with a special status.

The department has 7 arrondissements:

1. Yaoundé I (Nlongkak)
2. Yaoundé II (Tsinga)
3. Yaoundé III (Efoulan)
4. Yaoundé IV (Kondengui)
5. Yaounde V (Essos)
6. Yaoundé VI (Biyem-Assi)
7. Yaoundé VII (Nkolbisson)

Figure 2: Map of Mfoundi Division



Source: Yaoundé urban council (CUY/2007)

Population of Study

According to Amin (2005), a population is the totality of all the components relevant to certain research. When concluding a sampling study, the researcher is interested in the entirety or aggregate of things or people with one or more traits in common (Amin, 2005). Asiamah et al. (2017) believe that population members must share at least one common attribute. This characteristic qualifies participants as population members.

Target Population

The researcher intends to generalize the findings to this population. The target population, often known as the parent population, may not always be reachable to the researcher (Amin, 2005). For Asiamah et al. (2017), the set of people or participants with particular traits of interest and relevance is referred to as the target population, and it is the portion of the general population that remains after it has been refined. The researcher must therefore identify and exclude members of the general population who might not be able to share experiences and ideas in sufficient clarity and depth from the target population. The targeted population in the study are the upper-sixth students offering biology in selected high schools in the Mfoundi division.

Accessible population

This is the population from which the sample is actually drawn (Amin,2005). Asiamah et al. (2017) corroborate this by postulating that after eliminating every member of the target population who might or might not engage in the study or who cannot be reached during that time, the accessible population is then reached. The last group of participants is the one from whom data is gathered by polling either the entire group or a sample taken from it. If a sample is to be taken from it, it serves as the sampling frame. People eligible to engage in the study but unable to participate or would not be available at the time of data collection are referred to as the accessible population. The accessible population of this study is drawn from seven (07) schools where students of the English sub-system of education were targeted. The researcher, therefore, had access to 348 students drawn from the seven (07) schools, as seen below.

Table 2: Distribution of accessible population per school

SN	Schools	Population
1.	G.B.H.S Emana Yaounde	48
2.	CHUO Bilingual Comprehensive College Carriere Yaounde	19
3.	Greenhills Academic Complex Damas Yaounde	30
4.	Pi And Ju Anglo-Saxon International College Yaounde	45
5.	G.B.H.S Esssos Yaounde	126
6.	Franky comprehensive college	30
7.	Genius Trilingual College	50
	Total	348

Source: Division of personnel, divisional delegation of secondary education 2023

Table 2 above shows the accessible population, which is 348 in the targeted seven schools.

Sample of the study

The sample of this research work was drawn from the accessible population of 348 students of the English- system of education from the seven schools the researcher had access. A good sample is one that statistically represents the target population and is sizable enough to provide an answer to the research issue. Amin (2005) views a sample as a portion of the population whose results can be generalized to the entire population. The author adds that a sample can also be considered representative of a population. Majid (2018) corroborates this by asserting that because the community of interest typically consists of too many people for any research endeavour to involve as participants, sampling is a crucial tool for research investigations.

The sample size was determined using Krejcie & Morgan table (1970), which constituted 300 students drawn from seven schools representing the seven sub-divisions in Mfoundi. They were drawn in such a way that all students should be represented.

Table 3: Distribution of sample per school

SN	Schools	Population	Sample size
1.	G.B.H.S Emana Yaounde	48	43
2.	CHUO Bilingual Comprehensive College Carriere Yaounde	19	19
3.	Greenhills Academic Complex Damas Yaounde	30	28
4.	Pi And Ju Anglo-Saxon International College Yaounde	45	41
5.	G.B.H.S Esssos Yaounde	126	96
6.	Franky comprehensive college	30	28
7.	Genius Trilingual College	50	45
	Total	348	300

Sampling technique

Every research involves, to some degree or another, a sampling process. Sampling is one of the most important steps in research; it will lead to valid results when carefully done. Sampling is a process of selecting representative portions of a population that permits the researcher to make utterances or generalizations concerning the said population. It can also be the process of selecting elements from a population so that the sampled elements selected represent the population. Sampling is involved when any choice is made about studying some people, objects, situations, or events rather than others. A good sample should be representative of the population from which it was extracted. Regardless of the sampling approach, the researcher should be able to describe the characteristics and relate them to the population (Amin,2005).

Sampling techniques refer to the various strategies a researcher uses to draw out a sample from the parent population of the study (Amin, 2005). There are two main sampling techniques; probability and non-probability techniques. The sampling technique suitable for this study is probability sampling, in which all the elements of the population have some probability of being selected. Probability sampling will provide a base for the researcher to generalize about the population.

The type of probability sampling technique employed in this research is simple random sampling (SRS). Amin (2005) opined that a simple random sample is a sample obtained from the population in such a way that samples of the same size have equal chances of being selected. The researcher proceeded through this method by selecting the accessible population comprising seven government

bilingual high schools in Mfoundi. This was done through the random number method, in which Amin (2005) says if there are numbers that identify the elements of the population, then the random number method will be appropriate. The researcher proceeded as follows; The numbers 01,02,03…..11 were attributed to all the government bilingual high schools in the Mfoundi division on folded pieces of paper in a basket. The researcher pleaded with two neighbours who randomly selected 3 and 4 schools each from the basket. These seven schools were selected to represent the seven schools used in the accessible population.

Through this technique, no school or teacher was left out, ensuring the representativeness of all government bilingual high schools in the Mfoundi division.

Instrument for Data collection

An instrument is any tool that has been methodically built to collect data and should be gathered accurately. The questionnaire is the tool utilized to gather data for this investigation. According to Amin's definition from 2005, a questionnaire is a professionally crafted tool used to gather data in line with the research questions and hypothesis requirements. He continues by saying that a questionnaire can be considered a self-report tool used to collect data on factors of interest in research. A questionnaire is a useful tool for gathering survey data, providing structured, frequently numerical data, being able to be administered without the researcher's presence, and frequently being comparatively simple to analyze, as Cohen et al. (2007) reiterated. It is a tool for gathering data with specific questions that the respondent must answer and then return to the researcher. There are two different kinds of questionnaires: closed and open-ended. The type of study is the only factor influencing the questionnaire selection. This study will use closed-ended questions, including Likert-style rating scales and dichotomous questions. These closed questions are simple to code and take little time to complete.

According to Creswell (2009), a questionnaire takes a quantitative approach to measure perceptions and provides data upon which generalizations can be made on the views of a given population on a particular phenomenon. This study's self-administered questionnaire was preferred, given that the targeted respondents could read and express themselves effectively. The researcher used a self-administered questionnaire to capture the students views on the use of instructional material on the teaching of biology and it impact on student’s performance in some secondary schools in Mfoundi Division. It is a rigorous instrument prepared by the researcher about the research problem under

investigation, which is to be used to collect information from respondents. It consists of a carefully selected set of questions or statements requiring respondents' answers.

The collection of the research-developed questionnaire titled the use of instructional material on students' academic performance has two parts; A and B. Part A contains information on the personal data of the respondents, while part B contains twenty (20) statements built in four clusters A, B, C, and D. Cluster A of the questionnaire focused on the use of realia in the teaching biology. Cluster B of the questionnaire hinged on the use of graphic materials in the teaching of biology. Cluster C of the questionnaire concentrated on the use of mock-up and model in the teaching of biology. Finally, Cluster D of the questionnaire addressed the use of film projectors in the teaching of biology. This enables us to obtain information on the dependent variable, which is the actual problem.

Table 4: Variables and statements

Variables	Statements
Use of realia	1, 2,3, 4, 5
Use of graphic materials	6, 7, 8, 9, 10
Use of mock-up and models	11, 12, 13, 14, 15
Use of film projectors	16, 17, 18, 19, 20

All the five-cluster had ten statements each, all relating to the research questions that guided the study. The response format for clusters A to B is based on a four-point scale of strongly agree (SA), Agree (A), Disagree (D) and strongly disagree (SD). In other words, the higher the aggregate scores on the rating scale, the more positive the response of the subjects and the lower the score, respondents indicated their level of agreement by ticking (√) on the rating scale.

Table 5: Questionnaire options and corresponding weights on the Likert scale

Option	Weight
Strongly Agree (SA)	4 Points
Agree (A)	3 Points
Disagree(D)	2 Points
Strongly Disagree (SD)	1 Point

Table 5 shows how the questionnaire was weighted with the various options, from 4 points for SA to 1 point for SD.

Validation of the Instrument of data Collection

According to Amin ME (2005), Validation refers to the accuracy of the instrument in measuring what the researcher intends to measure. Validity refers to the measurement instrument and the level to which it saves the purpose of it design. The validity of the instrument can be affirmed with the reason that the questions were simple, understandable and easy for the respondents to answer. Face validity was adopted this was done by giving the initial draft of the questions to expert rates and were kindly requested to examine the adequacy of the statement relevance and suitability of language, structuring and sequencing of ideas and appropriateness of the instrument.

The comments and observations of these experts were used for modifications of the instrument. They modified some of the research questions and improved on the clarity of the questionnaire statements and the clarity of the response scale format of strongly Agree (SA), Agree (A), Disagree (D) and strongly Disagree (SD). Their comments were incorporated in the revised version of the questionnaire statements. Our method of distributing questionnaires to the respondent was face-to-face distribution. We later collected the questionnaire in on week. This was to give room for the respondents to take their time in filling the questionnaires without any inconvenience.

The Cronbach's alpha was used to calculate the reliability of the instrument from the data collected from the pre-test with 20 participants and the reliability was obtained as presented below:

Table 6: Indices of internal consistency

S/N	Variable	N	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items
1	Use of Realia	5	0.96	0.99
2	Use of Graphic Material	5	0.88	0.97
3	Use of mock-ups and models	5	0.86	0.97
4	Use of Film Projector	5	0.75	0.81
	Total	20	0.86	0.93

Face Validity

The questionnaire was carefully studied by specialists in instrument development and the supervisor in charge of the dissertation for examination and screening in case of any error. Some were adjusted, and maintained and others were disqualified.

Content Validity

The supervisor examined the statements on the questionnaire in relation to the objective of our work. After proper examination and acceptance of the statements, the content of the instruments was made valid. It was distributed to Teachers of the selected schools and collected a week later. The researcher permitted the respondents to pose questions where necessary during the exercise. In the end, most of the copies were collected, and the return rate was recorded.

Table 7: Indices of content validity index

S/N	Variable	N⁰ of items	N⁰ of Judges	Total N⁰ items by judges	Yes	No	CVI
1	Use of Realia	5	4	20	15	5	0.75
2	Use of Graphic Material	5	4	20	10	10	0.50
3	Use of mock-ups and models	5	4	20	15	5	0.75
4	Use of Film Projector	5	4	20	17	3	0.85
	Overall content validity index						0.75

Source: Researcher survey 2023

The content validity index was 0.75 indicating that the content relevant variance of the instrument was 75%.

Pilot Study

The researcher then conducted a pilot test in a school which did not constitute part of the sample. We did a pilot study because we wanted to develop and test the adequacy of the research instrument. The teachers responded and the internal consistency of the clusters were determined using Cronbach alpha which gave us a reliability of .86. The coefficient for the clusters was high enough for the study to realize the instrument because it reveals a complete understanding of the content of the questionnaire. This procedure ensures the content validity if the instrument. It might also give advance warning about where the main research project could fail, where research protocols may not be followed, or whether proposed methods or instruments are inappropriate or too complicated.

Reliability of the study

The questionnaire was pre-tested with comparable respondents drawn from outside the area of the study. The results of the pilot testing were used in computing relevant reliability. The instruments were trial tested using ten students in one of the schools in Mfoundi division. The students responded, and the internal consistency of the four clusters was determined using Cronbach alpha which gave us a reliability of .75. The coefficient of the clusters was high enough for the study to utilize the instrument. After using the questionnaire for the study, we had a Cronbach alpha of .75, implying the instrument was reliable.

Methods of data collection

The researcher took authorization of research from the Dean of the Faculty of Science of Education from the University of Yaounde 1. He first of all went to the Centre Regional Delegation for Secondary Education of Mfoundi Division, where he carried out documentary research on statistics of teachers in the division. he went to the schools and obtain permission from the principals. The permission was granted. As far as the questionnaire administered were concern, they were distributed to all the students of the schools' concern and was collected after with a research confirmation signed by the principals of the respective schools. During the exercise, the researcher permitted the students to ask questions were necessary. At the end, most of the copies were collected. This gave a return rate of 91%.

The return rate of the instrument

The return rate indicates the number of questionnaires that were received at the end of the research after the questionnaires were administered to respondents. The return rate for this study was calculated using a simple percentage based on the formula below

$$R = \frac{\sum RQ}{\sum AQ} \times \%$$

Where;

R= Return rate

∑RQ= Sum of questionnaires returned

∑AQ=Sum of questionnaires administered

% = Percentage expressed as a hundred

The rate of return of questionnaires for this study was calculated as follows;

Total number of questionnaires administered = 330

Total number of questionnaires returned= 300

Therefore, return rate is = 330⁄300 * 100 = **91%**

Methods of data analysis

This study made use of a method of data analysis by which each hypothesis is taken and material to answer or provide a test is provided. Consequently, A regression method was used. Data were presented using tables and descriptive statistics like percentages, frequencies, and means were used. Correlation as well as the statistically more advanced method of multiple regression analyses was used in data analyses.

A regression method was the main method used in this study. Regression methods form the backbone of much of the analyses in research. In general, these methods are used to estimate associations between variables, especially when one or more of these are variables are continuous. To answer the research question on how the independent variables, affect the dependent variables, a standard multiple regression analysis was conducted on the data in SPSS. The multiple regression analyses attempt to find out whether independent variables are able to predict the dependent variable and which of those independent variables is the strongest predictor of the dependent variable, in this case, teachers' effectiveness, and is, therefore, the most suitable analysis tool for the current research (Pallant, 2005).

The Extraneous Variable

The extraneous variable is any variable that if not controlled, can affect the experimental research outcome or result. In this study, the extraneous variable are the facilities for supervision, the behaviour of the supervisor, and rewards

Expected Results

After having tested our variables, we expect to see whether supervisory planning, monitoring, evaluation and communication influence the teaching and learning process's effectiveness.

The hypotheses for this study are thus restated with the corresponding statistical tests:

H_{a1}: The use of Realia in teaching statistically significantly affects secondary school student's academic achievement in Biology.

H_{O1}: The use of Realia in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

H_{a2}: The use of Graphic Material in teaching has a statistically significant effect on secondary school student's academic achievement in Biology.

H_{O2}: The use of Graphic Material in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

H_{a3}: The use of Mock-ups and models in teaching has a statistically significant effects on secondary school student's academic achievement in Biology.

H_{O3}: The use of Mock-ups and models in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

H_{a4}: The use of Film Projector in teaching has a statistically significant effects on secondary school student's academic achievement in Biology.

H_{O4}: The use of Film Projectors in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

The statistical analysis used to test the hypothesis was the simple linear regression. The simple linear regression analysis as the statistical method used to test all the four hypotheses of this study and level of significance adopted for the analysis was $P \leq 0.05$. This level of significance formed the basis for retaining or rejecting the four null hypotheses.

CHAPTER IV:

PRESENTATION OF RESULTS

The purpose of this study was to assess the influence of instructional materials on students' performance in Biology in some selected secondary high schools in Mfoundi Division, and this was further divided into four specific objectives as stated as follows: To examine the effects of using Realia on secondary school students' academic achievement in Biology; Explore the effects of using Graphic Material on secondary school students' academic achievement in Biology; investigate the effects of using Mock-ups and models on secondary school students' academic achievement in Biology; Examine the effects of using Film Projector on secondary school students' academic achievement in Biology. This chapter includes the results of the procedures used to answer the four research questions and test the four hypotheses. The results include statistical significance when appropriate and whether the null hypotheses were accepted or rejected.

General information

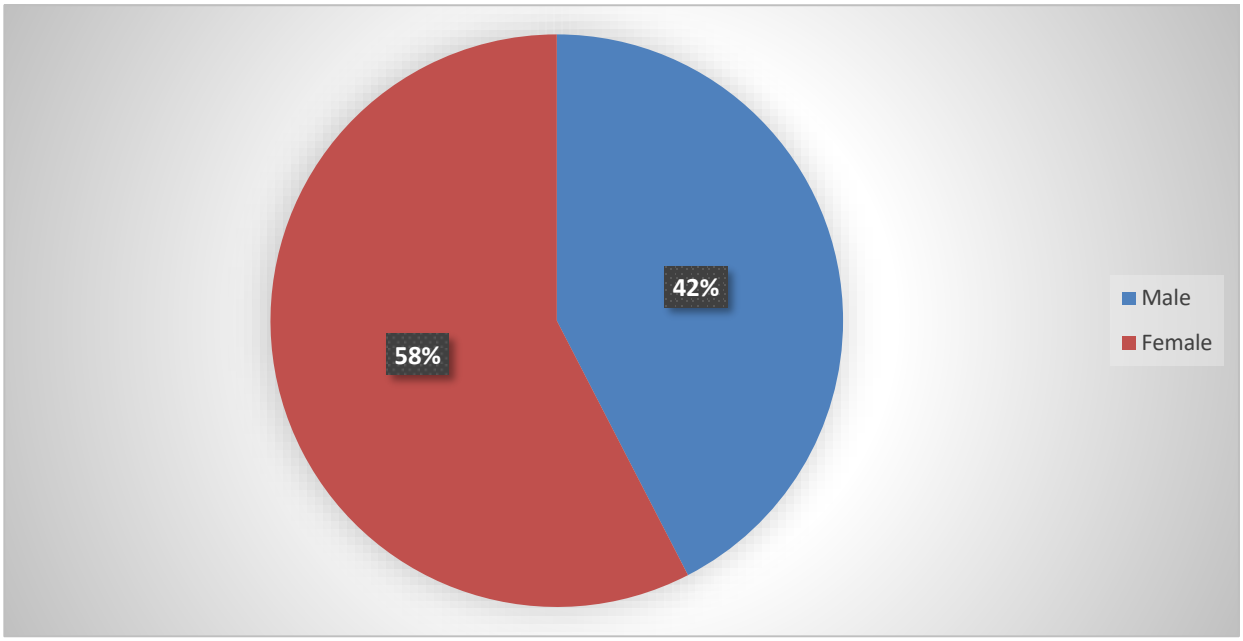
This section details the background information of the participants. It gives information on the gender of the participants, and the age of the participants, the information was purposed at testing the appropriateness of the participants in answering the questions regarding influence of instructional materials on biology students' academic performance.

Response rate

A total number of 330 questionnaires were administered to upper sixth student reading biology. Of the 330 questionnaires, 300 participants responded to the questionnaire resulting to a 91% rate. This response rate was quite good and representative in addition.

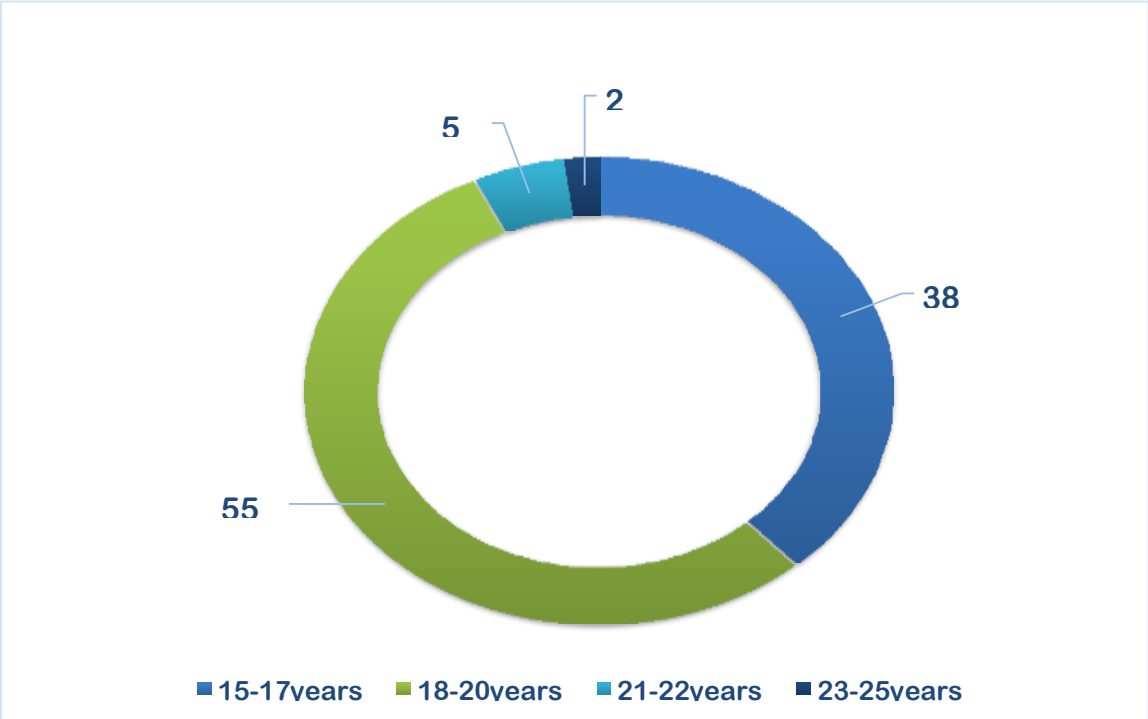
Gender of the Participants

Figure 3: gender of the participants



The figure above presents the frequency distribution of the participants and the results revealed that most participants were female (**f= 203, %= 58**) while male were weakly represented as compare to female (**f =147, %=42).** This indicates that females constitute the majority of the upper-sixth biology students.

Figure 4: Age distribution of the participants



The respondents were asked to indicate their age group and the findings are as stipulated in the figure above. The findings reveal that most respondents were found to be in the age group 18-20 years and above **(f=192, %=55),** followed by the age group 15-17 years **(f=133, %=38)** and the age group 23-25years had the least number of respondents (**f=7, %=2**). These results showed that the majority of the participants were very young which could be an advantage to the use of the instructional material.

Result based on research questions

This section will present the results of the analysis based on the research questions. Four research questions were formulated for this study as presented below:

Table 8: Cluster A: Use of realia and student's performance

	Items	Strongly disagree	Disagree	Agree	Strongly Agree
I1	I find it easy to extract quality information from photographs to better understand biology	18 (6%)	56 (18.7%)	172 (57.3%)	54 (18%)
I2	The use of real specimen of plant such as flowers, leaves, fruits etc. help to better understand biology lesson	18 (6%)	56 (18.7%)	155 (51.7%)	71 (23.6%)
I3	The use of real specimen of animals such as fishes, worms, frogs for dissecting during practical lesson facilitate understanding	10 (3.3%)	57 (19%)	148 (49.3%)	85 (28.4%)
I4	I used video lessons with no difficulty to make summaries	18 (6%)	66 (22%)	114 (38%)	102 (34%)
I5	I am acquainted with the various artifacts use in the teaching of biology lessons	23 (7.7%)	52 (17.3%)	150 (50%)	75 (25%)

Table 8 above represents the descriptive analysis of the use of realia Five items were developed in order to respond to the question on the use of realia materials and student academic performance. The results of the analysis revealed that for items one (I1), the majority of the participant affirmed 172 (57.3%) that they find it easy to extract quality information from photographs to better understand biology lesson. The results also revealed that for item two (I2) most participants agree 155(51.7%) that the use of real specimen of plant such as flowers, fruits, leaves help to better understand Biology lessons. For item three (I3) the majority agree 148(49.3%) that the use of real specimen of animal such as fish, worms,frogs for dissecting during practicals lesson The result of the

analysis revealed that for (I4) most participants 114(38%) agree that they could use video lessons with no difficulty to make their summaries. Finally, item five (I5) revealed that most participants agreed 15 (50%) that they were acquainted with the various artifacts used in the teaching of biology lesson. Based on the responses a good number of them asserted that they were able to use the realia materials and that have an effect on their performance.

Table 9: Cluster B-Use of graphic material and student's performance

Items		Strongly disagree	Disagree	Agree	Strongly Agree
I1	The used of chart is common during biology lesson.	25 (8.3%)	49 (16.3%)	127 (42.4%)	99 (33%)
I2	My Biology teacher always uses sketches to illustrate most of his lessons.	24 (8%)	48 (16%)	149 (49.7%)	79 (26.3%)
I3	Teaching Biology with diagrams helps student to understand faster.	75 (25%)	86 (28.7%)	96 (32%)	43 (14.3%)
I4	The use of pictures make biology lesson very interesting.	34 (11.3%)	86 (28.7%)	141 (47%)	39 (13%)
I5	The use of graphs is necessary to illustrate some concept in biology.	65 (21.7%)	121 (40.3%)	84 (28%)	30 (10%)

Table 9 above represents the descriptive analysis of the used of graphic materials. Five items were developed in order to respond to the question on the use of graphic materials and student academic performance. The results of the analysis revealed that for items one (I1), the majority of the participant asserted 127(42.4%) that the used of chart is common during biology lesson. The results also revealed that for item two (I2) most participants agree 149(49.7%) that their Biology teacher always uses sketches to illustrate most of his lessons. For item three (I3) the majority agree 96(32%) that teaching biology with diagrams helps students understand faster on the other hand good numbers of participants disagree that teaching biology with diagrams helps student to understand faster, The

result of the analysis revealed that for (I4) most participants 141(47%) agree that the use of pictures make biology lesson very interesting. Finally, item five (I5) revealed that most participants disagreed 121(40.3%) that the used graphs is necessary to illustrate some concept in biology. Based on the responses a good number of them asserted that the used of graphic materials and that have an effect on their performance.

Table 10: Cluster C: The use of Mock-ups and models in teaching

Items		Strongly disagree	Disagree	Agree	Strongly Agree
I1	The use of heart model to teach lesson on the structure of the heart aid to clarify difficult concept.	8 (2.7%)	20 (6.7%)	140 (46.6%)	132 (44%)
I2	The structure of the brain is better understood when taught with brain model	7 (2.3%)	27 (9%)	173 (57.7%)	93 (31%)
I3	The use of animal cell model to teach cell structure help students to understand better.	6 (2%)	34 (11.3%)	156 (52%)	104 (34.7%)
I4	The use of the kidney working model to teach the structure of the kidney make learning real.	14 (4.7%)	47 (15.7%)	147 (49%)	92 (30.6%)
I5	The used of digestive system model to teach lesson on digestion make learning interesting.	9 (3%)	56 (18.7%)	148 (49.3%)	87 (29%)

Table 10 above represents the descriptive analysis of the use of Mock-ups and models in teaching. Five items were developed in order to respond to the question on the use of Mock-up and their academic performance. The results of the analysis revealed that for items one (I1), the majority of the participant affirmed 140 (46.6%) that the used of heart model to teach lesson on the structure of the heart aid to clarify difficult concept. The results also revealed that for item two (I2) most participants agree 173(57.7%) that the structure of the brain is better understood when taught with brain model. For item three (I3) the majority agree 156(52%) that the used of animal cell model to teach cell structure help them to understand better. The result of the analysis revealed that for I4 most participants 147(49%) agree that the use of kidney working model to teach the structure of the kidney make learning real. Finally, item five (I5) revealed that most participants agreed 148(49.3%) that the used of digestive system model to teach lesson on digestion make learning interesting for them.

Based on the responses a good number of them asserted that the Mock-up and Model have have an effect on their performance.

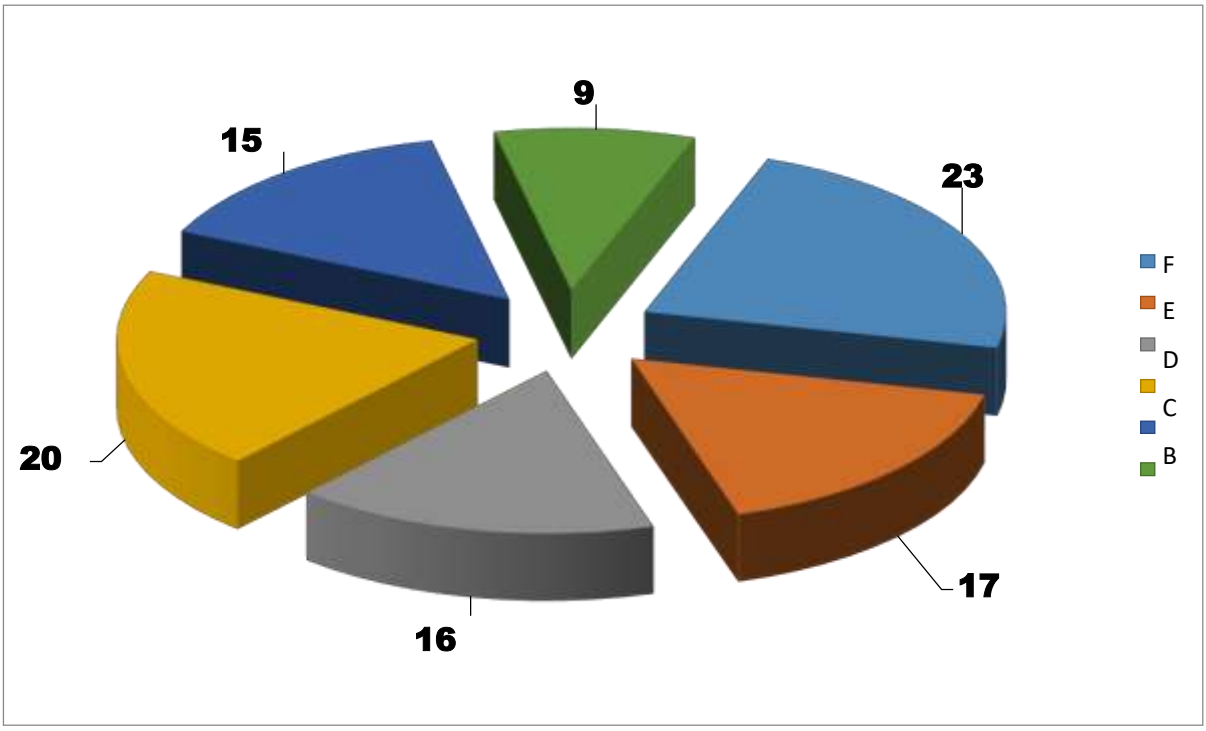
Table 11: Cluster D-The use of Film Projector and student's performance

Items		Strongly disagree	Disagree	Agree	Strongly Agree
I1	The use of film strips in teaching biology make learning real and improve understanding	7 (2.3%)	36 (12%)	149 (49.7%)	108 (36%)
I2	Learning has become very easy as slides are used to explain difficult concepts.	8 (2.7%)	24 (8%)	125 (41.7%)	143 (47.7%)
I3	The use of video tapes in teaching biology stimulate learning.	7 (2.3%)	50 (16.7%)	172 (57.3%)	71 (23.7%)
I4	The use of computer in teaching biology arouse student interesting.	15 (5%)	34 (11.3%)	144 (48%)	107 (35.3%)
I5	The used of power point in teaching biology has increased my passion for the subject.	11 (3.7%)	41 (13.7%)	161 (53.6%)	87 (29%)

Table 11 above represents the descriptive analysis of the types of instructional materials and the use of Film Projector. Five items were developed in order to respond to the question on the effects of the use of Film Projector and their academic performance. The results of the analysis revealed that for items one (item1), the majority of the participant affirmed 149(49.7%) that the use of film strips in teaching biology make learning real and improve understanding. The results also revealed that for item two (item2) most participants strongly agreed 143(47.7%) that learning has become very easy as slides are used to explain difficult concepts. For item three (I3) the majority agree 172(57.3%) that the use of video tapes in teaching biology stimulate learning. The result of the analysis revealed that for (I4) most participants 144(48%) agree that the use of computer in teaching biology arouse their interest. Finally, item five (I5) revealed that most participants agreed 161(53.6%) that the used of power point in teaching biology has increased their passion for the subject. Based on the responses a good number of them asserted that the used of film projector have an effect on their performance.

STUDENT PERFORMANCE AT THE REGIONAL MOCK

Figure 5: presenting the students' performance at the regional mock



The figure above represents the results of the analysis of the students' performance at the regional mock. The overall performance of the students was very good as 77% of the students were observed to have passed the mock and 23% of them failed the mock. The results showed that among those who passed; most students had C grade (20%), followed by 17% of students who had E grade. Very few students had A grade which represented 9% of the sample population. The analysis also revealed that 23% of the students who wrote the biology mock failed.

Hypothesis testing

A hypothesis is a predicted answer to a research question or problem. In social science research, there are two types of hypotheses; the Alternative hypothesis (sometimes called secondary hypothesis) denoted Ha which represents the hypothesis that the researcher wants to verify and the statistical or null hypothesis denoted Ho. These hypotheses are generally formulated in terms of independent and dependent variables. During this research project, four research hypotheses were formulated.

Verification of research hypothesis 1 (RHo1)

H_{a1}: The use of Realia in teaching statistically significantly affects secondary school student's academic achievement in Biology.

H_{O1}: The use of Realia in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

Table 12: Model Summary RHo1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.176[a]	0.031	0.028	1.617

a. Predictors: (Constant), use of Realia in teaching

The independent variable studied, explain that students' performance in Biology is influence by 3.1% by the independent variable, as represented by the R^2 in the table 8.0 above. This indicates that use of Realia in teaching has a very weak influence on their academic performance and 96.9% of their academic performance is influence by other factors). Also, there is a very weak positive relationship (r=0.176, SE=1.617) between the criterion and the predictor variables

Table 13: ANOVA[a] for the RHo1

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	24.822	1	24.822	9.493	0.002[b]
	Residual	773.973	296	2.615		
	Total	798.795	297			

a. Dependent Variable: sum of grades
b. Predictors: (Constant), use of Realia in teaching

The analysis of variance (ANOVA) was used to check the significant level. A significant regression equation was obtained as (F(1, 296)=9.493, P <0.05. The P-value obtained indicated that were was a statistically significant influence of use of Realia in teaching on students' academic performance. The result above reveals that the students' use of Realia in teaching is a strong predictor of students' performance in Biology because they are linearly related.

Table 14: Coefficients[a] RHo1

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.318	0.600		0.530	0.596
	the use of Realia in teaching	0.616	0.200	0.176	3.081	0.002

c. Dependent Variable: sum of grades

The simple linear regression model indicates that the independent variable (use of Realia in teaching) had a positive β coefficient. According to the regression equation established, the use of Realia in teaching at a constant of zero, students' performance in Biology will be 0.318. The findings also reveal that every unit increase in the use of Realia in teaching will lead to a 0.616 increase in students' performance in Biology. At 5% level of significance and 95% level of confidence the use of Realia had a 0.002 level of significance, which means it has a significance influence in students' performance in Biology.

Verification of research hypothesis 2 (RHo2)

H_{a2}: The use of Graphic Material in teaching has a statistically significant effect on secondary school student's academic achievement in Biology.

H_{O2}: The use of Graphic Material in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

Table 15: Model Summary RHo2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.192[a]	0.037	0.034	1.612

a. Predictors: (Constant), the use of Graphic Material

The independent variable studied, explain that students' performance in Biology is influence by 3.7% by the independent variable, as represented by the R^2 in the table 11.0 above. This indicates that the use of Graphic Material has a very weak influence on their academic performance and 96.3% of their academic performance is influence by other factors). Also, there is a very weak positive relationship (r=0.192, SE=1.612) between the criterion and the predictor variables.

Table 16: ANOVA[a] RHo2

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	29.569	1	29.569	11.378	0.001[b]
	Residual	769.226	296	2.599		
	Total	798.795	297			

a→Dependent Variable: sum of grades

b→Predictors: (Constant the use of Graphic Material

The analysis of variance (ANOVA) was used to check the significant level. A significant regression equation was obtained as (F (1, 296) =11.378, P <0.05. The P-value obtained indicated that were was a statistically significant influence of the use of Graphic Material over their academic performance. The result above reveals that the use of Graphic Material is a strong predictor of students' performance in Biology because they are linearly related.

Table 17: Coefficients[a] RHo2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.649	0.453		1.432	0.153
	The use of Graphic Material in teaching	0.568	0.168	0.192	3.373	0.001

a. Dependent Variable: sum of grades

The simple linear regression model indicates that the independent variable (the use of Graphic Material had a positive β coefficient. According to the regression equation established, the use of Graphic Material at a constant of zero, students' performance in Biology will be 0.649. The findings also reveal that every unit increase in the use of Graphic Material will lead to a 0.568 increase in students' performance in Biology. At 5% level of significance and 95% level of confidence students' ability to use the instructional material had a 0.001 level of significance, which means it has a significance influence in students' performance in Biology.

Verification of research hypothesis 3 (RHo3)

H_{a3}: The use of Mock-ups and models in teaching has a statistically significant effects on secondary school student's academic achievement in Biology.

H_{O3}: The use of Mock-ups and models in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

Table 18: Model Summary RHo3

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.152[a]	0.023	0.020	1.624

a. Predictors: (Constant), the use of Mock-ups and models

The independent variable studied, explain that students' performance in Biology is influence by 2.3% by the independent variable, as represented by the R^2 in the table 14.0 above. This indicates Students' academic engagements have a very weak influence on their academic performance and 97.7% of their academic performance is influence by other factors). Also, there is a very weak positive relationship (r=0.152, SE=1.624) between the criterion and the predictor variables.

Table 19: ANOVA[a] RHo3

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	18.460	1	18.460	7.002	0.009[b]
	Residual	780.335	296	2.636		
	Total	798.795	297			

a. Dependent Variable: sum of grades
b. Predictors: (Constant), the use of Mock-ups and models

The analysis of variance (ANOVA) was used to check the significant level. A significant regression equation was obtained as (F(1, 296)=7.002, P <0.05. The P-value obtained indicated that were was a statistically significant influence on students' academic engagements. The result above reveals that the use of Mock-ups and models is a strong predictor of students' performance in Biology because they are linearly related.

Table 20: Coefficients[a] RHo3

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.698	0.555		1.258	0.210
1 instructional materials and students' academic engagement	0.458	0.173	0.152	2.646	0.009

a. Dependent Variable: sum of grades

The simple linear regression model indicates that the independent variable (the use of Mock-ups and models) had a positive β coefficient. According to the regression equation established, the use of

Mock-ups and models at a constant of zero, students' performance in Biology will be 0.698. The findings also reveal that every unit increase in the use of Mock-ups and models will lead to a 0.458 increase in students' performance in Biology. At 5% level of significance and 95% level of confidence the use of Mock-ups and models had a 0.009 level of significance, which means it has a significance influence in students' performance in Biology.

Verification of research hypothesis 4 (RHo4)

H_{a4}: The use of Film Projector in teaching has a statistically significant effects on secondary school student's academic achievement in Biology.

H_{O4}: The use of Film Projectors in teaching has no statistically significant effects on secondary school student's academic achievement in Biology.

Table 21: Model Summary RHo4

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.181[a]	0.033	0.030	1.616

a. Predictors: (Constant), the use of Film Projector

The independent variable studied, explain that students' performance in Biology is influence by 3.3% by the independent variable, as represented by the R^2 in the table 17.0 above. This indicates that the use of Film Projector has a very weak influence on their academic performance and 96.7% of their academic performance is influence by other factors). Also, there is a very weak positive relationship (r=0.181, SE=1.616) between the criterion and the predictor variables

Table 22: ANOVA[a] RHo4

Model		Sum of Squares	df	Mean	F	Sig.
1	Regression	26.271	1	26.271	10.066	0.002[b]
	Residual	772.524	296	2.610		
	Total	798.795	297			

a. Dependent Variable: sum of grades
b. Predictors: (Constant), the use of Film Projector

The analysis of variance (ANOVA) was used to check the significant level. A significant regression equation was obtained as ($F(1, 296) = 10.066$, $P < 0.05$. The P-value obtained indicated that were was a statistically significant influence of the use of Film Projector over their academic performance. The result above reveals that the use of Film Projector is a strong predictor of students' performance in Biology because they are linearly related.

Table 23: Coefficients[a] RHo4

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.261	0.601		0.435	0.664
	the use of Film Projector in teaching	0.596	0.188	0.181	3.173	0.002

a. Dependent Variable: sum of grades

The simple linear regression model indicates that the independent variable (the use of Film Projector) had a positive β coefficient. According to the regression equation established, the use of Film Projector at a constant of zero, students' performance in Biology will be 0.261. The findings also reveal that every unit increase in the use of Film Projector will lead to a 0.596 increase in students' performance in Biology. At 5% level of significance and 95% level of confidence the use of Film Projector had a 0.002 level of significance, which means it has a significance influence in students' performance in Biology.

Implication of the findings

The following implications were made based on the study.

Table 24: Implementation of findings of all the objectives

Variable	Pearson correlation	R square	Unstandardized Beta	Significance	Decision
The use of Realia in teaching	0.176	0.031	0.616	0.002	the use of Realia in teaching had a significant effect on the students' performance in Biology
The use of Graphic Material in teaching	0.192	0.037	0.568	0.001	The use of Graphic Material in teaching had a significant effect on the students' performance in Biology
the use of Mock-ups and models in teaching	0.152	0.023	0.458	0.009	the use of Mock-ups and models in teaching had a significant effect on the students' performance in Biology
the use of Film Projector in teaching	0.181	0.033	0.596	0.002	the use of Film Projector in teaching had a significant effect on the students' performance in Biology

CHAPTER V: DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This study sought to investigate the influence of instructional materials on students' performance in Biology in some selected high schools in Mfoundi Division. In this chapter, the research will be focusing on discussions, conclusion and recommendations of the study. The discussions are related to the literature reviewed and the results obtained from the findings. The study sought to achieve the following objectives:

- Examine the effects of using Realia on secondary school students' academic achievement in Biology.
- Explore the effects of using Graphic Material on secondary school students' academic achievement in Biology.
- Investigate the effects of using Mock-ups and models on secondary school students' academic achievement in Biology.
- Examine the effects of using Film Projector on secondary school students' academic achievement in Biology.

Discussion

The discussion will be done based on the four objectives stated above:

The finding of this study reveals that using Realia in teaching biology has a significant effect on student academic performance. This finding is in line with the study of Nwike and Catherine (2013) who found out that there is significant effect of Realia (instructional materials) on students' achievement in science. Also, Ifeoma (2013) supported this view, she reported that there is statistically significant difference in the educational performance of students when they are taught with instructional materials than when they are not taught with them. This finding was also supported by Dale (1969) that each instructional material provides different learning experiences and that one instructional material may provide more learning experiences than another instructional material, for example real objects provide more learning experiences.

The finding of this study reveals that using graphic materials in teaching biology has a significant effect on student academic performance. According to Jurich (2001), the use of graphic materials such as pictures in teaching provides individual students with a tool to connect new words to a known meaning. This facilitates understanding and memorization. Interestingly, Dash and Dash (2007)

observe that graphic materials are simple to use as they can be shown, hung on the wall, touched and handled by every child. They are usually easily available and can be procured from local environment or produced by teacher. Moreover, Hilmi and Sim (1997) assert that, these graphic materials can be of great variety of size, shape or color, with local interest or appeal. They can also be adapted to the needs of a variety of subjects.

The findings of this study reveal that the use of Mock-ups and models in teaching biology has a significant effect on student academic performance to be used in teaching skeletal system concepts, this is due to the fact that Mock-ups and models make classroom more interesting. Making a classroom interesting is a fundamental way for teacher to encourage and make students learn without forcing them. Mock-ups and models enable students to be more creative and active in learning. This agree with findings of Gambari and Zubairu (2008); Achebe (2008) and Moreno and Mayer (2000), who found that students taught with Mock-ups and models acquired better knowledge, and improved comprehension skills than other groups. This finding is also in line with Edgar Dale's cone of experiences (Dale, 1969). Dale introduced the cone of experiences as a "pictorial device" for showing the progression of learning experiences from direct first-hand participation to pictorial representation and on to purely abstract, symbolic expression. He arranged the learning experiences from the point of view of learners in order of increasing abstractness or decreasing concreteness. The cone indicates that real direct experience has least abstractness and maximum concreteness, followed by contrived experiences which are not very rich, concrete and direct as real-life direct experience. The series followed down to verbal symbols which has the least concreteness and maximum abstractness.

The findings of this study show that using film projectors in teaching biology has a significant effect on student academic performance. This implies the stress teaching and learning become more interactive if the biology teacher uses of illustrative instructional resource. Oren (2017) proved that among the technologies preferred by science teachers to use in their teaching skills presentation include overhead projectors for the purpose that instructional material eases the communication with students and facilitated them to translate the abstract to the real concept. This implies that overhead projectors use in teaching biology teachers equip student with better understanding and easy retention. With the teaching skills they may use in microteaching or teacher practice.

Conclusion

Conclusion It has been emphasized that the students' performance in biology rely greatly on the use of instructional materials. Even though efforts have been made to encourage the intellectual skill and personal growth of the students in science. The major cause of the poor performances is attributed to among others, lack of effective use of appropriate instructional materials for teaching science. However, this study provides empirical support to the fact that performance of students in (Biology) could be greatly improved if the teachers make good use of instructional materials which are relevant to the concepts the teacher is teaching.

Recommendation

Based on the findings and conclusions of this study, the following recommendations were made: the recommendation aimed at making some amendment to the present situation under study. The recommendation will be made to the government, teachers, principals, parent and students.

To the government

The government should encourage authors and publishing houses to produce instructional materials that can easily be used by students. This can be achieved by sponsoring the production of those instructional materials.

The government should make sure those instructional materials are accessible to students and parents. That are the instructional materials should be available and cheap.

- Government should provide incentives to enable teachers acquire instructional materials where necessary.
- Instructional materials should be simple and relevant to the topic.
- Both male and female students should be given equal opportunity in science classrooms.
- Government should provide instructional materials that are free from biases, stereotypes, distortions and prejudices. `

To the teachers

Teachers should understand that they facilitators of the act of teaching-learning process. They should therefore make use of the various types of instructional materials when teaching different topics in order to meet the need of their students.

Science teachers should work hand in hand with their principals to get the right equipment needed for their practical.

Principals of schools

Principal should create an environment that would facilitate students' learning by providing well equipped library and laboratories.

Parents

Parents should endeavour to provide all the instructional material needed by their children to enhance and facilitate the learning process of the children.

Students

Student should strive to make use all the instructional materials put at their disposal by learning how to use every available type of instructional material which will help them to perform highly in all their examinations?

Contribution to Knowledge

- This study empirically establishes that:
- Students exposed to instructional materials performed significantly in their various exams.
- There is significant influence of students' academic engagement on their academic performance
- There is significant influence of knowledge retention of students on their academic performance
- Instructional materials enhance students learning ability.

Limitations of the Study

This study has some limitations that include the following: -

- There was limited time and funds for the study. As the data collection process required two phases, so based on the available resources the researcher went to few schools for data collection.
- The School time table and activities did not give enough room for extensive research work.
- The researcher was not able to achieve the target of 330 because a good number of questionnaires were not properly filled by the respondents, so a good number of them were rejected during the analysis process.
- The researcher faced difficulties in get the exact population of students reading biology in the Mfoundi division from the delegation. Only general information of students were available for the whole region. The researcher had to move from school to school to get the specific population of biology students.

Suggestion for further research

The researcher recommends a need for similar work in other divisions or different regions as the researcher could not fully exploit this work in all the divisions in the region.

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APPENDICES

Appendix A

REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie
********** UNIVERSITE DE YAOUNDÉ I**
****
FACULTE DES SCIENCES DE L'EDUCATION
****
DEPARTEMENT DE CUERRICULAR ET EVALUATION
****

REPUBLIC OF CAMEROON
Peace-Work-Fatherland
****
UNIVERSITY OF YAOUNDE I
********** FACULTY OF EDUCATION**
****
DEPARTMENT CURRICULUM AND EVALUATION
****

APPENDIX A: STUDENT QUESTIONNAIRE

My name is Marcus, a Master's Degree student in the faculty of education, at the University of Yaounde 1. As part of my course requirements, I am undertaking a research project to **assess the influence of instructional materials on Biology students' performances in some selected secondary high schools in the Mfoundi Division**

Kindly fill this questionnaire that would take approximately ten minutes of your time. The questionnaire consists of six (6) sections and is designed for academic purpose. Your answers will be treated with utmost confidentiality.

Instructions: Please answer all the questions in section I below by placing a tick in the box that correspond to your answer. Sections II to VI elicit your opinion according to the four-point Likert scale of strongly disagree (SD) =1, disagree (D) =2, agree (A) = 3 and strongly agree (SA) = 4

SECTION I: Respondents Demographic Details

1. **Gender**

☐ Male ☐ Female

2. **How old are you? ☐ 15-17years ☐ 18-20year ☐ 21-22years ☐ 23-25years**

3. **Indicate the name of your school……**

…….

SECTION II: STUDENT'S ABILITY TO USE THE VARIOUS TYPES OF INSTRUCTIONAL MATERIAL.

	STATEMENTS	SA	A	D	SD
i	I find it easy to use the various types of instructional materials				
ii	I know to extract quality information from pictures and charts to better understand Biology lessons.				
iii	I know how to read Biology textbooks and make summary for better comprehension.				
iv	I use video lessons with no difficulty to make my summaries.				
v	I am acquainted with the various laboratory equipment dissecting set the microscope etc.				

SECTION III: access to biology instructional material

		SA	A	D	SD
i	My parents were able to buy the various types of instructional materials for Biology.				
ii	My school provides us with the necessary laboratory equipment for effective practical lessons				
iii	We have a well-furnished library in our school with the various types of instructional materials in Biology				
iv	I find it easy to access the various types of Biology instructional materials.				
v	The various types of instructional material recommended by the Government are cheap and easy to get in the bookshops around.				

SECTION IV: The use of Mock-ups and models in teaching

		SA	A	D	SD
i	The Instructional materials make learning real and improve understanding				
ii	Instructional materials make Biology lessons easy for me				
iii	Instructional materials make learning Biology lessons interesting to me				
iv	The use of all the categories of instructional materials in teaching Biology has increase my passion for the subject.				
v	Instructional materials has promote my appetite for learning				

SECTION V: Types of instructional materials and the use of Film Projector

		SA	A	D	SD
i	The use of pictures and charts enable me to understand Biology lessons better.				
ii	The animal Specimen, real object and other concrete materials provided for practical stimulate learning.				
iii	I understand my Biology lessons better when handout are used in knowledge acquisition.				
iv	Learnings has become very easy and effective as computers, slides and photographs are used to explain some concepts.				
v	Instructional materials help me to understand difficult Biology concepts easily.				

SECTION VI: Regional Mock Performance Students 'grade in Biology.

☐ A ☐ B☐ C☐ D☐ E☐ F

Thanks for your cooperation

Appendix B

REPUBLIQUE DU CAMEROUN
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****
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****
DEPARTEMENT DE CURRICULA ET EVALUATION
****

REPUBLIC OF CAMEROON
Peace-Work-Fatherland
****
UNIVERSITY OF YAOUNDE I
****
FACULTY OF EDUCATION
****
DEPARTEMENT OF CURRICULUM AND EVALUATION
****

The Dean

N° _____/21/UY1/FSE/VDSSE

AUTHORISATION FOR RESEARCH

I the undersigned, **Professor BELA Cyrille Bienvenu,** Dean of the Faculty of Education, University of Yaoundé I, hereby certify that **MUBAN Marcus,** Matricule **20V3109,** is a student in Masters II in the Faculty of Education, Department: ***CURRICULUM AND EVALUATION***, Specialty: ***DEVELOPER AND EVALUATOR OF CURRICULUM.***

The concerned is carrying out a research work in view of preparing a Master's Degree, under the supervision of **Pr. NDI Julius NSAMI.** His work is titled « ***Influence of instructional materials on biology students' performance. The case of some selected secondary high schools in Mfoundi Division*** **».**

I would be grateful if you provide him with every information that can be helpful in the realization of his research work.

This Authorization is to serve the concerned for whatever purpose it is intended for.

Done in Yaoundé.... 15 DEC 2021

P.S. the Dean, by order

Le Vice-Doyen

Prof. Auguste OWONO-KOUMA