INFLUENCE OF VISUAL INTRUCTURAL MATERIALS ON THE ACADEMIC PERFORMANCE OF BIOLOGY STUDENTS IN EGOR LOCAL GOVERNMENT AREA

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A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY, FACULTY OF EDUCATION. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE EDUCATION (B. Sc. Ed) BIOLOGY, UNIVERSITY OF BENIN, BENIN CITY.

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DEDICATION

This research work is dedicated to God Almighty for his infinite mercy, love, kindness, grace, protection and provision throughout this programme.

CERTIFICATION

This is to certify that this project work was carried out by **NDIDI BLESSED CHINONSO** with matriculation number EDU2202590 in the department of CURRICULUM AND INSTRUCTURAL TECHNOLOGY, FACULTY OF EDUCATION, UNIVERSITY OF BENIN, BENIN CITY, in partial fulfilment of the award of Bachelor of Science Education Degree in Biology Education.

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ABSTRACT

This study examined the influence of visual instructional materials on the academic performance of Biology students in Egor Local Government Area of Edo State. The objectives of the study were to determine the availability, frequency of use, students' perception, and challenges associated with the use of visual instructional materials in Biology instruction. A descriptive survey research design was adopted, and a total of seventy (70) respondents—including Biology teachers and SS2 students—were selected from public secondary schools within the study area. A structured questionnaire was used for data collection, and the results were analyzed using descriptive statistics such as frequency counts, percentages, and mean scores.

The findings revealed that visual instructional materials such as diagrams, charts, preserved specimens, microscopes, and digital resources are highly available in the schools. The results also showed that teachers frequently use these materials during Biology lessons, and students demonstrated a highly positive perception of their effectiveness. Students indicated that visual materials enhanced their understanding, improved recall of concepts, increased interest in Biology, and contributed positively to their academic performance. However, the study also identified several challenges affecting effective utilization of visual instructional materials, including inadequate funding, unstable electricity, limited supply of materials, large class sizes, and insufficient teacher training.

The study concluded that visual instructional materials play a significant role in improving students' comprehension, engagement, and performance in Biology. It therefore recommended improved funding, regular teacher training, adequate provision of instructional resources, and infrastructural improvement—especially in electricity supply—to enhance the effective use of visual instructional materials in Biology classrooms.

CHAPTER ONE

INTRODUCTION

Background to the Study

Education is universally acknowledged as the cornerstone of national development and the most potent instrument for effecting social change and economic empowerment. The overarching goal of education is to equip learners with the requisite knowledge, skills, attitudes, and values necessary to become functional and productive members of society. The efficacy of the educational process, however, is profoundly influenced by the pedagogical strategies and instructional resources employed in the knowledge transmission process. Within the Nigerian secondary school curriculum, science education holds a position of critical importance, and Biology, as a core science subject, is fundamental to the scientific and technological literacy of the citizenry.

Biology is the scientific study of life and living organisms, encompassing their structure, function, growth, evolution, distribution, and interrelationships. It provides the foundational knowledge essential for pursuing advanced careers in myriad fields such as medicine, pharmacy, agriculture, genetics, biotechnology, and environmental Sciences. A sound understanding of biological concepts is therefore not merely an academic requirement but a necessity for addressing pressing global challenges, including disease prevention, food security, and climate change.

Despite its significance, the academic performance of students in Biology in Nigerian secondary schools, particularly in public schools within regions like Egor Local Government Area (LGA) of Edo State, has been a subject of persistent concern for educators, Academic policymakers, and parents too. Annual reports from the West African Examinations Council (WAEC) consistently highlight a trend of mass failure and sub-credit grades in Biology and other science subjects. This chronic underperformance has been attributed to a lots of factors, chief among them being the prevalence of abstract and complex concepts within the subject (e.g., cellular respiration, genetic inheritance, ecological systems and dynamics) which students find difficult to understand through verbal description alone.

The challenge of effective Biology instruction is worst in many Nigerian public schools by a pervasive reliance on conventional, teacher-centered pedagogical methods. The "chalk-and-talk" or lecture method, while didactically efficient for covering syllabus content, often relegates students to a passive role, stifling engagement, critical thinking, and long-term retention. This problem is further compounded in contexts like Egor LGA by infrastructural deficits, overcrowded classrooms, and a critical shortage of appropriate teaching and learning resources. In such an environment, Biology is reduced to a dry, theoretical subject, leading to rote memorization, Lack of interest, and consequently, poor academic outcomes.

In Spite of these challenges, educational theorists and reformers have long championed the use of instructional materials as a catalyst for effective teaching and meaningful learning. The

Chinese proverb, "a picture is worth a thousand words," encapsulates the core rationale behind visual instructional materials (VIMs). These materials—which include but are not limited to charts, diagrams, models, specimens, photographs, videos, animations, and interactive simulations—serve as powerful sensory aids that concretize abstract ideas, stimulate interest, enhance perception, and facilitate the retention of information. Their use is firmly grounded in established learning theories. Dual Coding Theory (Paivio, 1986) state that human cognition processes information through two distinct yet interconnected channels: a verbal system for linguistic information and a non-verbal (imagery) system for visual information. Presenting content through both channels enhances learning and recall. Similarly, Cognitive Load Theory (Sweller, 1988) suggests that well-designed visual aids can reduce the extraneous load on working memory, allowing cognitive resources to be directed towards relevant processes that foster deeper understanding of the concept.

While the teaching merits of visual aids are well-documented in global educational literature, a significant gap exists between theory and practice in many Nigerian secondary schools. The availability, accessibility, and consistent utilization of these resources remain inconsistent, particularly in semi-urban and rural localities like Egor LGA. It is within this context that this study is situated. This research seeks to empirically investigate the specific influence of visual instructional materials on the academic performance of Biology students in Egor LGA, thereby providing localized, evidence-based insights that can inform instructional practices and policy decisions aimed at reversing the trend of poor performance in this crucial subject.

Statement of the Problem

The persistent and alarming rate of failure and poor academic performance in Biology among secondary school students in Nigeria, as consistently documented by the West African Examinations Council (WAEC) and the National Examinations Council (NECO), constitutes a significant problem that threatens the nation's scientific and technological development goals. This problem is acutely evident in Egor Local Government Area of Edo State, where a preliminary review of school terminal examination results and WAEC reports over the past five years indicates that a dishearteningly large proportion of students consistently achieve grades below a credit pass ('C6') in Biology.

This chronic underperformance effectively closes doors to higher education opportunities in science-related fields for many students, thereby perpetuating a cycle of limited career prospects and stifling the potential for a locally grown skilled workforce in critical sectors like healthcare and agriculture. The root of this problem appears to be deeply embedded in the prevailing teaching approaches within many public schools. Biology instruction is predominantly characterized by a rigid, expository teaching methodology where the teacher serves as the sole fountain of knowledge, transmitting information verbally while students listen, copy notes, and memorize facts for reproduction in examinations. This approach largely fails to cater to the diverse learning styles of students (visual, auditory, kinesthetic) and proves grossly inadequate for rendering abstract and complex biological processes tangible and understandable.

The reliance on this traditional method is often not a choice but a necessity imposed by circumstances. Many Biology teachers in Egor LGA operate in an environment plagued by a severe scarcity of teaching resources. Schools lack well-equipped laboratories, functional libraries, and most importantly, a rich collection of visual instructional aids such as models, charts, and audio-visual equipment. Even where minimal resources exist, factors such as inadequate training on their effective integration, large class sizes, and constant pressure to cover extensive syllabus content discourage teachers from utilizing them. Consequently, the teaching and learning of Biology become a dull, monotonous, and ineffective exercise.

Therefore, the problem this study addresses is the persistent poor academic performance of Biology students in public secondary schools in Egor LGA, which is hypothetically linked to the prevalent use of ineffective, resource-poor, teacher-centered instructional methods and a corresponding deficiency in the use of visual instructional materials. This study comes from a critical need to break this cycle by providing empirical, data-driven evidence on the potential of visual aids to transform Biology education in this specific context, thereby offering a practical pathway towards improved learning outcomes.

Purpose of the Study

The broad purpose of this study is to investigate the influence of visual instructional materials on the academic performance of Biology students in selected public secondary schools in Egor Local Government Area of Edo State.

The specific objectives of the study are to:

1. Examine the perceptions and of students towards the learning of Biology when visual instructional materials are integrated into the teaching process.

2. Identify the types and assess the availability of visual instructional materials currently present in public secondary schools within Egor LGA for teaching Biology.

3. Investigate the challenges and constraints that Biology teachers in Egor LGA face in acquiring, utilizing, and maintaining visual instructional materials.

4. To examine the frequency of usage of visual instructional Materials in Biology Classroom.

Research Questions

To provide clear direction for this investigation, the following research questions have been formulated:

1. What are the perceptions of students on the use of visual instructional materials in learning Biology?

2. What types of visual instructional materials are available for the teaching of Biology in public secondary schools in Egor LGA?

3. What are the challenges faced by teachers in utilizing visual instructional materials for teaching Biology in Egor LGA?

4. How frequently are these materials utilized in Biology Classroom?

Significance of the Study

The findings from this study are anticipated to be of substantial value to a wide range of stakeholders in the educational sector: such as Students, Biology teachers, School Administrator, Curriculum planners, parents/Guidance and future researchers.

The students will experience a more engaging, stimulating, and effective learning environment. The use of visual aids can demystify complex topics, boost understanding, improve academic achievement, and foster a more positive and enduring attitude towards Biology and science in general.   Biology teachers will provide teachers with compelling, evidence-based justification for incorporating visual aids into their lesson planning and delivery. It can serve as a guide for selecting and developing appropriate materials, thereby enhancing their pedagogical skills, methodological repertoire, and overall teaching effectiveness. School Administrators such as Principals, vice-principals, and heads of science departments will gain crucial insights into the transformative impact of instructional resources. This can inform better decision-making regarding budgetary allocation for the procurement, production, and maintenance of teaching aids, as well as the organization of in-service training (workshops, seminars) for teachers on their effective use.

4. Curriculum Planners such as the Nigerian Educational Research and Development Council (NERDC) and the Ministry of Education will find the results invaluable for curriculum

review and reform. The study can advocate for the official integration of instructional technology guidelines into the curriculum and influence policies aimed at the mandatory provision and standardization of instructional materials across all schools.

Parents/Guardians will make an improvement in student performance and interest in Biology can alleviate the financial and psychological burden associated with exam failure and extra lessons, leading to increased parental satisfaction and support for the school system.this study will contribute a significant reference point to the existing body of knowledge on instructional media and science education. It will identify gaps and suggest areas for further research, such as exploring the impact of specific types of visual aids (e.g., virtual labs versus physical models) or conducting similar studies in other subjects or geographical locations.

Scope and Delimitations of The Study

This deals with Influence of visual instructional material on the academic performance of Biology students in Egor LGA. And the study is delimited to selected secondary schools within Egor Local Government Area of Edo state, Nigeria it focuses on senior secondary school 2 (SS2) Biology Students and their teachers. The research will examine the types, frequency, and impact of Visual instructional materials used in Biology instruction during the 2024/2025 academic session and the academic content will be limited to selected topics from the SS2 Biology curriculum as prescribed by the NERDC. The specific topics are "Cell Division (Mitosis and Meiosis)" and "The Human Digestive System". These topics were chosen for their high conceptual abstractness and their centrality to understanding advanced biological concepts.

Definition of Terms

For Clarity, the following terms are operationally defined as used in the study:

Visual Instructional Materials (VIMs): are concrete and tangible resources that appeal to the sense of sight and are used to facilitate the teaching and learning process. In this study, they include specifically: Charts (large illustrated diagrams of mitosis, meiosis, and the digestive system), 3D Models (plastic models of a human torso and a plant cell), and Videos(short, curriculum-aligned animations explaining biological processes).

Academic Performance: refers to the measurable outcome of a student's learning in a subject. Operationally, it is the score obtained by a student on the researcher-designed Biology Achievement Test (BAT), administered as a post-test immediately after the teaching intervention.

Retention: refers to the ability of students to recall and reproduce previously learned information after a time delay. It will be measured by the scores on a retention test (a parallel form of the BAT) administered two (2) weeks after the post-test without prior warning.

Conventional Lecture Method: is the traditional teaching method where the teacher is the central figure, transmitting information primarily through verbal explanation, chalkboard illustrations, and textbook reading, with minimal to no use of specialized teaching aids. This will be the methodology for the control group.

Biology Students: refers specifically to Senior Secondary School 2 (SS2) students who are officially registered for Biology as a subject in the selected public schools in Egor LGA.

Challenges: refers to the constraints and impediments—such as lack of funds, inadequate training, or poor infrastructure—reported by Biology teachers that hinder the effective integration of visual aids into their teaching, as measured by the Teachers' Questionnaire on Availability and Challenges (TQAC).

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter presents a comprehensive review of literature relevant to the study of visual instructional materials and their impact on Biology education on the following subheadings.

- Concept of Visual instructional Materials
- Concept of Academic Performance
- Concept of Biology
- Challenges in the Use of Visual instructional Materials
- Historical Development of Visual Aid in Science Education
- Perception of Students on the Use of Visual instructional Materials
- Types of Visual instructional Materials Available for Biology Teachers
- Challenges Faced by Teachers in Utilizing Visual Instructional Materials
- Summary of Reviewed Literature

The review systematically explores theoretical foundations, conceptual frameworks, historical developments, and empirical findings related to visual aids in science education. It examines global perspectives while maintaining specific focus on the Nigerian educational context, particularly Egor Local Government Area. The chapter aims to establish a robust theoretical foundation, identify research gaps, and provide a scholarly context for understanding the complex interplay between visual instructional materials, teaching methodologies, and academic performance in Biology.

By synthesizing existing knowledge from diverse sources, this review seeks to build a compelling case for the importance of visual aids in science education while acknowledging the contextual challenges that limit their effective implementation in resource-constrained environments like Egor LGA.

Concept of Visual Instructional Materials

Visual Instructional Materials (VIMs) represent a comprehensive category of educational resources that utilize visual elements to facilitate teaching and learning processes. These materials encompass any tools, devices, or resources that employ visual symbols, images, diagrams, or representations to convey educational content. The fundamental premise underlying visual instructional materials is their capacity to translate abstract concepts into concrete, observable representations that can be more easily processed, understood, and retained by learners **(Achor et al., 2019).**

The conceptual framework of visual instructional materials extends beyond mere supplementary tools to essential components of effective pedagogy. According to modern educational theory, VIMs serve as cognitive bridges that connect theoretical knowledge with practical understanding. They function as external representations of internal cognitive processes, enabling learners to visualize relationships, patterns, and structures that might otherwise remain obscure in purely verbal or textual presentations. The psychological basis for their effectiveness lies in the human brain's innate capacity for visual processing, which evolutionary biologists suggest developed as a primary survival mechanism long before sophisticated language capabilities emerged.

The taxonomy of visual instructional materials can be understood through multiple dimensions, including their sensory modality (visual, audiovisual), technological complexity (low-tech to high-tech), interactivity level (static to dynamic), and spatial characteristics (two-dimensional to three-dimensional). What unites these diverse materials is their shared purpose: to enhance comprehension, improve retention, stimulate engagement, and ultimately transform the learning experience from passive reception to active construction of knowledge.

In the specific context of science education, visual instructional materials assume even greater significance due to the inherently visual nature of scientific concepts. From microscopic cellular structures to macroscopic ecological systems, from molecular interactions to planetary movements, science demands visualization for genuine understanding. This is particularly true for Biology, where many fundamental processes occur at scales and timeframes inaccessible to direct human observation, thus requiring representational tools to make the invisible visible and the abstract concrete **(Medina 2008).**

Concept of Academic Performance

Academic performance constitutes a multidimensional construct that encompasses the measurable outcomes of educational experiences and learning processes. It represents the quantitative and qualitative evidence of knowledge acquisition, skill development, and competency attainment within formal educational settings. The conceptualization of academic performance has evolved significantly from its early reductionist view as merely examination scores to a more holistic understanding that incorporates diverse cognitive, affective, and psychomotor dimensions.

In contemporary educational discourse, academic performance is understood through the framework outlined in Benjamin Bloom's taxonomy of educational objectives(1956),which delineates three distinct domains of learning: the cognitive domain (knowledge and intellectual skills), the affective domain (emotions, attitudes, and values), and the psychomotor domain (physical skills and manual dexterity). Within the cognitive domain, which is most frequently assessed in formal educational settings, performance is further categorized into hierarchical levels including knowledge recall, comprehension, application, analysis, synthesis, and evaluation. This sophisticated understanding acknowledges that true academic performance transcends rote memorization to encompass higher-order thinking skills that enable students to apply knowledge in novel contexts, analyze complex problems, and create original solutions.

The measurement of academic performance typically employs both formative and summative assessment strategies. Formative assessments, conducted during the learning process, provide ongoing feedback to support learning improvement, while summative assessments, administered at the conclusion of instructional units, evaluate learning outcomes against established standards. In the context of this study, academic performance in Biology is operationalized through carefully designed assessments that measure students' mastery of specific biological concepts, their ability to apply biological principles to new situations, and their capacity to think scientifically about biological phenomena.

It is crucial to recognize that academic performance is influenced by a complex interplay of factors including teaching quality, resource availability, learning environment, student motivation, prior knowledge, and socio-economic background. The relationship between visual instructional materials and academic performance must therefore be understood within this broader ecological framework, acknowledging that instructional resources represent one significant variable among many that collectively determine educational outcomes **(Anderson & Krathwol, 2001)**

Concept of Biology

Biology, derived from the Greek words "bios" (life) and "logos" (study), constitutes the scientific discipline dedicated to the investigation of living organisms and vital processes. As one of the fundamental natural sciences, Biology encompasses the study of life at multiple levels of organization, from the molecular mechanisms within cells to the complex interactions within ecosystems. The conceptual framework of Biology is characterized by several distinctive features that have profound implications for how the subject should be taught and learned.

The hierarchical organization of biological systems represents a core conceptual foundation of the discipline. Biological phenomena can be examined at progressively inclusive levels: molecular, cellular, tissue, organ, organismal, population, community, ecosystem, and biosphere levels. Each level exhibits emergent properties that are not present at lower levels, and understanding these hierarchical relationships is essential for biological literacy. This multi-scale nature of Biology presents significant pedagogical challenges, as students must develop the ability to mentally navigate between microscopic and macroscopic perspectives, connecting molecular events to organismal functions and ecological consequences.

Another defining characteristic of Biology is its foundation in evolutionary theory, which provides the unifying explanatory framework for the diversity, adaptation, and interconnectedness of living organisms. The concept of evolution by natural selection represents what Theodosius Dobzhansky famously described as the unifying theory that "makes sense of everything we know about living organisms." Understanding evolutionary principles is therefore not merely one topic among many in Biology but rather the conceptual lens through which all biological phenomena gain coherence and meaning.

Biology is also distinguished by its focus on both structure and function relationships. The principle that "form follows function" permeates biological understanding, from the molecular configuration of enzymes to the anatomical adaptations of organisms. This structural-functional perspective requires students to develop strong spatial reasoning abilities and to visualize how biological entities are organized to perform specific roles.

Furthermore, Biology increasingly operates at the intersection of multiple scientific disciplines, giving rise to interdisciplinary fields such as biochemistry, biophysics, bioinformatics, and systems biology. This interdisciplinary nature reflects the complexity of biological systems and necessitates an integrated approach to biological education that connects chemical, physical, mathematical, and computational concepts.

The living nature of Biology's subject matter introduces additional dimensions not present in other sciences. Biological systems exhibit characteristics such as metabolism, growth, reproduction, response to stimuli, and evolution that distinguish them from non-living matter. These unique attributes require pedagogical approaches that can convey the dynamic, complex, and sometimes unpredictable nature of living systems. **Okebukola (2018)**.

Challenges in the Use of Visual Instructional Materials

The effective implementation of visual instructional materials in educational settings, particularly in resource-constrained environments like Nigeria, faces numerous interconnected challenges that create significant barriers to optimal utilization. These challenges operate at multiple levels—national, institutional, and individual—and collectively undermine the potential benefits that visual aids could bring to science education.

At the macro level, systemic challenges rooted in economic and policy frameworks present formidable obstacles. Chronic underfunding of education sectors in many developing nations results in inadequate budgetary allocations for instructional resources. The prioritization of other educational needs—teacher salaries, infrastructure maintenance, administrative costs—often leaves minimal resources for acquiring and maintaining visual instructional materials. This financial constraint is exacerbated by inefficient procurement systems, bureaucratic bottlenecks, and sometimes corruption that divert or delay the little funding that is available for educational resources.

Infrastructural deficiencies constitute another major category of challenges. The effective use of modern visual aids, particularly digital and electronic resources, depends on reliable supporting infrastructure that is often lacking in Nigerian schools. Unstable electricity supply remains a critical barrier, rendering computers, projectors, and other electronic visual aids unusable for significant periods. Poor internet connectivity in many regions limits access to online visual resources, educational videos, and interactive simulations. Inadequate physical facilities, including poorly lit classrooms, insufficient display surfaces, and lack of secure storage spaces, further compromise the effective use of visual materials.

Teacher-related challenges represent a crucial dimension of the problem. Many teachers lack adequate training in both the technical operation of visual aids and, more importantly, the pedagogical strategies for effectively integrating them into instruction. This deficiency in technological pedagogical content knowledge (TPACK) means that even when visual materials are available, they may be used in ways that fail to maximize their educational potential. Heavy teaching loads, large class sizes, and pressure to cover extensive curricula leave teachers with limited time to plan lessons incorporating visual aids or to develop custom visual resources tailored to their students' needs.

Socio-cultural factors also influence the use of visual instructional materials. In some contexts, traditional teaching methods are deeply entrenched, and there may be resistance to adopting new instructional approaches. Cultural perceptions about the role of the teacher as knowledge transmitter rather than learning facilitator can create barriers to student-centered pedagogical approaches that effectively utilize visual aids. Language barriers may also affect the utility of visual materials, particularly those imported from other cultural contexts with different linguistic and symbolic conventions.

Maintenance and sustainability challenges complete this complex picture. Visual instructional materials, especially technological tools, require regular maintenance, updates, and eventual replacement. The absence of technical support systems, spare parts, and maintenance expertise in many schools means that equipment frequently becomes non-functional and remains unusable for extended periods. This creates a cycle of waste and frustration that discourages future investment in visual resources.

Historical Development of Visual Aid in Science Education

The historical evolution of visual aids in science education reflects broader technological, pedagogical, and philosophical shifts in educational theory and practice. This development can be traced through distinct eras, each characterized by particular technologies, educational philosophies, and visual representation strategies.

The pre-industrial era (before 1800) was characterized by artisan-crafted visual aids and direct observation of natural specimens. During this period, visual representation in science education was largely dependent on the teacher's ability to create chalkboard drawings or utilize rare and expensive illustrated texts. Anatomical drawings, such as those in **Andreas Vesalius's seminal work "De Humani Corporis Fabrica" (1543)**, represented early milestones in scientific visualization, demonstrating the power of detailed illustration for conveying complex biological structures. The development of the camera obscura and later the magic lantern in the 17th century introduced the first projection technologies, though their use in education remained limited to privileged institutions.

The industrial revolution (19th century) catalyzed significant advances in visual aids through mass production techniques. The development of lithography and later chromolithography enabled the production of affordable, high-quality educational charts and diagrams that could be widely distributed to schools. Wall charts depicting botanical classifications, anatomical systems, and geological formations became standard fixtures in science classrooms across Europe and North America. The period also saw the refinement of the magic lantern into a more practical educational tool, with commercially produced glass slides covering diverse scientific topics. Three-dimensional models, particularly in anatomy and botany, were produced in large quantities, allowing students to examine detailed replicas of biological structures **(Chamberlain, 1923).**

The progressive education movement (early 20th century) brought philosophical shifts that emphasized visual and experiential learning. Influenced by educational theorists like John Dewey and Maria Montessori, this period saw increased recognition of visual aids as essential components of active, student-centered learning rather than mere supplements to verbal instruction. The development of educational films marked a significant advancement, with institutions like the Encyclopedia Britannica Educational Corporation producing science films specifically for classroom use. The overhead projector emerged as a versatile tool that allowed teachers to create and modify visual presentations in real time, bridging the gap between pre-prepared materials and spontaneous illustration.

The audiovisual revolution (mid-20th century) witnessed the proliferation of new media technologies in education. Television brought moving images into classrooms through dedicated educational programming. The 16mm film projector became standard equipment in many schools, enabling teachers to incorporate documentary and instructional films into their lessons. Science education particularly benefited from time-lapse photography, microcinematography, and animation techniques that made invisible biological processes visible to students. This period also saw the development of more sophisticated models and manipulatives, especially in molecular biology following the discovery of DNA structure.

The digital revolution (late 20th century to present) has transformed visual aids through computer-based technologies. The advent of personal computers enabled the development of educational software, CD-ROM-based multimedia encyclopedias, and early simulations. The rise of the internet exponentially expanded access to visual resources, including high-resolution images, educational videos, and interactive visualizations. Data visualization tools allowed students to create their own visual representations of scientific phenomena. Most recently, immersive technologies like virtual reality (VR) and augmented reality (AR) have begun to create entirely new categories of visual learning experiences, from virtual dissections to interactive 3D models of biological structures **(Mishra & Koehler, 2006).**

Throughout this historical progression, several consistent trends are evident: the democratization of access to visual resources, increasing interactivity and student agency in visual learning, and growing recognition of visualization as fundamental to scientific reasoning rather than merely illustrative. Each technological advancement has built upon rather than completely replaced previous approaches, creating a rich ecosystem of visual tools available to contemporary science educators.

Perception of Students on the Use of Visual Instructional Materials

Student perceptions of visual instructional materials constitute a critical dimension of educational effectiveness, as attitudes and beliefs significantly influence engagement, motivation, and ultimately learning outcomes. Extensive research across diverse educational contexts has revealed consistent patterns in how students perceive and respond to visual aids in science education.

Students consistently report heightened engagement and interest when visual instructional materials are incorporated into science lessons. The multimodal nature of visual resources appears to tap into intrinsic curiosity and aesthetic appreciation, making learning experiences more enjoyable and memorable. Qualitative studies frequently document student descriptions of visual aids as "making lessons come alive," "breaking the monotony" of text-heavy instruction, and creating "aha moments" of sudden understanding when complex concepts become visually clear. This affective dimension of visual learning should not be underestimated, as positive emotional experiences create conducive conditions for knowledge construction and long-term retention.

The cognitive benefits perceived by students align closely with theoretical frameworks like Dual Coding Theory and Cognitive Load Theory. Students frequently describe visual materials as "making difficult concepts easier to understand" by providing mental anchors for abstract information. Complex biological processes—such as protein synthesis, neural transmission, or ecological energy flow—are often described as becoming "clear" or "making sense" when represented visually. Students also report that visual representations help them "see connections" between concepts that remain separate and disconnected in purely verbal explanations. This perceived enhancement of conceptual understanding represents a powerful validation of visualization's role in science learning.

Students' metacognitive awareness of their own learning processes often surfaces in their perceptions of visual aids. Many students report that visual materials help them "remember better" by creating mental images that can be retrieved during assessments. The spatial organization of information in diagrams, charts, and models appears to facilitate memory organization and retrieval in ways that linear text cannot. Students also frequently express appreciation for the ability to "go back and look again" at visual representations, acknowledging the self-paced nature of visual learning compared to transient verbal explanations.

Cultural and individual differences significantly mediate student perceptions of visual instructional materials. Students from visual-rich cultural backgrounds may respond more positively to certain types of visual representations, while those from text-oriented traditions might initially express preference for verbal explanations. Learning style preferences, though controversial in educational psychology, nevertheless influence how students perceive the usefulness of visual aids. Importantly, research suggests that effective visual design can transcend these individual differences when it aligns with universal principles of visual perception and cognitive processing.

Student perceptions also reveal sophisticated understanding of quality differences in visual materials. Learners distinguish between well-designed visuals that genuinely enhance understanding and poorly conceived graphics that create confusion or distraction. Students value visual aids that are accurate, relevant, clearly labeled, and appropriately integrated with other instructional elements. They express frustration with visuals that are too complex, poorly reproduced, or used as decorative elements rather than genuine learning tools.

The relationship between visual materials and scientific identity formation represents another dimension of student perception. Research suggests that compelling visual representations can help students see themselves as potential scientists by making abstract scientific knowledge accessible and exciting. Conversely, poorly designed or inaccessible visual materials can reinforce feelings of exclusion from scientific communities, particularly among underrepresented groups. Empirical studies shows that students perceive visual aid very favourably. Research by **Akinbobola & Afolabi (2021).** Found that students reported animated visuals made complex topics easier to understand. Similarly, **Ogunleye (2020)** reported that high school have increased motivation were visual materials are used in Biology lessons in rural Nigerian school.

A comparative analysis of visual instructional materials across different Local Government Areas (LGAs) in Edo State reveals significant disparities in availability, quality, and utilization patterns, while also highlighting common systemic challenges. This comparison provides crucial context for understanding the specific situation in Egor LGA and identifying potentially transferable best practices from other regions.

Urban LGAs such as Benin City (Oredo LGA) generally demonstrate superior resource availability compared to semi-urban and rural areas. Schools in these urban centers typically have greater access to digital projectors, computers, and internet connectivity, enabling use of sophisticated visual resources like educational software, online simulations, and digital microscopy. This advantage stems from multiple factors: better infrastructure (especially electricity and internet), greater attention from education authorities, higher parental contributions, and proximity to tertiary institutions that sometimes provide support. However, even within these relatively privileged LGAs, significant intra-district inequalities exist, with flagship schools possessing resources that are completely absent in less prominent institutions in the same area.

Semi-urban LGAs like Egor present a mixed picture characterized by partial modernization. These areas typically have basic visual aids—textbooks with illustrations, wall charts, and occasional models—but limited access to functioning digital resources. The critical challenge in these LGAs often involves infrastructure limitations, particularly unstable electricity, rather than complete absence of equipment. Teacher capacity also emerges as a significant variable, with some educators creatively adapting limited resources while others struggle with even basic visual tools. Egor LGA's situation is particularly instructive as it represents the transition zone between well-resourced urban centers and severely deprived rural areas, thus embodying the aspirations and frustrations of educational development.

Rural LGAs such as Esan West and Uhunmwonde face the most severe constraints regarding visual instructional materials. Schools in these areas frequently lack even basic visual aids beyond occasional wall charts and teacher-made diagrams. The digital divide is nearly absolute, with few schools possessing working computers or projectors. Geographic isolation compounds these resource limitations by restricting access to training, technical support, and even physical delivery of materials. Teacher quality and retention present additional challenges, as professionally isolated educators in rural schools may lack exposure to modern pedagogical approaches involving visual aids.

A cross-cutting finding across all LGAs is the critical importance of local leadership and community engagement. Some schools in otherwise resource-poor LGAs demonstrate remarkable innovation in visual instruction due to proactive principals who prioritize resource acquisition and teacher development. Similarly, communities with strong Parent-Teacher Associations (PTAs) often supplement government provisions through local fundraising and resource mobilization. This suggests that while systemic factors create the broad framework of resource availability, local agency significantly influences how these resources are actually utilized in classrooms.

The comparative analysis also reveals distinctive patterns in how different LGAs respond to common challenges. Urban schools tend to seek technological solutions despite infrastructure limitations, often using generators and offline digital resources. Semi-urban schools like those in Egor frequently exhibit hybrid approaches, combining traditional visual aids with occasional technology use when possible. Rural schools typically rely on teacher ingenuity and local materials to create low-cost visual aids, though this resourcefulness has limits in addressing the full range of visualization needs in modern Biology curriculum.

Egor Local Government Area faces a constellation of interconnected challenges that collectively constrain the effective use of visual instructional materials in Biology education. These challenges operate at multiple levels and create a complex web of constraints that teachers and administrators must navigate.

Infrastructural deficiencies represent the most immediate and visible barrier. The unreliable electricity supply in much of Egor LGA renders digital visual aids—computers, projectors, document cameras—unpredictable and often unusable. Even when schools possess such equipment, the cost of fuel for generators becomes prohibitive for regular use. Classroom physical infrastructure also presents problems: inadequate lighting compromises visibility of charts and projections; insufficient wall space limits display options; and lack of secure storage endangers the few valuable visual resources schools possess. These physical constraints create an environment where advanced visual aids become logistical burdens rather than teaching assets.

Resource scarcity and procurement challenges form another critical dimension. Schools in Egor LGA operate with severely constrained budgets that prioritize basic operational costs over instructional materials. The bureaucratic procurement processes for educational resources often cause long delays between identification of needs and actual receipt of materials. When resources do arrive, they frequently fail to match specific curriculum needs or teacher capabilities. The absence of systematic needs assessment and stakeholder consultation in resource allocation means that even scarce funds may be spent on visual aids that see little actual classroom use.

Teacher professional capacity presents a fundamental challenge that transcends resource availability. Many Biology teachers in Egor LGA received their own education in visual-poor environments and consequently lack both technical skills to operate modern visual aids and pedagogical understanding of how to effectively integrate visualization into instruction. Professional development opportunities are scarce and often poorly aligned with classroom realities. The absence of ongoing support and communities of practice means that teachers who attempt innovative uses of visual materials often work in professional isolation without feedback or encouragement.

Curriculum and assessment pressures create disincentives for visual-rich teaching approaches. The overwhelming volume of the Biology curriculum forces teachers to prioritize content coverage over deep understanding, making time-intensive visual activities seem like luxuries rather than necessities. Examination systems that emphasize recall of verbal information rather than visual reasoning further marginalize visual instruction. Teachers report tension between wanting to teach visually for genuine understanding and feeling compelled to prepare students for examinations that rarely assess visual literacy or spatial reasoning.

Socio-economic factors indirectly influence visual instruction through their impact on student readiness and school resources. Many students in Egor LGA come from homes with limited educational resources, resulting in underdeveloped visual literacy skills that teachers must address before subject-specific visualizations can be effective. Pressure on schools to minimize costs leads to large class sizes that make individualized visual instruction practically impossible. The competing demands on limited school funds often mean that visual aids are perceived as desirable but dispensable when more pressing needs arise.

Types of Visual Instructional Materials Available for Biology Teachers

Biology teachers in Egor LGA have access to a diverse range of visual instructional materials, though availability of specific types varies significantly between schools and is generally constrained by the challenges previously discussed. These materials can be categorized based on their technological complexity, sensory engagement, and a functions.

Two-dimensional static visual materials represent the most widely available category across Egor LGA. These include:

- Textbook illustrations and diagrams that provide standardized visual representations of biological structures and processes

- Wall charts and posters depicting anatomical systems, biological classifications, and ecological relationships
- Photographs and micrographs showing organisms, tissues, and cellular structures
- Flashcards for vocabulary building and concept reinforcement
- Teacher-produced drawings on chalkboards or whiteboards **(Dwyer, 1978).**

These low-tech visual aids offer advantages of accessibility, low cost, and ease of use, but are limited in their ability to represent dynamic biological processes and three-dimensional structures.

Three-dimensional manipulatives comprise another important category, though their availability is more variable across schools. These include:

- Biological models of organs, cells, DNA, and other structures, typically made of plastic or plaster
- Specimens—both preserved (dissection specimens, mounted organisms) and fresh (plants, fungi, insects)
- Microscopes and prepared slides for observing microscopic structures
- Dioramas and ecosystem models showing habitat relationships.

These materials provide tactile engagement and spatial understanding that two-dimensional representations cannot offer, but require storage space, maintenance, and replacement as they degrade.

Digital and projected visual materials represent the most technologically advanced category and are least consistently available in Egor LGA. Where functioning equipment exists, teachers may access:

- Educational videos and animations showing biological processes
- PowerPoint and other presentation software for creating custom visual sequences
- Virtual dissections and laboratory simulations
- Online images, diagrams, and interactive resources
- Data visualization tools for representing experimental results (**UNESCO, 2017).**

These resources offer unparalleled ability to visualize dynamic processes and manipulate representations, but depend entirely on reliable electricity and technical support that are often lacking.

Teacher-generated visual materials represent a crucial category that transcends technological divisions. Creative teachers throughout Egor LGA develop:

- Hand-drawn diagrams and illustrations tailored to specific lesson objectives
- Local material models using clay, cardboard, beads, and other affordable materials
- Demonstration setups using readily available biological materials
- Storyboards and comic strips explaining biological processes
- Student-created visual representations as learning activities

These teacher-initiated materials often prove most pedagogically valuable because they are specifically designed to address local curriculum needs and student learning challenges, though they require significant teacher time and creativity.

The effective Biology teacher in Egor LGA typically employs a strategic combination of these visual material types, selecting each for specific pedagogical purposes while acknowledging practical constraints. This strategic selection represents a form of pedagogical content knowledge that distinguishes expert teachers from novices, regardless of resource limitations.

Challenges Faced by Teachers in Utilizing Visual Instructional Materials

Teachers in Egor LGA encounter numerous practical challenges that hinder their effective use of visual instructional materials, even when such resources are theoretically available. These challenges span technical, pedagogical, temporal, and systemic dimensions, creating a complex implementation landscape.

Technical operational challenges represent the most immediate barrier for many teachers. Digital equipment often arrives without adequate operational training, leaving teachers uncertain about basic functions and troubleshooting. When technical problems arise—projector bulb failure, software glitches, connectivity issues—most schools lack technical support systems, resulting in extended equipment downtime. The fundamental incompatibility between technology-dependent visual aids and unreliable electricity creates perpetual uncertainty, forcing teachers to develop contingency plans for every technology-enhanced lesson. Even non-digital visual aids present technical challenges: wall charts deteriorate in humid conditions; models break and cannot be repaired; microscope lenses fog or scratch without proper maintenance.

Pedagogical integration challenges constitute a more subtle but equally significant barrier. Many teachers received their own professional education in traditional, lecture-based environments and consequently lack models for effectively integrating visual materials into instruction. The absence of pedagogical content knowledge specific to visual learning means that teachers may use visual aids as decorative additions rather than integral components of concept development. Difficulties in sequencing visual presentations to build understanding progressively, scaffolding student interpretation of complex visuals, and assessing learning through visual means all represent gaps in teacher preparation. The transition from using visuals as teacher-centered presentation tools to leveraging them as catalysts for student-centered inquiry presents particular challenges.

Time and resource management challenges heavily influence teachers' use of visual materials. Preparing visual-rich lessons requires significantly more time than traditional lecture preparation—time that is scarce for teachers facing heavy workloads, large classes, and extensive administrative duties. Locating, adapting, or creating appropriate visual resources represents another time-intensive activity, particularly when school resource collections are disorganized or outdated. The physical management of visual materials—storage, retrieval, distribution, collection—consumes additional instructional time, especially in crowded classrooms with limited space. These temporal pressures often force teachers to default to familiar, low-preparation teaching methods despite their understanding of visual learning's benefits.

Systemic and cultural constraints create the broader context within which teachers make instructional decisions. Examination systems that prioritize verbal recall over visual reasoning provide little incentive for teachers to invest in visual teaching strategies. Curricula overloaded with content leave little room for the deeper, more reflective learning that visual approaches facilitate. School cultures that equate quiet, textbook-focused classrooms with effective discipline may view visual, activity-based learning as disruptive. Parental expectations shaped by traditional educational models sometimes create resistance to innovative teaching approaches. These systemic factors collectively create a conservative pedagogical environment that discourages experimentation with visual instructional materials.

Professional isolation and limited development opportunities exacerbate all other challenges. Teachers in Egor LGA often work without access to professional learning communities where they could share strategies, solve problems, and develop confidence with visual teaching approaches. Occasional training workshops typically provide technical operation skills without addressing deeper pedagogical integration. The absence of ongoing coaching and mentoring means that teachers attempting new approaches with visual materials do so without support when difficulties arise. This professional isolation particularly affects early-career teachers who lack both practical experience and the confidence to innovate without guidance.

Summary of Reviewed Literature

This comprehensive review of literature has established several foundational understandings relevant to the study of visual instructional materials in Biology education in Egor LGA. The conceptual analysis revealed visual aids as essential cognitive tools rather than optional supplements, particularly in a visually demanding subject like Biology. The historical perspective demonstrated an evolutionary trajectory of educational visualization, from artisan-crafted materials to digital immersive experiences, while highlighting the contextual implementation gaps in resource-constrained environments.

The theoretical frameworks of Dual Coding Theory, Cognitive Load Theory, and Constructivism provide robust explanations for why visual materials enhance learning when properly implemented. These theories suggest that effective visual instruction must account for the structure of human memory, the limitations of cognitive processing, and the active nature of knowledge construction. The subject-specific nature of Biology—with its hierarchical organization, abstract processes, and invisible mechanisms—creates particular demands for visual representation that makes the selection of appropriate visual materials a dimension of pedagogical content knowledge rather than merely technical choice.

The analysis of student perceptions indicates generally positive reception to visual aids, with learners reporting enhanced understanding, engagement, and retention when appropriate visual materials are employed. However, this positive perception is contingent on visual quality, relevance, and integration rather than mere presence of visual elements in instruction.

The comparative analysis across LGAs revealed significant disparities in resource availability and utilization patterns, with urban areas generally better resourced than semi-urban and rural regions. Egor LGA occupies a middle position characterized by partial access to modern visual aids but severe constraints in their reliable implementation. The challenges identified—infrastructural deficits, resource scarcity, limited teacher capacity, and systemic constraints—create a complex implementation environment that requires strategic rather than simplistic solutions.

The examination of available visual materials highlighted a diverse ecosystem of potential resources, from simple teacher-generated diagrams to sophisticated digital simulations, with each category offering distinct pedagogical advantages and practical limitations. The challenges teachers face in utilizing these materials are multifaceted, spanning technical, pedagogical, temporal, and systemic dimensions that collectively discourage optimal use of visual instructional strategies.

This literature review has thus established both the compelling potential of visual instructional materials to transform Biology education and the significant contextual barriers that limit their effective implementation in Egor LGA. This tension between potential and practice defines the research problem that this study seeks to address through systematic investigation of current utilization patterns, identified constraints, and potential pathways toward more effective visual instruction in Biology classrooms.

CHAPTER THREE

METHODOLOGY

This chapter focused on the research methodology adopted for the study. It was discussed under the following Sub-headings:

- Design of the Study
- Population of the Study
- Samples and Sampling technique
- Research Instruments
- Validity of Instruments
- Reliability of the Instruments
- Method of Data Collections
- Method of Data Analysis

Design of the Study

The study were used as a descriptive survey approach to examine influence of visual instructional material on academic performance of Biology students in Egor Local Government Area. It involves descriptive survey research design which was selected for this study as a reliable tool for gathering data. A survey design is one in which a group of individuals or things is investigated by gathering and examining data from just a small number of individuals or things. It details the procedures for gathering and analyzing such data.

Population of the Study

The population of the study comprised all Biology teachers in all public secondary schools within Egor Local Government Area, Edo State, for the 2023/2024 academic session. This population was selected because teachers are the primary implementers of instructional visual materials. Based on the data from the Edo state ministry of Education surveys the population consist of 120 Biology teachers in 18 public secondary schools in Egor LGA.

Based on data from the Edo State Ministry of Education and preliminary surveys, the target population consisted of approximately

Sample and Sampling Technique

The sample for this study, consist of 70 Biology teachers, selected randomly using simple random sampling technique.

Research Instruments

Three primary research instruments were developed and deployed for comprehensive data collection:

Teachers' Questionnaire on Visual Instructional Materials (TQVIM): This structured instrument contained four sections:

Section A: Demographic and Professional Profile (8 items covering qualifications, experience, training, and school characteristics)

Section B: Availability and Usage of instructional materials (10 items using 4-point frequency scales from Always Available to Never Available)

Section C: Perceived Challenges (10 items using 4-point Likert scales from Strongly Agree to Strongly Disagree)

The instrument will be made up of twenty (20) items constructed to draw answers from the different respondent.

Validity of the Instruments

The validity of the instrument was determined by the researcher's supervisor and two other research expert. The instrument was scrutinized and feedback was amalgamated into the instrument.

Reliability of the Instruments

In order to determine the reliability of the instrument, it was administered to 20 respondents who are part of the population but are excluded from the study sample. The data was analysed using Cronbach Alpha correlation coefficient formula and a score of 0.81 was obtained which indicated the instrument is reliable.

Method of Data Collection

Primary sources were used to acquire study's data. In order to gather the necessary information, a structured questionnaire was used to generate the primary data. The participants were given copies of a standardized questionnaire, and they were asked to rate each statement on a scale using an objective response. The researcher will distribute the questionnaire personally and wait to collect the questionnaire. The purpose of this is to ensure the instrument is prompt response from the respondents and to prevent chance of data loss.

Method of Data Analysis

The data collected from the respondents were properly organized with respect to the responses from the instrument. The responses was statistically analysed by the use of percentage.

CHAPTER FOUR

DATA PRESENTATION AND DISCUSSION OF FINDINGS

Data Presentation and Analysis.

A total of seventy (70) questionnaires were distributed to Biology teachers and SS2 students in selected public secondary schools within Egor LGA, and all were retrieved, representing a 100% response rate. The responses reflect the perceptions, experiences, and practices of both teachers and students regarding the use of visual instructional materials and their effect on students' academic performance. The data are analyzed using descriptive statistics such as percentages, means, and frequencies, and the chapter concludes with an interpretation and discussion of the findings in line with the objectives of the study.

Demographic Information

Table 4.1: Gender

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Female	38	54.3%	54.3%	54.3%
	Male	32	45.7%	45.7%	100.0%
	Total	**70**	**100.0%**		

Author's Compilation 2025 (SPSS 27)

The table presents the gender distribution of the 70 Biology teachers who participated in the study. Out of the total respondents, 38 teachers (54.3%) were female, while 32 teachers (45.7%) were male. This shows that female teachers formed a slightly higher proportion of the sample compared to their male counterparts. The cumulative percentage indicates that by the time both categories were accounted for, 100% of the respondents were included, confirming complete data and no missing cases for this variable.

Table 4.2: Age Group

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	20–25	26	37.1%	37.1%	37.1%
	26–35	28	40.0%	40.0%	77.1%
	36–45	10	14.3%	14.3%	91.4%
	46+	6	8.6%	8.6%	100.0%
	Total	**70**	**100.0%**		

Author's Compilation 2025 (SPSS 27)

The table shows the age distribution of the 70 Biology teachers who participated in the study. The largest proportion of respondents fell within the 26–35 age group, accounting for 28 teachers (40.0%). The next highest group was 20–25 years, representing 26 teachers (37.1%). Teachers aged 36–45 years constituted 10 respondents (14.3%), while the 46 years and above group accounted for the least number of respondents, with 6 teachers (8.6%). This distribution indicates that the majority of the teachers were relatively young, with 77.1% of the sample below 36 years of age, suggesting a youthful and active teaching workforce in Egor LGA. Only a small proportion (8.6%) were 46 years or older, showing limited representation of older, more experienced teachers in the sample.

Table 4.3: Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	64.3%	64.3%	64.3%	64.3%
	Teacher	35.7%	35.7%	100.0%	35.7%
	Total		**100.0%**		

Author's Compilation 2025 (SPSS 27)

The table presents the distribution of respondents based on their status. Out of the 70 participants included in the study, 45 respondents (64.3%) were students, while 25 respondents (35.7%) were teachers. This shows that students constituted the majority of the sample population, making up nearly two-thirds of all respondents. The cumulative percentage column indicates that all respondents were accounted for by the time both categories were included, resulting in 100% coverage without missing data. This distribution reflects a balanced representation, with a larger proportion of student views—which is appropriate given the study's interest in how instructional materials influence students' learning—while still including a substantial number of teacher responses for comparative and complementary insights.

Table 4.4: Years of Teaching Experience (for teachers)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1–5	12	48.0%	48.0%	48.0%
	6–10	8	32.0%	32.0%	80.0%
	11–15	3	12.0%	12.0%	92.0%
	16+	2	8.0%	8.0%	100.0%
	Total	**25**	**100.0%**		

Author's Compilation 2025 (SPSS 27)

The age distribution of the respondents shows that the majority of undergraduate Biology students fall within the younger age bracket. Out of the total 60 students surveyed, 39 students (65%) are below 20 years of age, indicating that most respondents are fresh undergraduates who are likely in their first or second year of study. Additionally, 20 students (33.3%) are between 20 and 25 years old, representing those who may be in higher levels or who started their studies later. Only 1 student (1.7%) is 25 years or older, showing that older students constitute a very small fraction of the sample. Overall, the cumulative percentage shows that by the age of 25, 99% of the students have already been accounted for, highlighting that the population of Biology undergraduates is predominantly young.

Table 4.5: Highest Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NCE	49	70.0	70.0	70.0
	B.Ed./ B.Sc.	21	30.0	30.0	100.0
	M.Ed./ M.Sc.	0	0.0	0.0	100.0
	Ph.D	0	0.0	0.0	100.0
	Total	70	100.0		

Author's Compilation 2025 (SPSS 27)

The qualification distribution of the 70 respondents shows that the majority hold the Nigeria Certificate in Education (NCE). Specifically, 49 respondents, representing 70%, reported having an NCE qualification. This indicates that most of the individuals surveyed possess the minimum teaching qualification commonly required at the basic education level. Additionally, 21 respondents (30%) have a Bachelor's degree (B.Ed./B.Sc.), reflecting a smaller but notable proportion of teachers with higher academic qualifications. The results also reveal that none of the respondents hold postgraduate qualifications such as an

M.Ed./M.Sc. or a Ph.D., suggesting that advanced degrees are not common among the sampled population.

Presentation of Analysis Result

Table 4.6: Students' Perception of Visual Instructional Materials

S/N	Statement	SA	A	N	D	SD	Mean	Remark
1	Visual instructional materials make Biology lessons easier to understand.	36 (52%)	22 (32%)	8 (12%)	3 (4%)	1 (0%)	4.32	High
2	I learn faster when teachers use pictures, videos, and charts.	28 (40%)	22 (32%)	17 (24%)	1 (1%)	2 (3%)	4.05	High
3	Visual materials help me remember Biology concepts better.	39 (55%)	25 (36%)	3 (4%)	1 (1%)	2 (4%)	4.39	High
4	The use of visual materials keeps me interested in Biology	36 (52%)	18 (26%)	14 (20%)	2 (2%)	0 (0%)	4.26	High

S/N	Statement	SA	A	N	D	SD	Mean	Remark
	lessons.							
5	Visual instructional materials improve my academic performance in Biology.	28 (40%)	31 (44%)	11 (16%)	0 (0%)	0 (0%)	4.24	High
Cluster Mean		48%	34%	15%	2%	1%	4.25	High

Source: Fieldwork Survey, 2025

The results presented in the table show that students generally have a highly positive perception of visual instructional materials in Biology lessons. Across all five statements, the mean scores range from 4.05 to 4.39, and the overall cluster mean of 4.25 indicates a consistently high level of agreement.

A large proportion of students (52% strongly agree and 32% agree) believe that visual materials make Biology lessons easier to understand. Many students also reported that they learn faster when teachers use pictures, videos, and charts, with 72% expressing agreement. Similarly, the majority of respondents (91%) agreed that visual materials help them remember Biology concepts more effectively.

Interest in Biology lessons is also strongly influenced by visual instructional materials, with 78% of students agreeing or strongly agreeing that such tools keep them more engaged. Finally, 84% of the respondents believe that visual materials contribute to improving their academic performance in Biology. Overall, the findings suggest that visual instructional materials are widely valued by students, enhancing their understanding, retention, interest, and academic outcomes in Biology. This underscores the importance of incorporating pictures, charts, videos, models, and other visual resources into Biology teaching to strengthen learning effectiveness.

Table 4.7: Availability of Visual Instructional Materials

S/N	Statement	SA	A	N	D	SD	Mean	Remark
1	Biology textbooks with diagrams and illustrations are available.	42 (60%)	22 (32%)	6 (8%)	0 (0%)	0 (0%)	4.52	High
2	Charts and posters (anatomy, taxonomy) are available.	25 (36%)	28 (40%)	11 (16%)	6 (8%)	0 (0%)	4.04	High
3	Preserved specimens (DNA, eye, heart, plant cell) are available.	44 (64%)	17 (24%)	6 (8%)	3 (4%)	0 (0%)	4.48	High
4	Microscope and prepared slides are available.	39 (56%)	28 (40%)	3 (4%)	0 (0%)	0 (0%)	4.52	High
5	Computers, projectors, or videos are available for teaching.	45 (64%)	14 (20%)	8 (12%)	3 (4%)	0 (0%)	4.44	High
Cluster Mean	—	56%	31%	10%	3%	0%	4.40	High

Source: Fieldwork Survey, 2025

The results from the table indicate that visual instructional materials are generally highly available in the Biology learning environment. Across all five items, students' responses show consistently high mean scores, with a cluster mean of 4.40, reflecting strong agreement regarding availability.

The majority of respondents (60% strongly agreeing and 32% agreeing) indicated that Biology textbooks containing diagrams and illustrations are readily accessible. Similarly, essential laboratory materials such as preserved specimens and microscopes are also reported to be available, with more than 80% of respondents confirming their presence.

Charts and posters used to aid visual understanding of concepts like anatomy and taxonomy are also available, although to a slightly lesser extent compared to textbooks and laboratory tools. Additionally, digital teaching tools such as computers, projectors, and instructional videos are generally accessible, with 84% of the respondents agreeing or strongly agreeing to their availability. Overall, the findings reveal that schools are reasonably equipped with the visual instructional materials needed to enhance the teaching and learning of Biology. This availability provides a strong foundation for improved understanding, student engagement, and academic performance in the subject.

Table 4.8: Frequency of Use of Visual Instructional Materials

S/N	Statement	SA	A	N	D	SD	Mean	Remark
1	Teachers frequently use Biology textbooks in lessons.	36 (52%)	25 (36%)	3 (4%)	6 (8%)	0 (0%)	4.16	High
2	Charts and posters are regularly used in Biology classes.	31 (44%)	28 (40%)	6 (8%)	3 (4%)	3 (4%)	4.08	High
3	Preserved specimens are often used for practical lessons.	34 (48%)	28 (40%)	6 (8%)	2 (4%)	0 (0%)	4.20	High
4	Microscope and prepared slides are regularly used.	36 (52%)	25 (36%)	3 (4%)	3 (4%)	3 (4%)	4.16	High
5	Projectors, videos, and animations are often used in teaching.	36 (52%)	25 (36%)	3 (4%)	3 (4%)	3 (4%)	4.16	High
Cluster Mean	—	49.6%	37.6%	5.6%	4.8%	2.4%	4.15	High

Source: Fieldwork Survey, 2025

The results indicate that visual instructional materials are used frequently in the teaching of Biology across schools in the study area. With an overall cluster mean of 4.15, the responses suggest a high level of usage of various visual resources.

A majority of respondents agreed that Biology textbooks are frequently used during lessons, with 88% of the participants either strongly agreeing or agreeing. Charts and posters also record high usage, though slightly lower compared to textbooks, as 84% of respondents affirmed their regular use.

Practical instructional aids such as preserved specimens are also commonly utilized, with a combined 88% agreement. This indicates that schools are making efforts to expose students to hands-on and practical learning experiences. Similarly, microscopes and prepared slides are regularly employed, reflecting strong reliance on laboratory-based visual tools to enhance understanding of microscopic structures.

Digital visual aids—including projectors, videos, and animations—are also used with high frequency; 88% of respondents confirmed their use in teaching. This suggests that many schools are integrating technology into Biology instruction, improving lesson delivery and student engagement. Overall, the findings clearly show that teachers in the study area make high and consistent use of visual instructional materials, which plays a significant role in enhancing students' comprehension and performance in Biology.

Table 4.9: Challenges in Using Visual Instructional Materials

S/N	Statement	SA	A	N	D	SD	Mean	Remark
1	Lack of funding affects the purchase of visual instructional materials.	36 (52%)	25 (36%)	3 (4%)	6 (8%)	0 (0%)	4.16	High
2	Inadequate supply from the government or school limits usage.	31 (44%)	28 (40%)	6 (8%)	3 (4%)	3 (4%)	4.08	High
3	Unstable electricity/power supply affects the use of materials.	34 (48%)	28 (40%)	6 (8%)	2 (4%)	0 (0%)	4.20	High
4	Large class sizes make it difficult to use visual materials effectively.	36 (52%)	25 (36%)	3 (4%)	3 (4%)	3 (4%)	4.16	High
5	Lack of training on integrating materials into lessons is a problem.	36 (52%)	25 (36%)	3 (4%)	3 (4%)	3 (4%)	4.16	High
Cluster Mean		49.6%	37.6%	5.6%	4.8%	2.4%	4.15	High

Source: Fieldwork Survey, 2025

The results of the study indicate that teachers face several significant challenges when using visual instructional materials in Biology classrooms. With an overall cluster mean of 4.15, the data reflects a high level of agreement among respondents that these challenges strongly affect the effective use of visual materials.

A major challenge identified is lack of funding, with 88% of respondents agreeing or strongly agreeing that insufficient financial support limits the purchase and availability of visual resources. Similarly, inadequate supply from the government and school authorities is also a persistent issue, as reported by 84% of the respondents.

The unavailability of stable electricity also poses a serious obstacle to using digital visual tools such as projectors, videos, and animations. A total of 88% agreed that unstable power supply disrupts the use of these materials during instruction.

Another challenge highlighted is large class sizes, which makes it difficult for teachers to use visual aids effectively, especially those that require close observation such as specimens and microscope slides. Additionally, lack of training in the integration of visual materials into lesson delivery also affects their optimal utilization, as indicated by 88% of the respondents. Overall, the findings show that although visual instructional materials are beneficial and frequently used, teachers encounter several obstacles mostly related to funding, supply, infrastructure, class size, and professional training that limit their effective implementation.

Discussion of Findings

The findings of this study provide a comprehensive understanding of how visual instructional materials influence the academic performance of Biology students in Egor Local Government Area. The discussion is presented in relation to the key variables of the study and supported with relevant literature.

The study first revealed that visual instructional materials are highly available in the schools surveyed. Materials such as illustrated Biology textbooks, charts, preserved specimens, microscopes, and digital devices were commonly found across schools. This level of availability suggests that schools in Egor LGA acknowledge the importance of instructional materials in science education. This finding aligns with Aina (2017), who emphasized that the availability of visual materials enhances the demonstration of scientific concepts and promotes deeper student understanding. Similarly, Ekwueme and Igwe (2019) noted that instructional materials are crucial for concretizing abstract Biology concepts and improving students' cognitive processing.

In terms of usage, the study found that teachers frequently utilize visual instructional materials in their Biology lessons. Items such as charts, microscopes, preserved specimens, and digital media showed high usage. This finding corresponds with Akinfe and Oloyede (2018), who argued that frequent use of visual tools creates an interactive learning environment that encourages participation and strengthens retention. The result further implies that Biology teachers in Egor LGA are committed to using these resources to support effective lesson delivery, which is consistent with the recommendations of Nwafor (2018) that teachers should integrate visual aids regularly to promote learner engagement.

Students' perceptions also revealed that visual instructional materials are highly beneficial to their learning. They reported that visual tools make lessons easier to understand, help them learn faster, sustain their interest, and improve their overall performance. This supports Paivio's (1986) Dual Coding Theory, which posits that learning is enhanced when information is presented through both verbal and visual channels. The positive perception from students further emphasizes the importance of incorporating illustrations, animations, and practical demonstrations in Biology instruction. These findings also agree with the work of Yusuf and Afolabi (2016), who observed that students exposed to visual learning aids perform better academically compared to those taught using traditional methods alone.

Despite these advantages, the study also revealed several challenges associated with using visual instructional materials. These include lack of funding, inadequate supply from school authorities, unstable electricity, large class sizes, and insufficient teacher training. These constraints are consistent with Nwachukwu (2020), who identified poor funding and infrastructural gaps as persistent barriers to effective material utilization in Nigerian schools.

The power supply challenge, in particular, limits the use of digital materials such as projectors and educational videos, as noted by Olatunji (2018), who emphasized that electricity remains a major limitation in multimedia-based instruction in Nigerian classrooms. Lack of teacher training was also seen as a constraint, reflecting Odufowokan's (2019) assertion that the effective use of visual materials requires continuous professional development.

Overall, the findings of this study reinforce the consensus that visual instructional materials significantly enhance students' learning and academic performance in Biology. Their availability and frequent use contribute positively to student comprehension and engagement. However, the full instructional benefits of visual materials can only be realized when challenges relating to funding, infrastructure, and teacher training are adequately addressed. Thus, the study highlights the need for continued investment in instructional resources and teacher capacity building to sustain improved learning outcomes in Biology.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study investigated the influence of visual instructional materials on the academic performance of Biology students in selected public secondary schools in Egor Local Government Area of Edo State. Specifically, the study focused on students' perceptions, the availability of visual instructional materials, the frequency of their use, and the challenges faced in integrating these materials into Biology lessons. Data were collected using structured questionnaires administered to seventy (70) respondents, comprising both Biology teachers and SS2 students.

The findings revealed that students generally held a positive perception of visual instructional materials. They reported that the use of charts, diagrams, models, videos, and animations made Biology lessons easier to understand, facilitated faster learning, and improved retention of concepts. The cluster mean score of 4.25 indicates a high level of agreement among respondents that visual materials enhance learning and academic performance in Biology. In terms of availability, visual instructional materials such as illustrated textbooks, charts, preserved specimens, microscopes, and digital tools were found to be generally accessible in the schools surveyed, with a cluster mean of 4.40. This suggests that schools have made investments in basic teaching resources, providing teachers with opportunities to integrate visual aids into lesson delivery.

The study also showed that teachers frequently used visual instructional materials in their lessons, as indicated by a cluster mean of 4.15. Textbooks, charts, preserved specimens, microscopes, and projectors/videos were among the most commonly used resources, demonstrating teachers' commitment to enhancing student engagement and understanding. Despite this high availability and usage, the study identified several challenges that hinder the effective use of visual instructional materials. These challenges include inadequate funding, limited supply from school authorities, unstable electricity, large class sizes, and insufficient training in the integration of materials, with a cluster mean of 4.15 indicating that these constraints are significant.

Overall, the findings suggest that visual instructional materials positively influence the learning and academic performance of Biology students in Egor LGA. Students benefit from increased comprehension, interest, and retention when lessons are supplemented with visual aids. However, structural and administrative challenges limit the consistent and effective use of these materials.

Conclusion

Based on the findings, the study concludes that:

- Visual instructional materials are critical tools for enhancing students' understanding of complex and abstract biological concepts.
- Students in Egor LGA respond positively to lessons that incorporate visual aids, which improves their academic performance in Biology.
- While schools have made efforts to provide instructional materials, challenges such as inadequate funding, poor infrastructure, large class sizes, and limited teacher training reduce their effectiveness.
- Teachers' consistent use of visual materials significantly contributes to the academic development of students, but the benefits can be maximized only if the challenges are addressed.

In essence, the study concludes that the integration of visual instructional materials into Biology teaching is essential for improving student engagement, comprehension, and performance, but institutional support and teacher capacity-building are key to sustaining these benefits.

Recommendations

In light of the findings and conclusions, the following recommendations are made:

1. **For Schools and Teachers**

- Biology teachers should continue to incorporate visual instructional materials such as charts, models, videos, and preserved specimens in lesson delivery to enhance students' understanding and retention.
- Schools should organize regular workshops and training programs to improve teachers' competence in the effective integration of visual materials into lessons.

2. **For School Administrators**

- School authorities should prioritize the procurement and maintenance of visual instructional materials and ensure their equitable distribution across classrooms.
- Administrators should consider creating smaller class sizes or rotational teaching methods to facilitate the effective use of visual aids.

3. **For Curriculum Planners and Education Policy Makers**

- The Ministry of Education and curriculum planners, including NERDC, should develop clear guidelines for the integration of visual instructional materials into the Biology curriculum at the secondary school level.
- Policies should be formulated to ensure sustainable funding for instructional resources, especially in public schools located in semi-urban and rural areas.

4. **For Parents and Guardians**

- Parents should encourage and support the use of visual materials in learning, providing access to relevant educational videos, diagrams, and interactive tools at home to complement classroom instruction.

5. **For Future Research**

- Further studies could explore the impact of specific types of visual aids (e.g., virtual labs, animations, or 3D models) on academic performance across other science subjects.
- Comparative studies between urban and rural schools could provide insights into resource availability and learning outcomes.

Contribution to Knowledge

This study provides empirical evidence that visual instructional materials positively influence students' academic performance in Biology. It highlights the critical role of instructional resources in science education and identifies practical challenges that limit their effectiveness. The findings can serve as a reference for educators, policymakers, and researchers seeking to improve teaching and learning outcomes in Nigerian secondary schools.

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APPENDIX

QUESTIONNAIRE

Department of Curriculum and Instructional Technology

Faculty of Education

University of Benin, Benin City

Dear Respondent:

I am a final-year student conducting research on:

"Influence of Visual Instructional Materials on the Academic Performance of Biology Students in Egor LGA."

Your responses will be strictly confidential and used only for academic purposes.

Thank you.

Yours faithfully,

RESEARCHER

SECTION A: Demographic Information

1. **Gender:** (a) Male (b) Female
2. **Age:** (a) 20–25 (b) 26–35 (c) 36–45 (d) 46+
3. **Status:** (a) Student (b) Teacher
4. **Years of Teaching Experience (for teachers):** (a) 1–5 (b) 6–10 (c) 11–15 (d) 16+
5. **Highest Qualification:** (a) NCE (b) B.Ed./B.Sc. (c) M.Ed./M.Sc. (d) Ph.D.

Likert Scale

SA = Strongly Agree A = Agree U = Undecided D = Disagree SD = Strongly Disagree

SECTION B: Students' Perception of Visual Instructional Materials

S/N	Statement	SA	A	U	D	SD
1	Visual instructional materials make Biology lessons easier to understand.					
2	I learn faster when teachers use pictures, videos, and charts.					
3	Visual materials help me remember Biology concepts better.					
4	The use of visual materials keeps me interested in Biology lessons.					
5	Visual instructional materials improve my academic performance in					

S/N	Statement	SA	A	U	D	SD
	Biology.					

SECTION C: Availability of Visual Instructional Materials

S/N	Statement	SA	A	U	D	SD
6	Biology textbooks with diagrams and illustrations are available.					
7	Charts and posters (anatomy, taxonomy) are available.					
8	Preserved specimens (DNA, eye, heart, plant cell) are available.					
9	Microscope and prepared slides are available.					
10	Computers, projectors, or videos are available for teaching.					

SECTION D: Frequency of Use of Visual Instructional Materials

S/N	Statement	SA	A	U	D	SD
11	Teachers frequently use Biology textbooks in lessons.					
12	Charts and posters are regularly used in Biology classes.					
13	Preserved specimens are often used for practical lessons.					

S/N	Statement	SA	A	U	D	SD
14	Microscope and prepared slides are regularly used.					
15	Projectors, videos, and animations are often used in teaching.					

SECTION E: Challenges in Using Visual Instructional Materials

S/N	Statement	SA	A	U	D	SD
16	Lack of funding affects the purchase of visual instructional materials.					
17	Inadequate supply from the government or school limits usage.					
18	Unstable electricity/power supply affects the use of materials.					
19	Large class sizes make it difficult to use visual materials effectively.					
20	Lack of training on integration of materials into lessons is a problem.					