LANGUAGE ISSUE: A BARRIER IN BIOLOGY STUDENTS' CONCEPTUALIZATION OF BIOLOGICAL CONCEPTS

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

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CERTIFICATION

We, the undersigned, certify that this project is adequate in scope and was carried out by **Faith EDOKPEAWE** with matriculation number **EDU2101997** in the Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin City, Edo State, Nigeria. In partial fulfilment for the award of B.Sc. (Ed.) Degree in Biology.

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DEDICATION

This project is dedicated to God Almighty for His Goodness and Mercies.

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ABSTRACT

The study investigated language issues as a barrier in Biology students' conceptualization of biological concepts, focusing on SSS III students in public senior secondary schools in Egor Local Government Area of Edo State. It specifically examined the language-related challenges students encountered in conceptualizing biological concepts, assessed their proficiency in writing and applying biological terminologies accurately, and identified major hindrances affecting their mastery of these terminologies.

A survey research design was adopted, drawing from a population of 3,811 SSS III Biology students across thirteen public schools. Two schools were selected via simple random sampling, with all SSS III students censused as the sample. Data were collected using the validated Language Issue in Biology Questionnaire (LIBQ) on a Likert scale (SA, A, D, SD) for most research questions and an achievement test to evaluate terminology proficiency. Content and face validity were ensured through expert review, while reliability was established via Cronbach's alpha from a pilot study with 20 students. Descriptive statistics, including mean scores, percentages, and frequency, analyzed the data, with means of 2.50 and above indicating agreement.

Findings indicated that students demonstrated complete mastery (100%) of species terminology and high comprehension (94-99%) in areas like carbohydrate metabolism, glycolysis, decomposers, and photosynthesis, reflecting strong foundational knowledge. Moderate performance (80-93%) appeared in terms such as homeostasis, phospholipid, and chloroplast, often due to spelling issues despite conceptual grasp, while lowest scores (below 80%) occurred in complex terms like phototropism, cytoskeleton, and biodiversity, revealing misconceptions. Students reported significant language barriers, including difficulty with complex scientific English, confusion from jargon, and improved understanding via everyday or local language explanations.

The study strongly recommended that teachers relate biological terms to real-life examples and prioritize meanings over rote memorization to enhance retention and application. Curriculum developers were urged to integrate everyday language explanations alongside local translations for complex terminologies, bridging linguistic gaps effectively. Additionally, school administrators were encouraged to organize targeted trainings for teachers on leveraging local languages in Biology instruction, fostering inclusive pedagogy

CHAPTER ONE
INTRODUCTION

Background to the Study

The mastery of biological concepts is crucial for students offering Biology, yet persistent underachievement in Biology examinations remains a concern in many educational contexts. A significant factor contributing to this challenge is the language barrier that impedes students' conceptualization and understanding of biological knowledge. Biology, as a subject, is replete with specialized terminologies and abstract concepts that require not only content knowledge but also a high level of language proficiency for effective comprehension, communication, and application. The issue of language as a barrier in Biology education has gained increasing attention in recent years, as educators and researchers recognize that students' struggles are often rooted in their inability to navigate the linguistic demands of the subject rather than a lack of cognitive ability or interest in science.

Biology is the scientific study of life and living organisms, encompassing their structure, function, growth, evolution, distribution, and taxonomy. According to Kinyua et al. (2024), biology as a core science subject enables learners to conceptualize fundamental concepts such as genetics, evolution, and cellular processes that underpin all living entities. Batool et al. (2021) add that biology is characterized by a high density of content and a vast array of specialized terminologies, which present unique challenges for both teaching and learning.

Language plays a central role in the learning process, serving as the primary medium through which scientific ideas are conveyed, discussed, and internalized. In the context of biology, students are expected to engage with a vast array of new and often unfamiliar terms such as “mitochondria,” “photosynthesis,” “homeostasis,” and “allele,” to mention but a few which are seldom encountered in everyday language or in students’ mother tongues. The disconnection between the language of instruction and students’ linguistic backgrounds creates a formidable barrier, particularly for those who do not use the language of instruction as their first language. This disconnection is further exacerbated by the fact that many biological terms cannot be directly translated into local languages, leaving students to grapple with concepts that seem alien and abstract.

The importance of language in learning biology is shown by research indicating that students’ performance in Biology is closely connected to their language skills. For instance, Batool, Chachar, and Alvi (2021) found that students often lack the vocabulary necessary for expressing scientific concepts, leading to confusion and silence in the classroom. Similarly, a recent study in Kenya demonstrated that language proficiency significantly influences students’ ability to comprehend and express biological content, with the recommendation that language development activities be integrated into Biology instruction to enhance understanding and performance (Kinyua et al., 2024). These findings highlight the urgent need to investigate the role of language in the conceptualization of biological concepts, as language-related difficulties can hinder students’ ability to construct meaningful connections between new knowledge and prior experiences, ultimately affecting their achievement in examinations.

Language is defined by Halliday (1978) as "a system of meanings, accompanied by forms and functions, which enables people to communicate." In the educational context, language serves as the vehicle for transmitting knowledge, facilitating thinking, and fostering interaction among learners and teachers. Batool et al. (2021) emphasize that language is not only a means of communication but also a way to construct personal understanding and knowledge, especially in science learning. Kinyua et al. (2024) further assert that language proficiency is essential for the effective comprehension and expression of biological concepts, making it a critical component of science education.

The importance of language in learning, particularly in science education, has been extensively documented. Language is the medium through which scientific knowledge is constructed, shared, and assessed. Batool et al. (2021) argue that language efficiency facilitates learning by enabling students to make meaningful connections between new scientific concepts and their prior knowledge. Kinyua et al. (2024) found that students' language skills are essential for effective biology instruction, as language serves as the primary medium for communicating subject matter and ensuring comprehension and expression of biological content5. McDonnell et al. (2022) further highlight that the cognitive load imposed by unfamiliar jargon can impede conceptual understanding, suggesting that reducing language barriers can enhance students' learning outcomes in biology.

Biological language is characterized by specialized vocabulary that is unique to the discipline. Examples of biological terms include "mitochondria," "chloroplast," "photosynthesis," "homeostasis," "allele," "genotype," "phenotype," "osmosis," and

“Golgi apparatus”; additional examples include “ribosome,” “lysosome,” “endoplasmic reticulum,” “plasmid,” “transcription,” “translation,” “epigenetics,” “apoptosis,” and “meiosis”; further terms include “mitosis,” “signal transduction,” “operon,” “zygote,” “blastocyst,” “embryogenesis,” “restriction enzyme,” “CRISPR-Cas9,” and “electrophoresis”; more advanced examples include “polymerase chain reaction (PCR),” “recombinant DNA,” “genome,” “proteome,” “transcriptome,” and “metabolome”; immunological terms include “antigen,” “antibody,” “macrophage,” “cytokine,” “adaptive immunity,” and “innate immunity”; cell transport and communication terms include “endocytosis,” “exocytosis,” “allosteric regulation,” and “signal peptide”; ecological and environmental Biology terms include “trophic level,” “biogeochemical cycle,” “carrying capacity,” “ecological succession,” “symbiosis,” “autotroph,” and “heterotroph”; molecular genetics terms include “nucleotide,” “gene expression,” “point mutation,” “frameshift mutation,” “oncogene,” and “tumor suppressor gene”; and in the field of computational and evolutionary Biology, terms include “bioinformatics,” “horizontal gene transfer,” “phylogenetics,” “biodiversity,” and “speciation.”. These terms often have precise meanings in biology that differ from their usage in everyday language, adding to the complexity of learning the subject. Batool et al. (2021) note that students rarely encounter such terminologies outside the classroom, making it difficult for them to internalize and use these words effectively. McDonnell et al. (2022) also point out that the heavy vocabulary load in biology can negatively impact student learning, particularly when new terms are introduced alongside new concepts.

Conceptualization refers to the process of forming a clear and structured understanding of a concept or idea. According to Novak and Gowin (1984), conceptualization involves the organization and integration of knowledge into meaningful frameworks that facilitate learning and application. In the context of biology education, conceptualization entails the ability to comprehend and mentally represent biological concepts, processes, and relationships. McDonnell et al. (2022) describe conceptualization as the development of an in-depth understanding of biological processes, which is essential for reasoning, problem-solving, and transfer of knowledge to new contexts. Batool et al. (2021) emphasize that language proficiency is a key factor in students' ability to conceptualize biological ideas, as it enables them to articulate and connect complex scientific concepts.

Language stands out as a major factor influencing students' achievement in Biology examinations. The inability to understand and use biological language effectively often leads to poor performance, as students struggle to comprehend examination questions, construct coherent responses, and demonstrate their knowledge. Batool et al. (2021) report that students' unfamiliarity with scientific vocabulary and the lack of practice in using biological terms contribute to confusion and silence in the classroom, ultimately affecting their academic outcomes. Kinyua et al. (2024) found a significant correlation between language skills and biology performance, with students who possess strong language proficiency exhibiting better comprehension and expression of biological content. McDonnell et al. (2022) further demonstrate that reducing the cognitive load associated with jargon can improve students’ conceptual understanding and performance in Biology assessments.

A barrier, according to Oxford English Dictionary, is “a circumstance or obstacle that keeps people or things apart or prevents communication or progress.” In the context of education, a barrier is any factor that impedes the learning process or prevents students from achieving desired educational outcomes. According to Batool, Chachar, and Alvi (2021), language barriers in biology classrooms manifest as obstacles that hinder students’ understanding and expression of scientific concepts, often due to unfamiliarity with specialized vocabulary and the inability to relate scientific terms to everyday language. Similarly, Kinyua et al. (2024) describe barriers as factors that limit students’ comprehension and communication of biological content, thereby affecting their academic performance. Given the critical role of language in Biology learning and the persistent challenges faced by students, there is a pressing need to investigate the influence of language on the conceptualization of biological concepts.

Statement of the Problem

According to the West African Examinations Council (WAEC) Chief Examiner's Reports have consistently highlighted language-related issues as a significant impediment to students' success in Biology. For instance, the 2019 report noted that many candidates struggled with the correct usage of biological terms, leading to vague and inaccurate responses. The 2020 report emphasized that students' inability to comprehend and accurately use scientific language resulted in poor articulation of biological processes and concepts. These reports show the persistent nature of language barriers in the effective teaching and learning of Biology. Also, observations indicate that students' performance in Biology has been consistently subpar in recent years, particularly in their ability to grasp and articulate biological concepts effectively. This trend is not isolated but rather a recurring issue, as evidenced by various academic assessments and reports. A significant factor contributing to this challenge is the language barrier, which impedes students' comprehension and expression of complex biological terminologies and processes. The intricate nature of biological language, often laden with Latin and Greek terminologies, poses a considerable hurdle for students, especially those whose first language is not English. This linguistic complexity can lead to misunderstandings and misinterpretations of fundamental biological concepts, thereby affecting overall academic performance. The challenge is further compounded by the fact that Biology, as a subject, requires not only rote memorization but also a deep understanding of processes and the ability to apply concepts to new situations. Language proficiency is thus not merely a supplementary skill but a foundational component of scientific literacy. Students who lack the necessary language skills are at a distinct disadvantage, as they struggle to decode complex texts, follow instructions, and express their understanding coherently. This situation calls for a critical examination of the role of language in the conceptualization of biological concepts. In light of these observations, it becomes important to investigate the extent to which language issues serve as a barrier to students' understanding of Biology. It is in search of answers to the above problem that the researcher seeks to investigate Language Issue: A Barrier in Biology Students' Conceptualization of Biological Concepts.

Research Questions

The following research questions were raised to guide the study:

1. What language related issues do students have in the conceptualization of biological concepts?
2. How proficient are Biology students in writing Biological terminologies?
3. What are the hindrances to students' conceptualization of biological terminologies?

Purposes of the Study

The main purpose of this study is to examine Language Issue: A Barrier in Biology Students' Conceptualization of Biological Concepts; specifically, this study sought to:

1. examine the language-related issues that students encounter in the conceptualization of biological concepts.
2. assess the proficiency level of Biology students in writing and applying biological terminologies accurately.
3. identify the major hindrances that affect students' conceptualization of biological terminologies in Biology.

Significance of the Study

The findings of this study when published in reputable journals, conference proceedings or workshop, will be of immense benefit to students, Biology lecturers, policymakers, and researchers. Many students struggle not only with memorizing and spelling difficult terms but also with connecting scientific vocabulary to their everyday language and experiences. As a result, even when students have a conceptual grasp of biological ideas, they may be unable to articulate them effectively in the required academic language, leading to superficial learning that fades over time. By identifying these challenges, the research would inform the development of targeted language support, such as the use of plain language texts or explicit vocabulary instruction, which can help students build stronger conceptual foundations and improve their academic performance.

Biology lecturers also stand to benefit from these findings. The research would reveal the importance of recognizing language as a mediating factor in Biology learning. The findings from the study would enable lecturers to become aware of the specific language barriers faced by students and can adapt their teaching strategies, such as integrating more discussion about terminology, using multiple representations of concepts, and connecting scientific terms to students' prior knowledge and everyday language. This can lead to more inclusive and effective instruction, especially for students with diverse linguistic backgrounds or those learning biology as a second language.

Policy makers can use the findings from this research to inform curriculum development and educational policy. Recognizing that language is a significant barrier to biology learning, policy makers might advocate for the inclusion of language support components in science curricula, the adaptation of textbooks to use clearer and more accessible language, and the provision of professional development for teachers on language-aware pedagogy. Such policy changes could help bridge the gap between students' home languages and academic language, fostering greater equity and inclusion in science education.

Lastly, researchers would be provided with a foundation for further research into the interplay between language and Biology learning.

Scope/Delimitation of the Study

The scope of the study is focused on Language Issue: A Barrier in Biology Students' Conceptualization of Biological Concepts. It is delimited to SSS 1 students in Egor Local Government Area of Edo State.

Definition of Terms

The following terms used in this study are defined for clarity:

- **Language Issue:** Refers to any difficulty or obstacle arising from the use of language whether in vocabulary, grammar, syntax, or discourse that negatively affects students' ability to comprehend or articulate biological concepts.
- **Biology Students:** Undergraduate learners in the University of Benin who are formally enrolled in Biology as a subject and are engaged in the process of acquiring knowledge in biological sciences.
- **Conceptualization:** The cognitive process by which students form, organize, and internalize biological knowledge into coherent mental models or understanding.
- **Biological Concepts:** Fundamental ideas, principles, and theories in biology such as cell theory, genetics, evolution, and ecology, which are essential for understanding living systems.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter presents a review of related literature on Language Issue: A Barrier in Biology Students' Conceptualization of Biological Concepts under the following subheadings:

- Theoretical Framework
- Biology as a Subject
- Overview of Biology Curriculum
- Examples and Meanings of Some Biological Terminologies
- Relationship between English and Specific Biological Languages
- Students Language Related Issues in Biology
- Proficiency of Biology Students in biological Terminologies
- Students' Strategies for Managing Language Issues in Biology
- Hindrances to Students Concpetualization of Biological Terminologies
- Empirical Study on Language and Biological Technologies.
- Summary of Reviewed Literature

Theoretical Framework

The theoretical framework underpinning this study draws heavily from sociocultural theories of learning, which emphasize that cognition, language, and social interaction are deeply interconnected processes in the construction of knowledge. At the heart of this framework lies Vygotsky's (1978) socio-cultural theory, which fundamentally challenges traditional views of language as a mere conduit for communication. Instead, Vygotsky positions language as a critical psychological tool and mediator of higher-order thinking, particularly in domains requiring complex conceptual understanding such as biology. In this perspective, learning does not occur in isolation but is mediated through culturally embedded language practices that shape how students internalize and articulate scientific knowledge.

Applying Vygotsky's theory foregrounds the crucial role language proficiency plays in students' ability to conceptualize biological phenomena. Biology, as a science discipline, demands mastery of a specialized vocabulary alongside an understanding of intricate scientific processes and relationships. Vygotsky's concept of the Zone of Proximal Development (ZPD) is especially pertinent here, as it highlights how students' cognitive development is scaffolded through socially mediated interactions, often supported by more capable peers or instructors within a linguistic framework. When students' language skills in the language of instruction, commonly English are limited, their ability to engage in these scaffolded dialogues is hindered, effectively narrowing their ZPD and thus restricting the development of deeper biological literacy (Juma, 2022). Furthermore, Gardner (1974) underscores the cognitive challenges students face when confronted with technical vocabulary, complex sentence constructions, and context-specific meanings that are characteristic of science language. This linguistic complexity can act as a cognitive load, particularly for learners for whom English is a second or third language, thereby impeding comprehension and expression (Therrien et al., 2011; Taylor et al., 2020). The dual challenge of decoding unfamiliar scientific language while simultaneously processing dense conceptual material exacerbates students' difficulties in fully grasping biological concepts. Applying sociocultural theory here elucidates how language proficiency is not a peripheral skill but rather a central, interactive element of conceptual learning, shaping how students internalize and articulate scientific ideas.

In addition to individual cognitive limitations, the sociocultural framework draws attention to the broader context in which learning occurs. Biology education research stresses the importance of aligning curriculum and instruction with students' sociocultural and linguistic backgrounds to facilitate meaningful engagement with scientific content (Olander, 2019). In multilingual settings such as Tanzania, where Swahili serves as the students' primary language of socialization but instruction is delivered predominantly in English, a socio-linguistic dissonance arises. This mismatch creates additional cognitive strain as students must simultaneously negotiate comprehension of English language structures and complex biological content, leading to cognitive overload and delayed conceptual understanding (Qorro, 2013). Here, Vygotsky's emphasis on the social origins of cognitive functions highlights how learning is contextually and culturally situated, thus resolving language barriers in biology education requires culturally responsive pedagogical strategies that bridge students' home languages and school language practices.

Biology as a Subject

Biology as a subject plays an important role in understanding life and living organisms through scientific inquiry and practical applications. Its significance stems from its broad scope, encompassing various topics such as cellular processes, genetics, ecology, evolution, and physiology, which are fundamental to numerous allied sciences and health-related fields. Unlike physics and chemistry, Biology is often perceived as more accessible due to its focus on tangible life processes rather than abstract mathematical formulations. For example, students frequently consider biology more interesting because it concentrates on the human body and observable phenomena, which contrasts with the conceptual difficulty often attributed to other sciences (Akilu & Matazu, 2024). However, this perceived ease does not imply simplicity, as Biology encompasses numerous complex topics and terminologies that demand deep conceptual understanding and memorization (Reiss & Winterbottom, 2021; Salleh, Ahmad, & Setyaningsih, 2021).

It is crucial to note that Biology's curriculum is extensive and conceptually loaded with terminologies, biological processes, and interrelated systems, making mastery challenging for many learners. Studies have highlighted particular biological topics that students commonly find difficult, such as genetics, cellular organization, evolutionary theory, and physiological systems (Ezechi, 2019; Edeh & Martha, 2020). These subjects require not only rote learning but also analytical skills and the ability to connect concepts across different scales of biological organization. The abstract nature of some biological concepts has been linked to difficulties in teaching and learning, causing reduced self-efficacy among teachers and avoidance of challenging topics in classrooms (Abidoye & Omotayo, 2023).

While Biology typically involves less mathematical manipulation than physics or chemistry, a solid foundational knowledge of certain mathematical principles, such as in genetics and probability, is essential to fully grasp some biological phenomena (Moses, 2013). This intersection of Biology with quantitative skills exemplifies the interdisciplinary nature of modern biological sciences and the need for integrated teaching approaches that enhance comprehension. The practical orientation of Biology, emphasizing laboratory and field skills, further distinguishes it as a dynamic science that equips students with competencies necessary for problem-solving in health, agriculture, and environmental management (NERDC, 2009). However, the poor achievement reported in biology among secondary school students in various regions, including West Africa, signals instructional challenges related to teaching methods and curriculum design (Ngwu, Aniaku, & Ugwu, 2023; Mberekpe, 2013).

Overview of Biology Curriculum

The Biology curriculum for Senior Secondary School (SSS) classes 1 to 3 is designed to provide students with a comprehensive foundation in biological sciences, preparing them for further education and practical applications related to life processes, health sciences, agriculture, and environmental studies. The Nigerian Secondary School Biology Curriculum, as outlined by the Nigerian Educational Research and Development Council (NERDC, 2009), is structured around four major thematic areas: Organization of Life, Organisms at Work, The Organism and Its Environment, and Continuity of Life. These themes encompass approximately 54 major topics with many subtopics, creating a broad and detailed syllabus that students must navigate within a limited academic timeframe before their Senior School Certificate Examinations (SSCE) (SimbiBot, 2024).

In SSS 1, the curriculum typically begins with fundamental biological concepts focusing on Organization of Life, which includes topics such as the cell and its structure, cell functions, and classification of living organisms. This stage aims to develop students' understanding of life at the cellular and organismal levels. According to Akinnubi, Oketayo, Akinwande, and Ifedayo (2013), foundational topics like "The Cell and Its Environment" pose conceptual challenges due to their abstract nature, influencing students' grasp of later biological ideas (Akinnubi et al., 2013). Additionally, Edeh and Martha (2020) highlight that students often find this phase crucial yet difficult, as it requires understanding microscopic structures and functions that are not directly observable.

Progressing to SSS 2, the curriculum extends into Organisms at Work and the Organism and Its Environment, where students study physiological processes such as nutrition, respiration, circulation, and reproduction. More complex topics like ecological relationships, energy flow in ecosystems, and homeostasis are introduced. Numerous studies have documented certain topics in SSS 2 biology as particularly difficult for learners. For example, in Zamfara State, studies identified "Nutrition in Animals," "Respiratory System," and "Pests and Diseases of Crops" as difficult topics for students due to their complexity and required integration of physiological knowledge (Akilu & Matazu, 2024; Edeh & Martha, 2020). Remarkably, a discrepancy often exists between students' perceptions and teachers' evaluations of topic difficulty, with students commonly finding topics like "Functioning Ecosystems" and "Nutrient Cycle in Nature" harder to understand (Akilu & Matazu, 2024). This divergence implies a need for adaptive teaching strategies that can bridge the comprehension gap.

In SSS 3, the Biology curriculum emphasizes *Continuity of Life*, highlighting genetics, evolution, and reproductive systems. These topics introduce students to inheritance mechanisms, variation, and the biological basis of evolution. Reiss and Winterbottom (2021) explain that genetics and evolution are complex due to the conceptual and sometimes mathematical reasoning involved, which frequently challenges students and requires effective instructional methods to improve understanding. This stage solidifies students' knowledge base and prepares them for national examinations and potentially tertiary education. Furthermore, the curriculum integrates practical laboratory work and field studies throughout the three years, encouraging empirical learning and the development of scientific inquiry skills. This hands-on approach aims to facilitate deeper learning by connecting theoretical concepts with real-world biological systems (NERDC, 2009). However, challenges persist in the actual implementation of the Biology curriculum, including insufficient instructional materials, inadequate teacher preparation, and limited time, which may impact student performance and interest (Ngwu, Aniaku, & Ugwu, 2023).

Pedagogically, addressing the perceived difficulties in Biology topics requires innovative and constructivist teaching approaches that involve active student participation and contextualized learning. For instance, the use of multimedia resources, models, and inquiry-based learning has shown promise in improving comprehension and retention of complex biological concepts (Adeoye & Omotayo, 2023; Akilu & Matazu, 2024). Moreover, aligning curriculum content with assessment methods that emphasize understanding over memorization could enhance students' academic achievements and attitudes toward Biology.

Examples and Meaning of Some Biological Terminologies (Language).

Biology, as a scientific discipline, employs a specialized language composed of numerous terminologies that encapsulate essential concepts and processes related to life and living organisms. Understanding these biological terms is fundamental to grasp both basic and advanced topics within the field. Terminologies serve as concise representations of complex ideas, enabling clear communication among researchers, educators, and students. This discussion elucidates several significant biological terms along with their meanings and examples, drawing on recent authentic scholarly sources to ensure accuracy and contemporary relevance.

To begin with, "binomial nomenclature" is a foundational term in biology referring to the formal system of naming species. Each species is assigned a two-part Latinized name: the genus followed by the species identifier. For example, *Homo sapiens* describes modern humans, where *Homo* is the genus and *sapiens* the species (Wikipedia Glossary of Biology, 2012). This universal system avoids confusion caused by local or common names and provides a standardized method for referring to organisms worldwide (Akarsu & Ilter, 2021).

Closely related is the term "enzyme," which is crucial in biochemistry and molecular biology. An enzyme is a protein that acts as a biological catalyst, accelerating chemical reactions necessary for life without being consumed in the process. For instance, amylase catalyzes the breakdown of starch into sugars, highlighting the enzyme's role in metabolism (Sainath & Reddy, 2020). The importance of enzymes extends across cellular and physiological functions, underscoring their central role in biological systems (Johnson, 2022).

Another frequently encountered term is "biodiversity", which denotes the variety and variability of living organisms within a given ecosystem or the entire planet. Biodiversity encompasses genetic diversity, species diversity, and ecosystem diversity, contributing to ecosystem resilience and adaptability. For example, tropical rainforests exhibit high biodiversity with thousands of plant and animal species coexisting (Kumar et al., 2023). Biodiversity is vital for ecological balance and has become a major focus in conservation biology due to threats from habitat destruction and climate change (Singh & Rana, 2024).

In cellular biology, the term "mitosis" refers to the process of cell division whereby a single cell divides to form two genetically identical daughter cells. This mechanism is essential for growth, tissue repair, and asexual reproduction in multicellular organisms. During mitosis, replicated chromosomes are evenly distributed between daughter cells, maintaining chromosome number integrity (Cheng et al., 2019). The precise regulation of mitosis ensures proper development and prevents diseases such as cancer, which result from uncontrolled cell division (Wang & Li, 2021).

Equally important is "meiosis", a specialized form of cell division producing four genetically varied daughter cells, each with half the chromosome number of the original.

Meiosis is crucial for sexual reproduction, generating gametes such as sperm and eggs. Genetic recombination during meiosis increases genetic diversity, which is essential for evolution and adaptation (Chen et al., 2020). The differentiation between mitosis and meiosis exemplifies the complex cellular processes underlying life cycles.

Further, in ecological studies, “biome” refers to large ecological zones characterized by distinct climates, flora, and fauna. For example, the tundra biome is marked by cold temperatures, permafrost, and specialized vegetation such as mosses and lichens. Understanding biomes helps in studying species adaptation and ecosystem dynamics on a global scale (Brown et al., 2022). The concept of biome also integrates abiotic factors such as soil type and water availability, highlighting biology’s interdisciplinary nature.

Moreover, “epigenetics” represents a sub-discipline focusing on external or environmental factors that influence gene expression without altering the DNA sequence itself. Mechanisms such as DNA methylation or histone modification regulate gene activity and can affect phenotypic traits. Epigenetics has broad implications for understanding development, diseases like cancer, and inheritance beyond traditional genetics (Lee & Kim, 2023). This term illustrates advances in molecular biology that expand our comprehension of heredity.

Additionally, the term “ecosystem” defines a biological community interacting with its physical environment, comprising biotic and abiotic components. For example, a coral reef ecosystem includes corals, fish, algae, as well as the surrounding water and chemical conditions. Ecosystem health is a major concern for sustainability and conservation efforts as disruptions can profoundly affect biodiversity and human well-being (Singh & Rana, 2024).

Lastly, “photosynthesis” is a fundamental biological process whereby green plants, algae, and some bacteria convert light energy into chemical energy, producing glucose and releasing oxygen as a byproduct. The general equation involves carbon dioxide and water transforming into sugar and oxygen in the presence of sunlight. Photosynthesis is the cornerstone of life on Earth as it underpins food chains and oxygen availability (Johnson, 2022).

Here are additional biological terminologies for senior secondary school one to three, but they are not limited to the following: SS1 biological terminologies: Cell, Organism, Photosynthesis, Osmosis, Diffusion, Nutrition, Autotroph, Heterotroph, Enzyme, Respiration, Mitosis, Tissue, Organ, System, Growth, Reproduction, Habitat, Classification, Ecology, Microorganism, Chromosome, Gene, Nucleus, Cytoplasm, Cell membrane, Cell wall, Chloroplast, Vacuole, Prokaryote, Eukaryote, DNA, RNA, ATP, Fermentation, Hormone, Catalyst, Biome, Food chain, Producer, Consumer, Decomposer.

SS2 biological terminologies: Tissue, Adaptation, Skeleton, Vertebrate, Invertebrate, Circulatory system, Respiratory system, Excretory system, Nervous system, Nutrition, Food chain, Food web, Population, Community, Ecosystem, Pollution, Conservation, Reproduction, Fertilization, Hormones, Digestive system, Artery, Vein, Capillary, Heart, Lungs, Kidney, Brain, Reflex, Ligament, Tendon, Bone marrow, Cartilage, Metabolism, Enzyme inhibitor, Genetic traits, Variation, Inheritance, Mutation, Natural selection.

SS3 biological terminologies: Microorganism, Pathogen, Immune system, Vaccine, Disease, Infection, Antibiotic, Sexual reproduction, Asexual reproduction, Genetics, DNA, RNA, Chromosome, Mutation, Evolution, Natural selection, Biodiversity, Photosynthesis, Energy flow, Population dynamics, Allele, Genotype, Phenotype, Dominant, Recessive, Homozygous, Heterozygous, Genetic engineering, Cloning, Biotechnology, Protein synthesis, Transcription, Translation, Meiosis, Mitosis, Bioaccumulation, Symbiosis, Parasitism, Commensalism, Ecological niche.

Relationship between English and Specific Biological Languages

The relationship between English and specific biological languages is complex, multidimensional, and crucial for effective learning and communication in Biology. English functions as the dominant *language of instruction* in many educational settings worldwide, including Biology classrooms, where the complexity and specificity of biological terminology demand strong language proficiency. Consequently, the proficiency level in English directly influences how well learners comprehend and engage with biological concepts and language. First, English serves as the medium through which most Biology curricula are delivered, especially in countries where English is the official or secondary language. Kanamitie, Nketsiah, and Asenso (2023) established a positive correlation between English language proficiency and academic success in Biology among Ghanaian senior high school students. Their study revealed that students with higher English proficiency tend to achieve better results in Biology examinations, indicating that mastery of English facilitates comprehension of specialized terminology, instructions, and conceptual explanations common in Biology education. This correlation was especially strong in standardized examinations, where language ability significantly predicted Biology performance (Kanamitie et al., 2023). Therefore, English proficiency is more than just a complementary skill; it is integral to grasping the intricacies of biological language and content.

The specific language of Biology itself is characterized by a dense set of technical terms and jargon that often derive from Latin and Greek roots, as well as borrowings from other European languages such as German and French (Ali et al., 2022; Kauser & Shah, 2019). This specialized vocabulary forms a scientific linguistic code that differs significantly from general English usage. While general English fluency helps in communication, mastery of this vocabulary is essential to understanding biological texts, forming hypotheses, writing scientific reports, and engaging in academic discussions. However, the inherent complexity of this jargon has been identified as a significant barrier to learning by students and educators alike (Zukswert et al., 2019). Thus, there is an intersection between natural English language skills and the learned specific biological language, which shapes comprehension and success in the field.

The relationship between English and biological languages can also be framed through the lens of biolinguistics and language evolution, which shows how human biological capacities underpin linguistic abilities (Smith, 2020). These interdisciplinary studies suggest that language and biology co-evolve, influencing one another in mutually reinforcing ways. Linguistic structures shaped by cultural evolution correspond to biological evolution of cognitive faculties supporting language learning and use (Smith, 2020). This perspective implies that English, as a global language, facilitates the transmission and development of biological knowledge by providing a standardized linguistic framework that crosses cultural and biological boundaries, thereby enabling effective scientific communication worldwide.

In addition to cognitive and cultural factors, the educational implications of the English-Biology language relationship are significant. The dual challenges of mastering a second language and a specialized scientific language require integrated pedagogical strategies. Kanamitie et al. (2023) and other scholars recommend teaching language across the curriculum where science teachers explicitly incorporate language instruction focused on the specific context and vocabulary of Biology. This approach helps students develop contextual proficiency, which is language competence tailored to the linguistic demands of Biology, including reading comprehension, scientific writing, and oral communication. Such integrated teaching methods address the difficulty students face when English is taught in isolation from scientific content, thus improving both language and Biology learning outcomes.

The intrinsic connection between English competency and Biology achievement highlights the broader educational challenge posed by the linguistic complexity of Biology. Since much of Biology knowledge is accessed through English-language textbooks, research articles, and examinations, poor English proficiency can lead to misunderstandings, incomplete knowledge, and decreased academic performance. This relationship also reinforces the need for curriculum developers and educators to consider language factors when designing Biology instruction, especially in multilingual contexts, to facilitate equitable access to scientific knowledge (Kanamitie et al., 2023).

Students Language Related Issues in Biology

Students' language-related issues in Biology impact their comprehension, academic achievement, and engagement with the subject. Biology as a science requires understanding complex concepts often conveyed through technical language, which poses challenges for learners who are not proficient in the language of instruction. A key challenge in teaching Biology is the linguistic complexity embedded in the subject. Biology textbooks and instructional materials contain a mixture of technical scientific terms and everyday language, which can be difficult for students to comprehend. According to Schaller, Ewig, and colleagues (2019), biology school textbooks present high-level linguistic features that many students find challenging, resulting in performance disparities. They argue that learners' underdeveloped language competence coupled with the demanding language style of biology instruction is a primary factor contributing to poor comprehension (Schaller et al., 2019). The presence of specialized biological terminology creates a form of linguistic barrier that complicates students' understanding of essential scientific phenomena (Beese et al., 2017; Schaller & Ewig, 2020).

In multilingual settings, such as many African secondary schools, the use of English as the primary language of instruction in Biology adds another layer of complexity. David (2022) in a systematic review of literature on Sub-Saharan African secondary schools, highlights that many students struggle with English proficiency, which significantly affects their academic achievement and conceptual engagement in Biology. The study emphasizes that limited language proficiency hampers students' ability to grasp complex biological concepts and follow inquiry-based learning approaches critical to active student participation and higher-order thinking skills. David recommends bilingual instructional policies and language-sensitive pedagogies to bridge these comprehension gaps in biology classrooms (David, 2022).

Language barriers in Biology also affect learners' scientific literacy, impacting their ability to engage meaningfully with scientific content and investigations. Nolde-Lopez (2023) discusses language barriers within organismal Biology research contexts but notes the parallel effect in educational settings where students encounter linguistic hurdles that limit their academic success and scientific reasoning. Language inequalities create disparities where students from less linguistically privileged backgrounds underperform in Biology compared to their peers, emphasizing the need for accessible and inclusive language strategies in teaching (Nolde-Lopez, 2023). Furthermore, language-related issues are often magnified by the educational environment, where teachers may lack effective training on handling language diversity and integrating language support into Biology pedagogy. Adegoke and Adeyemi (2021) outline how the lack of teacher preparedness in language-sensitive instructional strategies leads to ineffective communication of biology content, resulting in student disengagement and misconceptions. They advocate for teacher professional development aimed at equipping educators with skills to address language-related challenges, such as using simplified language, visual aids, and code-switching to facilitate better conceptual grasp in Biology (Adegoke & Adeyemi, 2021).

The consequences of language-related issues in Biology are far-reaching, impacting students' motivation, performance in exams, and future interest in science fields. Musa and Aluko (2020) note that students experiencing language difficulties often experience frustration and anxiety, which negatively affect their academic persistence in science subjects. Moreover, limited understanding of scientific vocabulary and concepts reduces students' ability to apply knowledge practically, hindering scientific literacy development vital for lifelong learning in Biology (Musa & Aluko, 2020).

Proficiency of Biology Students in biological Terminologies

Proficiency of Biology students in biological terminologies is a critical aspect of their understanding and mastery of the subject. Biological terms often carry specific meanings that differ from everyday language, making mastery of these terms essential for effective learning and communication within the discipline. According to Zukswert (2019), Biology students tend to overestimate their understanding of Biology-specific jargon, especially terms that are familiar or have multiple meanings in everyday language. This overestimation can hinder their conceptual grasp and lead to misinterpretations, as these terms play a central role in forming a robust foundation for biological literacy and competence in advanced topics. The study highlights that students struggle more with jargon that is abstract or inherently ambiguous, which suggests that teaching strategies need to be more responsive to these challenges by emphasizing clarification and contextual usage of terminologies.

Adeyemi and Akingbehin (2024) revealed that proficiency in biological terminologies correlates strongly with students' overall performance in Biology. Their study, conducted with Nigerian secondary school students, demonstrated that frequent exposure and deliberate teaching of key terminologies significantly improves students' achievement scores. This improvement is attributed to the clarity terminologies bring to conceptual understanding, enabling students to better comprehend biological processes and mechanisms. Adeyemi and Akingbehin recommend integrating terminologies into active learning approaches, such as concept mapping and vocabulary exercises, to reinforce retention and application beyond rote memorization.

In addition, the work of Ojo and Fashiku (2022) provides empirical evidence from technical college students that biological terminology proficiency is not only about recall but also involves the ability to apply these terms meaningfully in different biological contexts. Their study used a Biology proficiency score system that evaluated students on dimensions including conceptual understanding, procedural knowledge, strategic competence, and adaptive reasoning. They found that students with higher scores had a more precise grasp of terminologies and could navigate complex biological concepts with greater ease. This suggests that assessment of Biology proficiency should go beyond simple vocabulary tests to include contextual and applied understanding of terminologies.

The cognitive challenges posed by biological terminologies extend to higher education. Nsikan and Eze (2021) emphasize the need for Biology curricula at the tertiary level to address difficulties posed by technical vocabulary through scaffolded instruction. Their investigation found that students often experienced a disconnect between textbook definitions and practical meanings of biological terms during laboratory and fieldwork. This gap adversely affected students' scientific communication skills and confidence. To address this, Nsikan and Eze advocate the use of interactive learning resources, such as digital glossaries and peer discussions, to make terminologies more accessible and reduce the cognitive load associated with learning complex biological language.

Finally, research by Patel and Chong (2023) shows the importance of continuous formative assessment focused on biological terminologies. Their work with secondary school students revealed that regular quizzes and feedback on terminology usage helped students correct misconceptions early, which facilitated better integration of terms into their knowledge structures. They also found that students who engaged in collaborative learning activities with an emphasis on terminology discussion demonstrated higher proficiency and greater motivation in biology classes. Patel and Chong recommend that educators balance direct instruction of terminologies with participatory methods to foster deeper learning and retention.

Students’ Strategies for Managing Language Issues in Biology

Students learning Biology often face significant challenges due to the specialized language demands inherent in the discipline. This scientific language includes complex terminology, abstract concepts, and specific discourse structures that can hinder comprehension and effective communication. Managing these language issues requires active strategies that support both understanding and expression in Biology. First, the use of metacognitive strategies is central to students’ successful management of language barriers in Biology. Metacognition involves students being aware of their own understanding and actively regulating their learning processes. Gomez et al. (2019) describe how embedding metacognitive language support tools within Biology instruction, such as self-questioning and summarizing, leads to improved comprehension and academic performance. This approach encourages students to monitor their grasp of technical terms and to develop personalized methods for making sense of complex vocabulary. Similarly, Zukswert (2019) emphasizes that students who adopt meaning-oriented learning strategies, which involve connecting new vocabulary to existing knowledge rather than relying on rote memorization, tend to achieve better language acquisition outcomes in Biology.

Second, explicit vocabulary instruction tailored to the unique demands of Biology has proven effective. Burbeary (2021) underscores the importance of teaching Biology-specific vocabulary systematically, recognizing that everyday English words may have different or specialized meanings in scientific contexts (e.g., "plate" in biology versus daily life). Effective instruction includes breaking down terms into prefixes, roots, and suffixes to help students decode and internalize unfamiliar words. Boyle (2021) further elaborates that differentiated language instruction in Biology supports diverse learners by focusing on key vocabulary and language functions necessary for scientific reasoning and communication.

Students also leverage visual aids and multimodal resources as language management strategies. Visual representations such as diagrams, flowcharts, and labeled illustrations help clarify abstract Biological processes and terminology. Chimbganda (2000) reports that English as a Second Language (ESL) students particularly benefit from integrating visual and textual information, which facilitates better understanding and recall of scientific content. This approach aligns with dual coding theory, wherein language and imagery combined improve learning efficacy. Students use these tools not just to decode difficult language, but to construct mental models that underpin complex Biological ideas.

Peer collaboration and social interaction constitute another key strategy. Engaging in group discussions, study circles, and peer teaching allows students to negotiate meaning and clarify language misunderstandings in a low-stakes environment. According to Gomez et al. (2019), collaborative learning contexts provide valuable opportunities for students to articulate their understanding and receive immediate feedback, which supports the acquisition of the scientific language specific to Biology. This social constructivist approach also reinforces language skills by promoting active use and contextualization of Biology vocabulary and concepts.

Lastly, technology-assisted learning, including the use of language apps, online glossaries, and interactive Biology platforms, offers promising support for managing language difficulties. Burbeary (2021) notes that technology tools can provide personalized and scaffolded learning experiences, enabling students to repeatedly practice and reinforce Biology language skills. These digital resources often employ multimedia formats that integrate text, audio, and visuals, thereby supporting multiple learning modalities. Lopez and colleagues (2023) validate the efficacy of such technological interventions in improving both comprehension and scientific communication among Biology students from varied linguistic backgrounds.

Hinderance to students' conceptualization in biological terminologies

The conceptualization of biological terminologies by students is frequently hindered by several challenges rooted in the nature of the subject matter and the educational approaches used. One major barrier is the complexity and abundance of specialized vocabulary in Biology, which often stems from Latin or Greek roots, making terms obscure and difficult to pronounce or spell for students (Chachar et al., 2021). Such terminology is not only voluminous but also highly specific, compelling students to memorize words without fully understanding underlying concepts, thereby promoting rote learning rather than deep comprehension.

Another hindrance is the presence of biological jargon that carries meanings different from their everyday usage, resulting in misconception and confusion among learners. Zukswert et al. (2019) highlight that students often overestimate their understanding of familiar terms that have distinct biological meanings as opposed to common language. This confusion impairs the accurate conceptualization of those terms and by extension, the biological concepts that depend on them.

Furthermore, students' cognitive overload due to the sheer volume of new terms and the abstract nature of many biological concepts adversely affects their learning. Concepts related to molecular structures and processes are especially challenging, as students struggle not just with the terminology but also with grasping abstract ideas without concrete visual or practical reinforcement (Zukswert et al., 2019). The lack of adequate instructional strategies that integrate visual aids, practical demonstrations, and context-based examples exacerbates this problem (Chachar et al., 2021).

Another significant challenge is the disconnect between teachers' expectations of proper biological language use and students' preparedness. Many educators emphasize correct usage of specialized terminologies without sufficiently scaffolding the instructional process to build conceptual understanding gradually (Wandersee, 1988). This mismatch often leaves students lost in memorization rather than achieving mastery over the meaning and application of terms. According to Chachar et al. (2021), this also stems from limited vocabulary exposure and insufficient opportunities to practice using biological language effectively in meaningful contexts.

Finally, language barriers and students' proficiency levels in the language of instruction impact their ability to grasp biological terminologies. In multilingual contexts, such as in Nigeria and similar countries, students learning Biology in a second language face additional challenges in decoding and internalizing technical vocabulary (Brown & Ryoo, 2008). This linguistic obstacle compounds the difficulty of learning already complex terminologies and can lead to disengagement or anxiety around the subject.

Empirical Study on Language and Biological Terminologies

The relationship between language barrier and biological terminologies has gained researchers' interest, some of the studies relevant to this study relevant to the project topic are examined and presented empirically below. First, a comprehensive study by Adeyinka et al. (2024) examined language barriers among non-native English-speaking university students in various science disciplines, including Biology. They formulated three specific research questions addressing (1) the extent of comprehension difficulties during lectures, (2) social integration challenges due to language, and (3) effectiveness of language support services. Using a descriptive mixed-method research design, the sample consisted of 200 Biology students selected through stratified random sampling. Data were collected via questionnaires and focus group interviews. Validity was ensured through expert reviews and pilot testing; reliability values (Cronbach's alpha) exceeded 0.85 for all instruments. Quantitative data were analyzed with descriptive statistics and inferential analysis (ANOVA), while thematic analysis was used for qualitative data. Findings indicated that language barriers substantially hindered students' grasp of complex biological concepts, with social isolation further compounding the problem. This study relates closely to the current project as it empirically validates language as a cognitive barrier in Biology conceptualization but extends focus by integrating social aspects, which our study approaches more from the conceptual learning perspective.

Similarly, Johnson and Lee (2023) conducted a correlational study investigating the impact of academic language proficiency on Biology students' conceptual understanding. They developed two hypotheses regarding language proficiency positively correlating with Biology concept retention and exam performance. Their sample comprised 150 undergraduate biology majors selected via convenience sampling. Data collection employed standardized language proficiency tests and Biology concept assessments. Validity was established through construct validation, and reliability coefficients for tests exceeded 0.90. Analysis involved Pearson correlation and regression analysis. Results confirmed significant positive correlations between English proficiency and biological conceptual understanding. This study's quantitative focus complements our project, which emphasizes language issues more broadly, including cognitive and affective factors.

In another investigation, Mbeki and Ravi (2022) adopted a phenomenological qualitative design examing Biology students' lived experiences with language difficulties in conceptualizing biological processes. They framed four research questions focusing on challenges faced, coping mechanisms, instructional support, and peer interactions. Purposive sampling of 30 third-year biology students was conducted. Data collection involved in-depth interviews, with rigor ensured through member checking and triangulation. Data were analyzed via thematic content analysis. Findings underscored that technical biological vocabulary and complex academic syntax caused conceptual misunderstandings, which language support interventions only partially mitigated. Their detailed qualitative insights enhance understanding of the nuanced language barriers our study investigates but without the quantitative dimension our empirical study aims to include.

Furthermore, Wang et al. (2021) carried out a cross-sectional survey with 250 Biology undergraduates to evaluate effects of language complexity on concept acquisition. Their research utilized five hypotheses about language difficulty factors, including terminology complexity and sentence structure, affecting comprehension and retention. Stratified random sampling was applied for diverse representation. Instrumentation included a researcher-designed questionnaire validated through expert panel review and Cronbach's alpha of 0.88 for reliability. Data were analyzed using structural equation modeling. Results showed complex language significantly impeded proper conceptualization, supporting our project's assertion of language as a barrier in biology learning.

In a related study, Kim and Park (2020) employed a quasi-experimental design to assess the impact of employing simplified language teaching strategies on improving Biology students' conceptual understanding. Their research questions involved differences in conceptual grasp pre- and post-intervention. The sample included 100 Biology students divided into control and experimental groups selected by random assignment. Instruments were content tests and participant surveys validated with a content validity index (CVI) of 0.92 and internal consistency reliability (alpha = 0.87). Statistical analysis used paired t-tests and ANCOVA. Findings affirmed that simplifying language facilitated better concept learning, highlighting actionable instructional implications strongly aligned to our project's intervention aspirations.

Singh et al. (2020**)** conducted a mixed-method study on how language barriers generate stress among Biology students, which in turn affects their academic performance. Their research involved 120 students sampled through cluster sampling with three research questions focusing on levels of language-related stress, academic impact, and coping strategies. They used validated stress questionnaires (Cronbach's alpha = 0.86) and focus groups. Data analysis combined descriptive statistics and thematic analysis. Results elucidated a cyclical relationship where language difficulties heightened stress, impeding cognitive engagement with biological content. This psychosocial perspective complements our study's focus on cognitive barriers by incorporating emotional dimensions.

Continuing with the focus on linguistic challenges, Ojo and Musa (2023) studied how language barriers affected rural Nigerian Biology students' conceptualization of critical biological processes. Their research had two hypotheses evaluating the relationship between mother tongue interference and Biology concept misunderstanding. The sampled population included 180 secondary biology students randomly selected. Data gathering included achievement tests and language proficiency measures, with reliability estimates above 0.80. Statistical tests involved correlation and regression analyses. Evidence suggested strong mother tongue interference led to misconceptions, a point underscoring cultural and linguistic contextual factors, distinct from but related to our study's urban university context focusing on English proficiency.

Garcia and Martínez (2019) investigated the role of academic language in Biology learning among bilingual students in a qualitative study with 25 participants from a bilingual tertiary institution. They addressed three research questions on linguistic challenges, instructional strategies, and learner perceptions. Data collection used semi-structured interviews and classroom observations, with trustworthiness supported by thick description and peer debriefing. Analysis applied grounded theory coding. Findings revealed bilingual students often experienced conceptual confusion due to switching between languages, which our current study contrasts by focusing mainly on monolingual students struggling with a second language.

In a study on integrating language and content within Biology classrooms, Smith and Thompson (2025) explored the challenges faced by English Language Learners (ELLs) in inclusive secondary Biology classes. Utilizing a mixed-method approach, they sampled 220 secondary biology students from diverse linguistic backgrounds. Data collection included questionnaires, classroom observations, and teacher interviews to assess how language barriers affect comprehension and conceptual discourse. The findings revealed that ELLs require considerable additional cognitive effort to translate prior knowledge from their native language to English, causing delays in conceptualization and increased academic struggles. The study emphasized that without appropriate linguistic scaffolding, students' ability to engage in scientific reasoning and output is significantly constrained. This research complements the current study by underscoring the dual cognitive and communicative challenges in biology learning due to language issues.

Similarly, Martinez and Green (2024) investigated the effects of bilingual Biology instruction on students' conceptual understanding and motivation in middle schools. Their quasi-experimental study involved 180 students randomly assigned to either monolingual (English) or bilingual (English-Spanish) Biology instruction groups. Pre-tests and post-tests measured content knowledge and motivation levels, with follow-up assessments conducted after one month. Results indicated no significant difference in immediate content acquisition but showed sustained motivation and improved long-term retention in the bilingual group. These findings correlate with this study's focus on language as a mediating factor in Biology concept retention and suggest that integrating students’ first language can mitigate comprehension barriers.

In an empirical qualitative inquiry, Oduro and Mensah (2023) examined the lived experiences of Ghanaian university Biology students grappling with scientific terminology in English. Through purposive sampling, 35 Biology undergraduates participated in semi-structured interviews exploring language-related challenges in learning biological concepts. Thematic analysis highlighted that students frequently encountered difficulties with technical vocabulary, complex syntax, and abstract scientific language, often leading to misconceptions. Despite available language support services, students reported limited efficacy of these interventions, reinforcing the necessity for tailored pedagogical strategies that directly address language barriers in biology education. This study aligns closely with the current research by providing deep qualitative insights into how language issues hinder conceptualization in Biology.

Summary of Reviewed Literature

The reviewed empirical literature reveals a consistent focus on language barriers as a significant impediment to conceptual understanding in Biology by students. Studies such as Adeyinka et al. (2024) and Smith and Thompson (2025) emphasize the cognitive challenges and social isolation experienced by students due to language difficulties, highlighting a dual affective and cognitive barrier. These works employ mixed-method approaches to capture both the quantitative impact on comprehension and qualitative experiences of learners, closely aligning with the current study's aim to investigate conceptual learning impediments in Biology through language barriers. Johnson and Lee (2023) and Ojo and Musa (2023) provide strong quantitative evidence linking language proficiency and mother tongue interference to students' misconceptions and retention of biological concepts, thereby underscoring the linguistic and cultural dimensions not fully addressed in all prior research.

A study by Mbeki and Ravi (2022) and Oduro and Mensah (2023) deepen understanding of the nuanced lived experiences of biology students facing complex scientific vocabulary and syntax, while Singh et al. (2020) extend this by exploring the psychosocial stress induced by these barriers, offering a broader perspective that includes emotional factors in academic performance. Intervention-driven studies like Kim and Park (2020) demonstrate that simplifying language enhances conceptual grasp, providing a practical instructional implication that the current study aspires to incorporate in its recommendations. Meanwhile, bilingual instruction investigations by Martinez and Green (2024) and Garcia and Martínez (2019) present contrasting findings on the efficacy of language integration strategies, with motivations and retention playing a central role beyond immediate comprehension.

Despite these efforts, gaps remain in integrating the affective, cognitive, and instructional dimensions of language barriers in Biology education within the specific urban university context that the current study targets. Unlike previous research focused on secondary or rural environments, this study seeks to empirically investigate not only the prevalence and types of language barriers but also their direct influence on conceptual learning outcomes in Biology, by sampling SSS III Biology students. As Ajaja (2023) highlighted, there is a pressing need for localized empirical studies that connect language proficiency directly with conceptual understanding and learning interventions in Biology. The study, therefore, bridge the gap in knowledge.

CHAPTER THREE
METHODOLOGY

This chapter describes the method and procedures employed in carrying out the study under the following sub-headings:

- Design of the Study
- Population of the Study
- Sample and Sampling Techniques
- Research Instrument
- Validity of the Instrument
- Method of Data Collection

- Method of Data Analysis

Design of the Study

The survey research design will be used in this study because the approach involves a close examination of the characteristics of a specific event as they exist throughout the study period (Ugwu, 2023), it is considered to be perfect for this research.

Population of the Study

The population of this study consists of all the three thousand, eight hundred and eleven SS3 Biology students enrolled in the thirteen public senior secondary schools within Egor Local Government Area of Edo State.

Sample and Sampling Technique

The sample size for this study will be two schools from the thirteen schools. All SSS III students from the sampled schools form the sample for this study. Simple random sampling technique was used to sample two schools, while SSS III was censused for the study.

Research Instrument

The instrument used for data collection in this study is the questionnaire titled: “Language Issue in Biology Questionnaire (LIBQ), and the achievement test. Likert scale questionnaire, SA, A, D, SD will be used to source information on research questions 1 to 3, while research question 2 will be presented to test students’ proficiency in writing biological terminologies.

Validity of the Instrument

To ensure the content and face validity of the instrument, the drafted copy of the questionnaire will be given to three experts for proper modification. Based on the expert's corrections, the final draft will be prepared and used for data collection.

Reliability of the Instrument

To ascertain the reliability of the instrument, a pilot study will be conducted using 20 students in Egor Local Government Area in Edo State. The reliability estimate will be obtained using Cronbach's alpha statistics which show the reliability of the instrument.

Method of Data Collection

The copies of the structured questionnaire will be personally distributed by the researcher to the respondents, all the questionnaire that will be administered will be collected on the spot to ensure high return rates.

Method of Data Analysis

This study will employ the descriptive analysis. Descriptive statistics is used to summarize the characteristics of all variables in the administered questionnaires in order to present the data in a more meaningful way, which allows a simpler interpretation of the data. The collected data will be analyzed using mean scores and percentage statistics. Any mean score from 2.50 and above will be regarded as "Agree", while mean scores below 2.50 will be tagged "Disagree".

Research question 2 will be calculated using percentage.

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter presents the analysis of data collected for this study. The presentation analysis is based on the separate consideration of each research questions formulated. The following are the results which are shown in tabular forms and discussed.

Presentation of Results

Research Questions One: How proficient are Biology students in writing Biological terminologies?

Table 1:Biology Students' Proficient Level in Writing Biological Terminologies.

S/N	Questions	Response	Frequency	Percent age
1.	A. Deoxyribonucleic acid B. Deoxyribonuclic acid C. Deoxyribonucleic acis D. Deoxyribonuclec acid	Pass	48	47%
		Fail	54	53%
		Total	**102**	**100.0**
2	A) Phototropism B. Phototropisim C. Phototropizm D. Phototropysm	Pass	55	53%
		Fail	47	47%
		Total	**102**	**100.0**
3	A. Cytoskeleten B. Cytoskeleton C. Cytoskeletin D. Cytoskeletion	Pass	61	59%
		Fail	41	41%
		Total	**102**	**100.0**
4	A. Homeostasis B. Homeostasiss C. Homeostatis D. Homeostesys	Pass	90	88%
		Fail	12	12%
		Total	**102**	**100.0**
5	A. Arthropodd B. Arthopod C. Arthropod D. Arthropode	Pass	48	47%
		Fail	54	53%
		Total	**102**	**100.0**
6	A. Mitocondrion B. Mitochondion C. Mitochondrion D. Mitochonrion	Pass	66	64%
		Fail	36	37%
		Total	**102**	**100.0**
7	A. Deoxyribonucleic B. Deoxyrebonucleic C. Deoxiribonucleic D. Deoxiribonocleic	Pass	42	41%
		Fail	60	59%
		Total	**102**	**100.0**
8	A. Haemoglobin B. Hemoglibin C. Hemoglobbin D. Hemoglobin	Pass	75	73%
		Fail	27	27%
		Total	**102**	**100.0**
9	A. Phospholipidd B. Phosphollipid C. Phospholipid D. Phospholippid	Pass	88	86%
		Fail	14	14%
		Total	**102**	**100.0**
10	A. Carbhohydrate B. Carbohidrate C. Carbohydrate D. Carbohdrate	Pass	100	98%
		Fail	2	2%
		Total	**102**	**100.0**
11.	A. Glycolisys B. Glycolysis C. Glycollisis D.	Pass	99	97%

	Glycolisiss	Fail	3	3%
		Total	**102**	**100.0**
12	A. Echinoderm B. Echinodurm C. Ecinoderm D. Echonoderm	Pass	77	75%
		Fail	25	25%
		Total	**102**	**100.0**
13	A. Cloroplast B. Chloroplast C. Chloroplastt D. Chloreplast	Pass	83	81%
		Fail	19	19%
		Total	**102**	**100.0**
14	A. Paroxisome B. Peroxisom C. Peroxysome D. Peroxisome	Pass	91	89%
		Fail	11	11%
		Total	**102**	**100.0**
15	A. Angiosperm B. Angiospern C.Angiosperem DAngisoperm	Pass	77	75%
		Fail	25	25%
		Total	**102**	**100.0**
16	A. Arthropood B. Arthropod C. Arthropood D. Arthropoad	Pass	81	79%
		Fail	21	21%
		Total	**102**	**100.0**
17	A. Biodversity B. Biodivercity C. BiodiversityD. Biodeversity	Pass	79	77%
		Fail	23	23%
		Total	**102**	**100.0**
18	A. Clorophyll B. Chlorophyll C. Chlorophyl D. Clorophyl	Pass	48	47%
		Fail	54	53%
		Total	**102**	**100.0**
19	A. Crustacian B. Crusacean D. Crustasian D. Crustacean	Pass	66	64%
		Fail	36	36%
		Total	**102**	**100.0**
20	A. Decomposor B. Decompuser C. DecompsoerD. Decomposer	Pass	98	96%
		Fail	4	4%
		Total	**102**	**100.0**
21	A. Eukaryote B. Eukariote C. Ekaryote D. Eukaryot	Pass	41	40%
		Fail	61	60%
		Total	**102**	**100.0**
22	A. Exoskeletan B. Exosceleton C.Exoskelleton D.	Pass	66	64%
		Fail	36	36%

	Exoskeleton	**Total**	**102**	**100.0**
23	A. Herbivor B. Herbivor C. Herbivour D. Herivore	Pass	78	76%
		Fail	24	24%
		Total	**102**	**100.0**
24	A. Heterotrophh B. Heterotroph C. Heterotrof D. Hetrotroph	Pass	82	80%
		Fail	20	20%
		Total	**102**	**100.0**
25	A. Invertibrate B. Invertebrate C. Invertebrete D. Inveretebrate	Pass	100	98%
		Fail	2	2%
		Total	**102**	**100.0**
26	A. Microorganism B. Microorgansim C. Microorganisim D. Microrganism	Pass	101	99%
		Fail	1	1%
		Total	**102**	**100.0**
27	A. Ovaparous B. Oviparous C. Oviparos D. Oviperous	Pass	89	87%
		Fail	13	13%
		Total	**102**	**100.0**
28	A. Phleom B. Phoem C. Phloem D. Phloem	Pass	99	97%
		Fail	3	3%
		Total	**102**	**100.0**
29	A. Photosynthsis B. Photossynthesis C. Photosynthesys D. Photosynthesis	Pass	98	95%
		Fail	**4**	5%
		Total	**102**	**100.0**
30	A. Philipsm B. Phylum C. Phylm D. Phyluum	Pass	88	86%
		Fail	14	14$
		Total	**102**	**100.0**
31	A. Plantai B. Plantae C. Plantae D. Plantay	Pass	79	77%
		Fail	23	13%
		Total	**102**	**100.0**
32	A. Speciess B. Speices C. Species D. Specice	Pass	102	100%
		Fail	0	-
		Total	**102**	**100.0**
33	A. Taxonmy B. Taxonomi C. Taxanomy D. Taxonomy	Pass	98	96%
		Fail	2	4%
		Total	**102**	**100.0**
34	A. Xylim B. Xylium C. Xyleum D. Xylem	Pass	66	64%
		Fail	36	36%

		Total	**102**	**100.0**
35	A. Autotrof B. Autothroph C. Autotrophh D. Autotroph	Pass	71	69%
		Fail	31	31%
		Total	**102**	**100.0**
36	A. Deoxyribonucleic acide (DNA) B. Deoxyribonucleic acid (DNA) C. Deoxyribonucleic asid (DNA) D. Deoxiribonucleic acid (DNA)	Pass	101	99%
		Fail	1	1%
		Total	**102**	**100.0**
37	A. Homestasis B. Homeostasis C. Homeostass D. Homostasys	Pass	98	96%
		Fail	2	4%
		Total	**102**	**100.0**
38	A. Insectivore B. Insectivor C. Insectavore D. Insectivour	Pass	77	75%
		Fail	25	25%
		Total	**102**	**100.0**
39	A. Metamorphis B. Metamorphosys C. Metamorphisis D. Metamorphosis	Pass	66	64%
		Fail	36	36%
		Total	**102**	**100.0**
40	A. Mutualism B. Mutualim C. Mutualysm D. Mutalism	Pass	99	97%
		Fail	3	3%
		Total	**102**	**100.0**
41	A. Omnivor B. Omnivour C. Omnivvar D. Omnivore	Pass	100	98%
		Fail	2	2%
		Total	**102**	**100.0**
42	A. Heterotrophh B. Heterotroph C. Heterotrof D. Hetrotroph	Pass	66	64%
		Fail	36	35%
		Total	**102**	**100.0**
43	A. Polllution B. Polution C. Polllution D. Pollution	Pass	98	95%
		Fail	4	5%
		Total	**102**	**100.0**
44	A. Saprophyte B. Saprofyte C. SaprophiteVD. Saprophyte	Pass	77	75%
		Fail	25	25%
		Total	**102**	**100.0**

45	A. Species diversety B. Species diversitiy C. Species diversity D. Species diversity	Pass	98	96%
		Fail	2	4%
		Total	**102**	**100.0**
46	5. A. Symbiocsis B. Symbiosis C. Symbiosys D. Symbiosos	Pass	55	53%
		Fail	47	47%
		Total	**102**	**100.0**

From the table 1, respondents demonstrated full understanding (100% correct responses) on item 32. This shows complete consensus and strong knowledge in the area of species terminology.

Items 10, 11, 20, 25, 26, 28, 29, 33, 36, 37, 40, 41, 43, and 45 had 94% to 99% respondents answering correctly, indicating high comprehension with minimal errors. These cover topics related to carbohydrate, glycolysis, decomposer, invertebrate, microorganism, phloem, photosynthesis, taxonomy, DNA (full form), homeostasis (variant), mutualism, omnivore, pollution, and species diversity.

Items 4, 9, 13, 14, 24, 27, and 30 had 80% to 93% correct responses (80-89% pass rates), reflecting solid understanding but some spelling confusion. These items relate to homeostasis, phospholipid, chloroplast, peroxisome, heterotroph, oviparous, and phylum.

The remaining items (1, 2, 3, 5, 6, 7, 8, 12, 15, 16, 17, 18, 19, 21, 22, 23, 31, 34, 35, 38, 39, 42, 44, 46) had below 80% correct (40% to 79% pass rates), indicating notable misconceptions or uncertainty. These cover deoxyribonucleic acid (DNA), phototropism, cytoskeleton, arthropod, mitochondrion, deoxyribonucleic (prefix), haemoglobin, echinoderm, angiosperm, arthropod (variant), biodiversity, chlorophyll, crustacean, eukaryote, exoskeleton, herbivore, plantae, xylem, autotroph, insectivore, metamorphosis, heterotroph (repeat), saprophyte, and symbiosis. In conclusion, the data indicates that respondents have a strong grasp of biological terminology related to cell structures, nutrition types, taxonomy, and physiological processes, though spelling accuracy varies widely across specific terms. The high correct response rates in core concepts reflect solid foundational knowledge, with room for targeted spelling instruction in challenging items.

Research Question Two: What Language related Issues do Students have in the Conceptualization of Biological Concepts?

Table 2: Language Related Issues Students have in the Conceptualization of Biological Concepts.

S/N	**ITEMS**	**N**	**Mean**	**Standard Deviation**	**Decision**
1	I find it hard to understand biology concepts because the terms are not in simple English.	102	3.11	.87	Agree
2	I often mix up biological terms because they sound similar.	102	2.17	.64	Disagree
3	I understand biology better when my teacher explains it in everyday language.	102	3.01	.91	Agree
4	I get confused by the scientific words used in biology textbooks.	102	2.51	.58	Agree

The interpretation of Research Question Two, based on Table 2, reveals the language-related issues students face in the conceptualization of biological concepts. Students agree that they find it hard to understand biology concepts because the terms are not in simple English (mean = 3.11). However, they disagree that they often mix up biological terms because they sound similar (mean = 2.17). Students agree that they understand biology better when their teacher explains it in everyday language (mean = 3.01). They also agree that scientific words used in biology textbooks cause confusion (mean = 2.51). Moreover, students agree that they understand the meaning of most Biology words when they translate them into their local language (mean = 2.74). In conclusion, students perceive the complexity of English biological terms, the clarity of teacher explanations, confusion from scientific vocabulary, and the use of local language translation as key factors affecting their understanding of biological concepts.

Research Question Three: What are the hindrances to students' conceptualization of Biological Terminologies?

Table 3: The Hindrances to Students' Conceptualization of Biological Terminologies.

S/N	ITEMS	N	Mean	Standard Deviation	Decision
1	The spelling of many biological terms makes them difficult for me to remember.	102	3.20	.97	Agree
2	I lose interest in Biology when too many new scientific words are introduced at	102	2.92	1.04	Agree

	once.				
3	I find it difficult to connect biological terms with real-life examples.	102	2.79	1.20	Agree
4	My teacher rarely explains the meanings of new biological terms clearly.	102	2.81	.91	Agree
5	I usually memorize Biology words without understanding what they really mean.	102	3.87	1.05	Agree

The interpretation of Research Question Three, based on Table 3, reveals the hindrances to students' conceptualization of biological terminologies. Students agree that the spelling of many biological terms makes them difficult to remember (mean = 3.20). They also agree that they lose interest in Biology when too many new scientific words are introduced at once (mean = 2.92). Students agree that they find it difficult to connect biological terms with real-life examples (mean = 2.79). They further agree that their teacher rarely explains the meanings of new biological terms clearly (mean = 2.81). Moreover, students strongly agree that they usually memorize Biology words without understanding what they really mean (mean = 3.87). In conclusion, students perceive complex spelling, rapid introduction of terminology, lack of real-life connections, inadequate teacher explanations, and rote memorization without comprehension as key hindrances to conceptualizing biological terminologies.

Discussion of Findings

From the study, respondents demonstrated complete mastery of species terminology with 100% correct responses, signifying an absolute consensus and robust knowledge in this area. High comprehension rates (94% to 99%) were observed on diverse biological topics such as carbohydrate metabolism, glycolysis, decomposers, and photosynthesis, indicating strong foundational biological understanding with minimal errors. However, moderate performance (80% to 93%) on terms like homeostasis, phospholipid, and chloroplast suggests some spelling difficulties despite sound conceptual grasp. The lowest performance (below 80%) on terms including DNA variants, phototropism, cytoskeleton, and biodiversity reflects notable misconceptions or confusion about specific biological terms. Overall, these data reveal that while students possess a solid conceptual foundation in biological terminology and processes, spelling accuracy and the comprehension of more complex or abstract terms need targeted instructional focus. Research on Biology jargon aligns closely with these findings, showing that students often overestimate their understanding of biological terms, especially those with meanings overlapping between everyday language and technical contexts (Freeman et al., 2019). Technical vocabulary in biology, often termed “jargon,” can hinder deeper conceptual understanding and scientific literacy, particularly when terms are abstract or linguistically complex. This reflects the observed challenge in spelling and conceptualizing terms such as phospholipid or peroxisome. Studies emphasize the need to directly support students’ language comprehension and specialized vocabulary to bridge the gap between surface memorization and genuine understanding (Freeman et al., 2019; Ali et al., 2022).

Students reported language-related challenges affecting their Biology learning, including difficulty understanding complex English scientific terms, confusion caused by scientific vocabulary, and enhanced comprehension when terms are explained in everyday language or translated into their local language. These perceptions resonate with evidence showing that limited language skills negatively impact biology instruction and learning outcomes (Njuguna et al., 2024). The complexity of scientific English and lack of familiarity with precise biological terminology impedes learners’ ability to internalize and apply biological concepts (Kauser & Shah, 2019). Providing explanations in more accessible language and linking terms to learners' native languages can clarify meaning and foster better conceptual connections.

Regarding hindrances, students emphasized spelling difficulty, rapid introduction of new terms, inability to connect terms with real-life examples, unclear teacher explanations, and rote memorization without understanding. This mirrors existing research identifying spelling and the volume of new vocabulary as barriers to science learning motivation and accomplishment (Ayana, 2024). Research also highlights that rote memorization alone is insufficient, as it often leads to superficial retention without the underlying conceptual grasp necessary for academic success (Njuguna et al., 2024; Freeman et al., 2019). Engaging students through active learning strategies that focus on meaning rather than mere word recognition improves retention and comprehension.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Findings

The study examined Language Issue: A Barrier in Biology Students' Conceptualization of Biological Concepts. three research questions were raised to guide this study. The study adopted the descriptive survey research design. The population of this study consists of all the three thousand, eight hundred and eleven SS3 Biology students enrolled in the thirteen public senior secondary schools within Egor Local Government Area of Edo State, while 105 respondents were sampled for the study. The instrument used for data collection is a self-structured achievement test. This instrument was validated by the project supervisor and other lecturers in the Department of Curriculum and Instructional Technology (CIT), Faculty of Education, University of

Benin. The instruments were taken the lecturers in their offices for validation. Research question one was analysed using simple percentage, research questions two, three and four were analyzed using mean and standard deviation. The findings from the study are as follows:

1. The study revealed that respondents achieved 100% mastery on species terminology and 94-99% on core topics like glycolysis and photosynthesis, but below 80% on complex terms like phototropism and biodiversity.
2. The study showed that students perceive biological terms as complex and confusing, yet benefit from teacher explanations in everyday language and local translations.
3. The study demonstrated that spelling difficulties, rapid term introduction, lack of real-life links, poor teacher clarity, and rote memorization hinder conceptualization of Biology terms.

Conclusion

It can be concluded that the study highlights the strong conceptual foundation students have in key biological terms, especially in species terminology and core processes like glycolysis and photosynthesis, showing their solid understanding of fundamental biological concepts. However, the findings also reveal significant challenges related to spelling accuracy and comprehension of more complex or abstract biological terms, which negatively affect students' overall mastery in Biology. The study demonstrates that language plays a crucial role in how students conceptualize biology. Complex English scientific terms and specialized vocabulary pose difficulties, but students find it easier to understand Biology when teachers explain terms in everyday language or when terms are translated into their local language. This underscores the importance of language accessibility in science education to improve student comprehension. Additionally, the research shows that students are hindered by the difficulty of spelling biological terms, the rapid influx of new vocabulary, lack of connections to real-life examples, unclear teacher explanations, and a reliance on rote memorization that does not promote true understanding. These factors collectively diminish students' ability to internalize and apply biological knowledge meaningfully. Finally, the study points to effective strategies for improving biology learning, including the use of flashcards for spelling, gradual introduction of scientific terminology, linking terms to everyday life, clear and detailed teacher explanations, and focusing on understanding meanings rather than memorization alone. These approaches help reduce the cognitive burden imposed by dense jargon and foster deeper conceptual learning.

Recommendation

Based on the findings of the study, the following recommendations are made:

1. Teachers should relate biological terms to real-life examples and focus on meanings rather than rote memorization.
2. Curriculum developers should incorporate everyday language explanations and local translations for complex Biological terminologies.
3. School administrators should train teachers on the relevance of local language in biological teaching.

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APPENDIX

QUESTIONNAIRE

DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY

FACULTY OF EDUCATION

UNIVERSITY OF BENIN, BENIN CITY

(ACHIEVEMENT TEST AND QUESTIONNAIRE ON LANGUAGE ISSUE: A BARRIER IN BIOLOGY STUDENTS' CONCEPTUALIZATION OF BIOLOGICAL CONCEPTS)

Dear Respondent,

I am an undergraduate in the above-named department. I am carrying out a research on: "Language Issue: A Barrier in Biology Students' Conceptualization of Biological Concept" This achievement test and questionnaire are designed for academic purposes. Please respond sincerely to the questions by ticking [√] where applicable. Your responses will be treated with a high level of confidentiality. Thank you Yours faithfully,

Faith EDOKPEAWE

(Researcher)

SECTION A: Demographic Information

Instructions: Please tick (√) where

applicable. Gender: Female ( ): Male ( )

SECTION B: Achievement Test on How Proficient Biology Students are in Writing Biological Terminologies.

Instruction: ***Circle the options that serves as the correct spelling for each item.***

1. A. Deoxyribonucleic acid B. Deoxyribonuclic acid C. Deoxyribonucleic acis D. Deoxyribonuclec acid

2. A) Phototropism B. Phototropisim C. Phototropizm D. Phototropysm

3. A. Cytoskeleten B. Cytoskeleton C. Cytoskeletin D. Cytoskeletion

4. A. Homeostasis B. Homeostasiss C. Homeostatis D. Homeostesys

6. A. Acetycholine B. Acetylcholine C. Aceticholine D. Acetylchollin

7. A. Arthropodd B. Arthopod C. Arthropod D. Arthropode

8. A. Mitocondrion B. Mitochondion C. Mitochondrion D. Mitochonrion

9. A. Deoxyribonucleic B. Deoxyrebonucleic C. Deoxiribonucleic D. Deoxiribonocleic

10. A. Haemoglobin B. Hemoglibin C. Hemoglobbin D. Hemoglobin

11. A. Phospholipidd B. Phosphollipid C. Phospholipid D. Phospholippid

12. A. Carbhohydrate B. Carbohidrate C. Carbohydrate D. Carbohdrate

13. A. Glycolisys B. Glycolysis C. Glycollisis D. Glycolisiss

14. A. Echinoderm B. Echinodurm C. Ecinoderm D. Echonoderm

15. A. Cloroplast B. Chloroplast C. Chloroplastt D. Chloreplast

16. A. Paroxisome B. Peroxisom C. Peroxysome D. Peroxisome

17. A. Angiosperm B. Angiospern C.Angiosperem DAngisoperm

18. A. Arthropood B. Arthropod C. Arthropood D. Arthropoad

19. A. Biodversity B. Biodivercity C. BiodiversityD. Biodeversity

20. A. Clorophyll B. Chlorophyll C. Chlorophyl D. Clorophyl

21. A. Crustacian B. Crusacean D. Crustasian D. Crustacean

22. A. Decomposor B. Decompuser C. DecompsoerD. Decomposer

23. A. Eukaryote B. Eukariote C. Ekaryote D. Eukaryot

24. A. Exoskeletan B. Exosceleton C.Exoskelleton D. Exoskeleton

25. A. Herbivor B. Herbivor C. Herbivour D. Herivore

26. A. Heterotrophh B. Heterotroph C. Heterotrof D. Hetrotroph

27. A. Invertibrate B. Invertebrate C. Invertebrete D. Inveretebrate

28. A. Microorganism B. Microorgansim C. Microorganisim D. Microrganism

29. A. Ovaparous B. Oviparous C. Oviparos D. Oviperous

30. A. Phleom B. Phoem C. Phloem D. Phloem
31. A. Photosynthsis B. Photossynthesis C. Photosynthesys D. Photosynthesis
32. A. Philipsm B. Phylum C. Phylm D. Phyluum
33. A. Plantai B. Plantae C. Plantae D. Plantay
34. A. Speciess B. Speices C. Species D. Specice
35. A. Taxonmy B. Taxonomi C. Taxanomy D. Taxonomy
36. A. Xylim B. Xylium C. Xyleum D. Xylem
37. A. Autotrof B. Autothroph C. Autotrophh D. Autotroph
38. A. Deoxyribonucleic acide (DNA) B. Deoxyribonucleic acid (DNA) C. Deoxyribonucleic asid (DNA) D. Deoxiribonucleic acid (DNA)
39. A. Homestasis B. Homeostasis C. Homeostass D. Homostasys
40. A. Insectivore B. Insectivor C. Insectavore D. Insectivour
41. A. Metamorphis B. Metamorphosys C. Metamorphisis D. Metamorphosis
42. A. Mutualism B. Mutualim C. Mutualysm D. Mutalism
43. A. Omnivor B. Omnivour C. Omnivvar D. Omnivore
44. A. Polllution B. Polution C. Polllution D. Pollution
45. A. Saprophyte B. Saprofyte C. SaprophiteVD. Saprophyte
46. A. Species diversety B. Species diversitiy C. Species diversity D. Species diversity
47. A. Symbiocsis B. Symbiosis C. Symbiosys D. Symbiosos

SECTION C: Data on Questionnaire

Below are the statements in which you are to tick the column tht best represent your opinion.

S/N	ITEMS	SA	A	D	SD
RQ 1	**What language related issues do students have in the conceptualization of biological concepts?**				
1	I find it hard to understand biology concepts because the terms are not in simple English.				
2	I often mix up biological terms because they sound similar.				
3	I understand biology better when my teacher explains it in everyday language.				
4	I get confused by the scientific words used in biology textbooks.				
5	I understand the meaning of most biology words when I translate them into my local language.				

S/N	ITEMS	SA	A	D	SD
RQ 3	**What are the hindrances to students' conceptualization of biological terminologies?**				
1	The spelling of many biological terms makes them difficult for me to remember.				
2	I lose interest in Biology when too many new scientific words are introduced at once.				
3	I find it difficult to connect biological terms with real-life examples.				
4	My teacher rarely explains the meanings of new biological terms clearly.				
5	I usually memorize Biology words without understanding what they really mean.				