INVESTIGATING UNDERGRADUATE STUDENTS' PERCEPTION OF MISCONCEPTIONS ON THE CONCEPT OF EVOLUTION AND THEIR ACHIEVEMENTS IN BIOLOGY

BY

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BENIN CITY

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

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CERTIFICATION

We, the undersigned, certify that this research project was carried out by **IGBERAESE OSEWE AMOS** in Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin City, Edo state.

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DEDICATION

This work is dedicated to Almighty God, for granting me divine health, strength, and guidance throughout my academic journey. His sustenance and favor have been my anchor.

To my late parents, whose dreams and aspirations for my education continue to inspire me, your legacy lives on through me, and I'm grateful for the values and foundation you laid. And to my late brother, who ignited the spark of education in me and encouraged me to pursue my dreams. Though you aren't here to see me finish, I know you're smiling down on me. This achievement is a testament to your enthusiasm and love.

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ABSTRACT

Undergraduate students' perception of misconceptions on the concept of evolution and their achievement in biology was investigated.

This study investigated the prevalence, sources, and impacts of evolution misconceptions among 150 undergraduate biology students across three departments—Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB), and Plant Biology and Biotechnology (PBB) at university of Benin. Guided by six research questions, it explored (1) common misconceptions about evolution, (2) the relationship between students' evolution perceptions, misconceptions, and academic achievement, (3) the origins of these misconceptions, (4) departmental differences, (5) overall trends, and (6) preferred instructional strategies to address them.

Data were collected via a structured questionnaire employing Likert scales (Strongly Agree to Strongly Disagree; True/False/Not Sure) and an objective test of evolutionary concepts. Frequency distributions, means, and percentages summarized responses, while an objective assessment categorized students' test scores into five performance bands.

Findings revealed that although 88% of students affirmed evolution as the foundation of modern biology, pervasive misconceptions persisted: 55% believed individuals evolve within a lifetime; 48% thought natural selection generates new traits; 46% accepted inheritance of acquired characteristics; and 39% assumed direct human–monkey ancestry. Misconceptions correlated strongly with poor performance: over 90% of students scored "Very Poor" or "Below Average" on objective questions, with no one achieving "Above Average" or "Excellent." Major sources of misunderstanding included secondary school instruction (71%), current teaching methods (71%), popular media influence (66%), and conflicts with personal beliefs (70%).

Students endorsed multiple pedagogical interventions; real-life examples (79%), visual aids and simulations (78%), interactive debates and projects (71%), belief-inclusive discussions (65%), and remedial sessions (69%), as means to deepen conceptual clarity.

The study concludes that high acceptance of evolution does not equate to accurate understanding. To bridge this gap, curricula must incorporate misconception-driven modules, active learning strategies, and belief-sensitive dialogues, supported by teacher training and targeted remediation. These measures are essential to enhance evolutionary literacy and improve academic outcomes in biology at the University of Benin.

CHAPTER ONE

INTRODUCTION

Background of the Study

Investigating undergraduate students' perceptions of misconceptions surrounding the concept of evolution and their corresponding academic performance in biology has become as a crucial area of focus in evaluating students' academic performance on the concept of evolution.

Evolutionary theory is the central theory of biology. It explains the unity of life by documenting how extant and extinct species share a common ancestry. It also explains the diversity of life by describing how species have evolved from ancestral ones through natural processes (a "species" can be defined as a group of individuals that can interbreed and produce fertile offspring, although this definition overlooks the complexities of microbial life). Today, an evolutionary perspective is dominant in many of the most active fields of biological research and also provides important insights in medical, agricultural, and conservation studies and applications. The evidence for evolution is vast and comes from several different disciplines, such as paleontology, systematics, developmental biology, and genomics, which makes scientists consider evolution to be a fact of life. All in all, evolutionary theory is a powerful scientific theory that organizes and provides coherence to

our understanding of life. As Theodosius Dobzhansky, an important evolutionary geneticist of the twentieth century, famously stated, without evolution biology seems like a pile of sundry facts that make no meaningful picture as a whole. Why do the debates about evolution persist, despite the plentiful evidence for it? (Kostas Kampourakis, 2020)

Evolution is an important part of biology education, but many undergraduate biology students do not accept important components of evolution, like the evolution of humans. Practices that reduce perceived conflict between religion and evolution have been proposed to increase student evolution acceptance. This study investigates college student experiences of conflict reducing practices in evolution education and how these experiences are related to their gains in acceptance of human evolution during evolution instruction. In this current study, we compared student evolution acceptance when they perceive different levels of conflict reducing practices in their evolution instruction. Perceived conflict between evolution and a student's religious beliefs and religious culture has been shown to be one of the biggest factors influencing evolution acceptance. There are substantial and consistent negative correlations between a student's level of commitment to their religion, which is called religiosity, and the extent to which they accept evolution. Low acceptance of evolution is also related to students' specific religious affiliations. Thus, we have advocated that instructors should try to mitigate potential consequences of religious identity differences between themselves and students by practicing cultural competence and using conflict reducing teaching strategies when teaching evolution [25]. Cultural competence is the ability of

individuals from one culture… to bridge cultural differences to effectively communicate to individuals from a different culture. Cultural competence has become a useful framework for describing how instructors can aim to bridge divides based on demographic and cultural differences between themselves and their students (PLOS ONE.0313490).

Acknowledging the cultural or religious controversy that may exist for some students in a classroom and fostering positive dialogue about it, coupled with emphasizing the nature of science, may provide teachable moments about why a difference exists between acceptance of evolution among scientists and among the public. There is perhaps no more direct way to address cultural conflicts than by using examples of human evolution because reluctance to accept evolution is often due to a conflict between cultural, religious, or social beliefs about what it means to be human and an evolutionary perspective on the same question (Pobiner et al. 2018).

The primary aim of this study Is to delve deeper into the perceptions held by undergraduate students regarding common misconceptions about evolution. By conducting surveys on focus groups, gather qualitative and quantitative data that will shed light on how these misconceptions are formed and perpetuated. Furthermore, this study seeks to analyze the impact of these misconceptions on students' academic performance in biology, as understanding the extent to which these misunderstandings affect learning outcomes is essential for developing effective instructional strategies. Through this investigation, I hope

to identify specific areas where educational interventions could be implemented to address misconceptions in evolution. I aim to enhance students' confidence and ability to engage with biological subjects effectively. Additionally, this research may contribute to broader discussions on the importance of accurately teaching evolution in academic settings, ultimately leading to improved educational practices that support students' academic success in biology and related disciplines.

The well-established finding that substantial confusion and misconceptions about evolution and natural selection persist after college instruction suggests that these courses neither foster accurate mental models of evolution's mechanisms nor instill an appreciation of evolution's centrality to an understanding of the living world (Ross H. Nehm et. al. 2008)

There a lot of misconceptions about evolution. Misconceptions about evolution include the idea that individuals evolve instead of populations, that evolution is a linear progression towards "better" organisms, and that it is only a theory. Other misunderstandings involve the belief that humans evolved from monkeys, that evolution is solely about natural selection, and that it explains the origin of life. Some Common misconceptions are as follows:

1. Evolution is a theory about the origin of life.
2. Acquired traits are passed down.
3. Evolutionary theory implies that life evolved (and continues to evolve) randomly or by chance.

4. Evolution result in progress: organisms are always getting better through evolution.
5. Individual organisms can evolve during a single life span.
6. Evolution only occurs slowly and gradually.
7. Because evolution is slow, humans cannot influence it.
8. Genetic drift only occurs in small populations.
9. Humans are not currently evolving.
10. Species are distinct natural entities, with a clear definition that can be easily recognized by anyone.
11. Natural selection involves organisms trying to adapt.
12. Natural selection gives organisms what they need.
13. Humans can't negatively impact ecosystem because species will just evolve what they need to survive.
14. Natural selection Acts for the good of the species.
15. The fittest organism in a population is those that are strongest, healthiest, tallest and/or largest.
16. Natural selection is about survival of the very fittest individuals in a population
17. Natural selection produces organisms perfectly suited to their environment.
18. Evolution is not a science because it is not observable or testable.
19. Evolution is "just" a theory.

20. Evolution theory is incomplete and cannot give a total explanation for the biodiversity we see around us.
21. Gaps in the fossil record disprove evolution.
22. The theory of evolution is flawed, but scientists won't admit it.
23. If students are taught that they are animals, they will behave like animals.
24. Evolution leads to immoral behavior.
25. Evolution and religion are incompatible.
26. Teachers should teach "both sides" of the evolution and let students decide – or give equal time to evolution and creationism.
27. Evolution is itself religious, so requiring teachers to teach evolution violates the first amendment.
28. Most biologists have rejected 'Darwinism' and no longer agree with the ideas put forth By Darwin and Wallace.

They prevent students from grasping accurate scientific explanations and understanding the core principles of evolution, leading to difficulties in applying this knowledge in other biological contexts. Addressing these misconceptions is crucial for improving scientific literacy and fostering a deeper understanding of biological processes. The following are ways in which these misconceptions can hinder affect students' achievement in biology:

1. Hindering Conceptual Understanding:

- Misconceptions act as barriers to understanding the fundamental mechanisms of evolution, such as natural selection, adaptation, and genetic inheritance.
- Students may hold incorrect beliefs about how evolution works, leading to a distorted understanding of the process and its implications.
- For example, some students might believe that evolution is a "survival of the fittest" where the strongest individuals always survive, rather than understanding that it's about the "survival of the fit enough".
- This misunderstanding can prevent students from grasping the complexities of evolutionary relationships and the diversity of life.

2. Affecting Performance on Assessments:

- Misconceptions can lead to incorrect answers on assessments and quizzes, hindering students' ability to demonstrate their knowledge of evolution.
- Students may struggle to apply their knowledge to new scenarios or explain complex evolutionary concepts if they are not grounded in accurate scientific principles.
- Research has shown a negative correlation between acceptance of evolution and later achievement in biology courses, indicating that misconceptions can impact overall performance.

3. Limiting Scientific Literacy:

- Misconceptions can hinder the development of scientific literacy by preventing students from understanding the scientific method and the evidence supporting evolutionary theory.

- They can also make it difficult for students to critically evaluate scientific claims and understand the role of evolution in various scientific disciplines.
- A solid understanding of evolution is essential for appreciating the interconnectedness of life and the importance of biodiversity.

4. Affecting Attitudes Towards Science:

- Students who struggle with evolution may develop negative attitudes towards science, especially if they feel confused or frustrated by the subject.
- This can lead to a reluctance to engage with scientific concepts and a decreased motivation to pursue science-related fields.
- It's important for educators to create a supportive learning environment where students feel comfortable asking questions and exploring their ideas, even if they have misconceptions.

Understanding the reality of evolution is fundamental to science education. However, many Americans deny the theory of evolution despite overwhelming evidence and uniform support from the scientific community (Nadelson and Hardy 2015).

Perhaps more surprisingly, even when acceptance of evolution is not a factor, college-level instruction does not necessarily result in full understanding of evolution either, and numerous studies identify multiple evolution related misconceptions held by different groups of students. For example, Cunningham and Wescott (2009) identified and evaluated biological

anthropology students' misconceptions about evolution and found that, despite acceptance of evolutionary theory, students lack understanding of the process of evolution. Tran et al. (2014) also identified similar misconceptions among advanced undergraduate biology majors. And Beggrow and Sbeglia (2019) reported that despite some differences in evolutionary reasoning and in the specific types of evolution misconceptions held by biology and anthropology majors, both populations performed poorly on a measure of evolutionary knowledge

Several other instruments to assess both student misconceptions about evolution and student understanding of evolution have been developed, including the Measure of the Acceptance of Evolutionary Theory (MATE; Rutledge and Sadler 2007) and the Inventory of Students' Acceptance of Evolution (I-SEA; Nadelson and Southerland 2012) with different student populations (see also Nehm and Mead 2019; Furrow and Hsu 2019). Results of multiple studies using these instruments show that student misconceptions continue despite college-level classroom instruction (e.g., Beggrow and Sbeglia 2019). Use of these types of assessment instruments aids in understanding and addressing student misconceptions, but there clearly remains a need to find the most effective teaching and learning strategies for evolution education (Glaze and Goldston 2015). Pobiner (2016) recently reviewed the current state of evolution teaching and learning and concluded that focusing on human examples, such as in biological anthropology courses, is an effective way to enhance student understanding and acceptance of evolution. Based on results of the "Teaching Evolution through Human Examples" project (Pobiner et al. 2015, 2018), these authors suggest that the

use of human examples is helpful because human examples are relevant, they increase students' acceptance and understanding of evolution, and they help students to appreciate historical science. Numerous other investigators have supported this suggestion (e.g., see Beggrow and Sbeglia 2019) and some research suggests that students across multiple disciplines (majors and non-majors) actually prefer the use of human examples when learning about evolution (e.g., Pobiner et al. 2018; Paz-y-Miño-C and Espinosa 2016). However, even with a focus on human evolution, misconceptions continue to exist (e.g., Cunningham and Westcott 2009; Beggrow and Sbeglia 2019).

Pittinsky (2015) further suggests that firsthand experience with scientific methods, as well as interactions with real scientists, would help address some of the problems in teaching evolution. It seems that when students learn to think like a scientist and use the same actions that led to original discoveries, they gain insight into the strategies and techniques used by scientists studying evolution (Passmore and Stewart 2002). Scharmann et al. (2018) and Nelson et al. (2019) also suggest that Nature of Science (NOS) principles should be covered before even introducing the theory of evolution. Some research supports this suggestion. Research suggests that the order in which concepts are introduced makes a difference in students' understanding of evolution, at least among high school students. For example, Mead et al. (2017) reported that teaching genetics first (before evolution) improves student understanding of evolution. And, Beggrow and Sbeglia (2019) further suggest that targeting naïve ideas about evolution should be an instructional goal, particularly in anthropology

education. Wingert et al. (2022) show that employing instructional activities that directly challenge students' teleological concepts about natural selection improves their acceptance and understanding of evolution. Taken together, these results support Nelson's (2008) recommendation of three learning strategies to improve student understanding of evolution: (1) extensively using active learning strategies; (2) focusing on science as a process and way of knowing; and (3) identifying and directly addressing student misconceptions.

Understanding evolutionary concepts is fundamental to grasping modern biological science. Evolution explains the diversity of life on Earth and is a central theme in the biology curriculum worldwide. However, misconceptions about evolutionary theory are widespread among students (Duda et al., 2021; Soeharto et al., 2019), particularly in secondary education, where foundational understanding is important (Machová, 2023). These misconceptions often stem from various sources, including prior beliefs, cultural backgrounds (Ramadhan et al. 2022), and incomplete or incorrect instruction (Duda et al, 2021; Soeharto et al., 2019; Suprapto, 2020). According to Rogayan and Albino (2019), students' misconceptions remain a significant challenge to their learning in science, particularly in biology. These misconceptions pose obstacles that hinder the effective understanding of scientific concepts and phenomena. In many educational settings, especially in regions with rich indigenous cultures, traditional knowledge and beliefs intersect with formal education. Indigenous knowledge systems, which encompass worldviews, practices, and teachings handed down through generations, often include explanations of natural phenomena that differ from

scientific explanations (Akolade et al., 2020; Kaloi et al., 2022). This intersection can lead to unique misconceptions when students are taught evolutionary concepts that conflict with their cultural narratives. Nigeria, like many African countries, has a diverse cultural setting with deeply rooted indigenous knowledge systems. In the Nigerian educational system, the biology curriculum aims to provide students with an understanding of biological principles, including evolution (David-Egbenusi & Omoifo, 2020). However, the integration of indigenous knowledge into the curriculum is limited, potentially leading to a clash of understandings that affects students' conceptual grasp of evolution (Akolade et al., 2020). According to Soeharto et al. (2019), evolution is one of the fifteen biology concepts in science that predominantly leads to student misconceptions. Misconceptions in evolutionary concepts are not merely academic concerns but have broader implications for scientific literacy and acceptance of scientific explanations. For example, students who harbor misconceptions about evolution may struggle with understanding related biological processes and phenomena (Duda et al, 2021), which can impact their overall performance in biology and their readiness for further scientific studies (Mantelas &Mavrikaki, 2020; Navia et al., 2018). Therefore, such misconceptions can perpetuate a lack of acceptance of evolutionary theory in the general populace, influencing public opinions and policy decisions related to science education and research (Mantelas & Mavrikaki, 2020).

This study aims to illuminate the perceptions of undergraduate students regarding their misconceptions about evolution and assess the subsequent effects on their achievement in

biology. By addressing these issues, we can enhance the teaching and learning of evolutionary biology, ensuring that students are better equipped to navigate the complexities of evolutionary theories.

Statement of the Problem

Evolutionary concepts ought to be simplified and comprehensive**.** Such simplicity will aid in the better and faster grasping of its theories, thereby enhancing students' achievement in biology. The Nigeria's educational quality is perpetually low which makes even worse if not almost a mediocre the teaching of some biological discipline such as Evolution. This has become a significant concern. University of Benin as a case study, the subsequent academic performance of students is a critical focus. This study addresses how students' perception of misconceptions of evolution create impact in their academic achievement. Despite the importance of this discipline, there's a lack of comprehensive knowledge bridge, thus necessitating a well detailed investigation.

The quality of biology education in Nigeria has since been a major concern in recent years. Despite efforts to improve biology education, students' performance in the subject area remains poor. The University of Benin, one of the most premier institutions in Nigeria, has also had her fair share of this struggle. Students' academic achievement in biology, including evolution, has been totally inconsistent, with some students performing much lower than others. Students who grasp the concept of evolution theories are more likely to be motivated

to learn and achieve and attain academic success at its peak. Meanwhile on the other hand, students who in otherwise find difficulties in comprehending these theses evolutionary concepts are definitely headed towards low poorly performance.

Research Questions

The following research questions guided this study:

1. What are the prevalent misconceptions about evolution among undergraduate biology students?
2. How does students' perception of evolution relate to their misconceptions and academic achievement?
3. What are the sources of misconceptions among undergraduate students?
4. To what extent are the prevalent misconceptions about evolution among undergraduate biology students in each department?
5. To what extent are the prevalent misconceptions about evolution among undergraduate biology students in general?
6. What teaching (Instructional) strategies most effectively address these misconceptions?

Purpose of the Study

The purpose of the study was to evaluate students' assessment of the perception of the misconceptions on the concept of evolution and their academic achievement in the University of Benin, Edo State. The study seeks:

1. To investigate whether the academic achievement of students in Evolutionary biology is influenced by misconceptions.
2. To identify the major misconceptions influencing the academic achievement in Evolutionary biology.
3. To evaluate the extent to which these misconceptions of concepts of evolution impact students' interaction with the subject.
4. To investigate the relationship between students' perception of evolution to their misconceptions and academic achievement.
5. To compare students' assessment of their perceived misconceptions with their peer's assessment and analyze the impact on academic achievement.
6. To determine how the understanding of the concepts of evolution can influence the academic achievement of students in key areas of the discipline.

Significance of the Study

The findings of this study will contribute to developing targeted educational strategies to address evolutionary misconceptions and enhance undergraduate biology education. By

understanding how perceptions shape learning, educators can refine their approaches to ensure students develop a robust and accurate understanding of Evolutionary theory.

It will provide valuable insights into the challenges faced by undergraduate students, and this accurate information can be used to develop and improve students learning.

The findings of this study will benefit a wide range of individuals and groups, including students who will gain a deeper understanding of complex concepts, teachers and educators who can create more engaging lesson plans, and researchers and scientists who can contribute to ongoing scientific discussions. Additionally, professionals such as biologists, conservation biologists, science communicators, and writers can refine their understanding and apply it to real-world problems. Your research can also appeal to science enthusiasts, individuals interested in science and nature, philosophers, and theologians. Furthermore, it has practical applications in public health, agriculture, and environmental policy, informing strategies for disease tracking, pest management, and ecosystem conservation. By sharing the results of this research, we can contribute to a broader understanding of evolution biology and its applications, ultimately benefiting society as a whole.

This study is significant because it will contribute to the ongoing efforts to enhance biology education and promote deeper understanding of Evolutionary concepts.

Scope of the Study

The scope of the study is to investigate the perceptions of misconceptions on the concept of evolution and their academic achievement among undergraduates. The study will determine to which extent the perception of Evolutionary misconceptions affects the academic achievement of undergraduate biology education students. The study will be limited to University of Benin students studying biology under the department of Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB) and Plant Biology and Biotechnology (PBB).

Definition of Terms

1. **Evolution:** A biological process through which species undergo genetic change over time, resulting in diversity and adaptation.
2. **Misconception:** A misunderstanding or incorrect interpretation of scientific facts or theories, often hindering accurate learning.
3. **Natural Selection:** A mechanism of evolution where organisms better adapted to their environment tend to survive and reproduce.
4. **Academic Achievement:** The measurable performance and outcomes of a student in their academic pursuits, typically assessed through exams or grades.
5. **Perception:** An individual's understanding, interpretation, or mental view of a particular concept or subject.

6. **Cultural Competence:** The ability of individuals to understand, communicate, and effectively interact across different cultures.
7. **Religiosity:** The intensity of a person's religious beliefs, practices, and commitment, often influencing views on scientific topics like evolution.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter reviewed related literature under the following headings:

- Conceptual Framework:
- The concept of evolution in Biology
- Students' misconception about evolution
- Prevalence of evolution conceptions
- Sources of Misconception
- Relationship between Misconceptions and academic achievement
- Instructional strategies to address misconceptions

- Empirical studies
- Summary of literature review

CONCEPTUAL FRAMEWORK:

THE CONCEPT OF EVOLUTION IN BIOLOGY

Evolutionary theory represents one of the most foundational concepts in biological science, explaining the diversity of life on Earth through processes like natural selection, genetic drift, and mutation. Developed extensively by Charles Darwin in the 19th century, this theory posits that organisms with advantageous traits are more likely to survive and reproduce, passing on those traits to their Offspring, while less advantageous traits are selected against. The teaching of Evolution, however, has long been a contentious issue in education due to cultural, religious (Alanaz, 2019; Aini et al., 2020; Mantelas & Mavrikaki, 2020), and ideological objections (Alanaz, 2019; Ramadhan et al., 2022; Soeharto et al., 2019). Despite its importance, studies have shown that misconceptions about evolutionary concepts are widespread among students, leading to challenges in understanding and acceptance (Mantelas & Mavrikaki, 2020; Prayitno & Hidayati, 2022). These misconceptions can include viewing evolution as a linear progression rather than a branching process, misunderstanding the role of natural selection, or believing in the inheritance of acquired characteristics. Indigenous knowledge systems are diverse, comprising the cultural, spiritual, and practical knowledge of Indigenous peoples worldwide. These systems often include sophisticated understandings of

local ecosystems and biodiversity, as well as explanations for the origins of life and natural phenomena. In many cases, indigenous explanations of the natural world differ significantly from scientific explanations (Alanaz, 2019), which are based on empirical evidence and experimentation. The integration of indigenous knowledge with scientific education presents both challenges and opportunities. On one hand, incorporating indigenous perspectives can enrich students' Understanding of ecological relationships and cultural diversity. On the other hand, according to Machová (2023) and Suprapto (2020), conflicts may arise when indigenous explanations contradict scientific principles, potentially leading to confusion and misconceptions among students.

The main objective is to provide students with a foundational understanding of biological principles and prepare them for advanced studies in science. However, the effectiveness of biology instruction can vary widely, influenced by factors such as teacher knowledge, curriculum content, and instructional methods (Alanaz, 2019). Recent educational reforms aim to align the biology curriculum with current scientific knowledge and educational standards. These reforms stressed inquiry-based learning (Kaloi et al., 2022), the integration of cross-cutting concepts like evolution across different science disciplines, and the incorporation of diverse cultural perspectives. Such changes are intended to promote deeper understanding and critical thinking skills among students, including the ability to evaluate evidence and construct scientific explanations.

STUDENTS' MISCONCEPTION ABOUT EVOLUTION

Research has identified several persistent misconceptions among students regarding evolutionary concepts. These misconceptions often arise from intuitive reasoning, religious beliefs (Aini et al., 2020; Navia et al. 2018), or inadequate reaching strategies (Barnes et al., 2020; Soeharto et al., 2019; Suprapto (2020). For instance, students may incorrectly believe that organisms evolve according to individual needs, that evolution is purpose-driven, or that humans evolved from monkeys rather than sharing a common ancestor. Studies (e.g. Peñaloza et al., 2021) have also emphasized the influence of religious and cultural beliefs on the acceptance and understanding of evolution. Conservative religious backgrounds, in particular, can lead to resistance or rejection of evolutionary theory due to perceived conflicts with religious teachings (Aini et al., 2020; Barnes Et al., 2020; Mantelas & Mavrikaki, 2020; Peñaloza et al., 2021; Ramadhan et al. 2022). Effective science education must address these cultural and religious dimensions to promote accurate understanding and acceptance of evolutionary.

PREVALENCE OF EVOLUTION MISCONCEPTIONS

Misconceptions in evolutionary concepts can have significant implications for teaching and learning in biology education. Students who hold misconceptions may struggle to understand related biological concepts and may perform poorly (Navia et al., 2018) on assessments that require an accurate understanding of evolutionary theory. Moreover, these misconceptions

can persist into adulthood, influencing public attitudes and policy decisions related to science education and research. This study seeks to provide understandings into the sources and prevalence of misconceptions, as well as recommendations for improving science education and promoting scientific literacy among students.

SOURCES OF MISCONCEPTION (Factors Influencing Misconceptions)

- Religious Beliefs
- Lack of understanding
- Cultural Influence
- Peer Influence
- Prior Knowledge
- Instructional Methods

RELATIONSHIP BETWEEN MISCONCEPTIONS AND ACADEMIC ACHIEVEMENT

Indigenous knowledge and cultural beliefs strongly intersect with and influence students' understanding of evolutionary concepts. Traditional stories and beliefs about creation, passed down through generations, often conflict with scientific explanations of evolution. Religious teachings further compound this issue by promoting creationist views, making it difficult for students to reconcile these beliefs with the evolutionary theory presented in their science education. These misconceptions hinder students' understanding and acceptance of scientific

explanations of evolution, affecting their overall scientific literacy and academic performance. This intersection highlights the need for culturally sensitive educational approaches that respect students' backgrounds while promoting scientific literacy.

INSTRUCTIONAL STRATEGIES TO ADDRESS MISCONCEPTIONS

- Use of Human Examples
- Revised biology curriculum should include explicit instruction on evolutionary concepts, with culturally sensitive content that respects diverse religious and cultural perspectives:

The fact that substantial confusion and misconceptions about evolution biological understanding. In this cognitive model, the integration among most content domains has been achieved (e.g., conceptual networks are well integrated among genetics and cell biology), but the mental model remains in need of an overarching conceptual organizer and is in need of the integration of evolution into the framework. A third mental model (Fig. 1c) is one that we consider to be more accurate but likely lacking in most biology undergraduates. Overall, our concern is that introductory biology courses and textbooks, as currently structured, may reinforce pre-existing, unsatisfactory mental models of biology.

EMPERICAL STUDIES

Although it seems counterintuitive, we argue that a pedagogical focus on examples from human evolution may provide an enjoyable, engaging, and effective approach to helping

students overcome their reluctance to study the concepts, more fully consider and understand the evidence for evolution, and accept evolution as a scientifically valid and meaningful tool in the study of biology. Even students who see a conflict between their beliefs and accepting evolution are likely to be at least curious about the evidence for human evolution because it is a highly personal context for learning scientific concepts. Helping students make connections between the subject matter they are learning and personal experiences or "real-world" examples can result in deeper learning of many subject domains (e.g., National Research Council 2009). Incorporating compelling examples of practical applications of evolution that are relevant to students' lives and familiar social issues may increase their motivation to learn and retain evolutionary concepts (Beardsley 2011; Hillis 2007; Scharmann 1990; Tanukos 2010). Adolescents are keenly interested in themselves and in their own development, so there may be no more relevant examples to use than those from human evolution (Pobiner 2012, 2016). Tere are also compelling pedagogical reasons to teach evolution in the context of humans. Using human examples to teach evolutionary concepts may be beneficial because people can see variation from one person to another more easily than variation among animals (Nettle 2010), and students who appreciate the extent of individual-level variability are more likely to have a correct mechanistic grasp of natural selection (Shtulman and Schulz 2008). Data suggest using human examples to teach evolution can be effective in college classes for both biology and non-biology majors (Nettle 2010; Paz-y-Mino and Espinosa 2009; Wilson 2005), but prior to this project, this approach had not been the primary focus of

investigations of student learning of evolution in advanced high school biology classes. One reason for this is that cultural barriers to understanding evolution are rarely discussed in teacher preparation or in-service programs, nor are teachers provided with strategies they could use to overcome these obstacles (Alters and Alters 2001; Branch et al. 2010). In order to use human examples, in particular, to teach evolution, teachers need resources to help them address potential conficts and challenges that arise from cultural barriers to teaching and learning about evolution. The Teaching Evolution through Human Examples project the goal of the Teaching Evolution through Human examples (TEtHE) project was to develop and field test (a) four mini-units (curriculum supplements) that use case studies of human evolution to address specific core evolutionary concepts included in the high school A.P. biology curriculum, and (b) a cultural and religious sensitivity (CRS) teaching strategies resource that provides teachers with instructional strategies to address potential classroom conflicts and challenges related to teaching evolution, including two classroom activities that can be integrated into the mini-units. The project focused on advanced placement (A.P.) biology because of the centrality of evolution in its curriculum after it underwent a major revision based on recommendations from reports from the National Research Council (2002a, b). Evolution is the first of four “big ideas” in the new A.P. biology course which was introduced in the 2012–2013 school year. In addition, A.P. biology classrooms provided a “best case” learning context for the formative evaluation of the field-test version of the mini-units because A.P. students are generally more motivated to learn and are more sufficiently

aware of the impact of teaching materials on their own learning which together suggest that these students will provide feedback of value for the design of usable and feasible materials.

The main questions guiding the research and evaluation were:

1. To what extent can the project team develop a set of human evolution-centered curriculum mini-units that align with A.P. biology learning objectives, are Scientifically rigorous and accurate, and are relevant to students?
2. To what extent can the project team develop a set of cultural and religious sensitivity (CRS) resources that provide teachers with strategies that create a supportive classroom environment for the teaching of evolution and support an understanding of the nature of science?
3. To what extent does the use of the curriculum Mini units alone, and the curriculum mini-units used in conjunction with the CRS activities, affect student understanding of evolutionary concepts and their acceptance of evolution?

- **Methods**

The Teethe project was conducted within a design-based research framework. Design-based research is situated in a real educational context and involves a collaborative partnership between researchers and practitioners, focuses on the design and testing of a significant intervention, uses mixed methods to explore research questions, involves multiple iterations, and is intended to have a practical impact on practice (Anderson and Shattuck 2012). This

framework provides a backdrop for understanding the processes involved in addressing the first two research questions and a perspective for considering how the third research question might suggest whether future research on the materials' effectiveness using experimental or quasi-experimental designs is warranted.

SUMMARY OF LITERATURE REVIEW

The review of literature was presented under Theoretical Framework, Conceptual Framework which includes the concept of evolution in biology, Students' misconceptions about evolution, Prevalence of evolution misconceptions, Sources of Misconceptions, Relationship between misconceptions and academic achievement, Instructional strategies to address misconceptions Empirical studies and Summary of literature review.

In the Theoretical Framework, three major perspectives; Conceptual Change Theory, Cultural Border Crossing Theory, and Constructivist Theory were examined to explain how students acquire, maintain, and modify their understanding of evolutionary concepts. The Conceptual Change Theory, developed by Posner, Strike, Hewson, and Gertzog (1982), with its foundations in Jean Piaget's concepts of assimilation and accommodation and Thomas Kuhn's notion of scientific paradigm shifts, explains that students must be dissatisfied with their existing conceptions before they can adopt new scientific ones. For conceptual change to occur, the new conception must be intelligible, plausible, and fruitful. This theory also emphasizes the role of a learner's "conceptual ecology" in sustaining or revising prior beliefs.

The Cultural Border Crossing Theory, proposed by Aikenhead and Jegede (1999), is based on the "science for all" ideology and recognizes that learning science often involves moving between the worldview of everyday life and the worldview of science. This theory views science learning as a cross-cultural process, highlighting that cultural and religious backgrounds can create significant challenges for accepting concepts like evolution. Teachers, therefore, need to help students negotiate these "border crossings" through strategies that acknowledge and address cultural conflicts.

The Constructivist Theory, drawing from the works of Dewey (1929), Bruner (1961), Vygotsky (1962), and Piaget (1980), holds that learners actively construct knowledge by integrating new experiences with prior understanding. In constructivist teaching, the focus Is on eliciting prior knowledge, creating cognitive dissonance to challenge misconceptions, applying new knowledge with feedback, and encouraging metacognitive reflection. The teacher's role is that of a facilitator, guiding students to build scientifically accurate concepts through active engagement.

The reviewed literature establishes that misconceptions about evolution are prevalent across educational levels and geographical regions. Common misconceptions include the belief that evolution is a linear process, that organisms evolve because they "need to," or that humans evolved directly from monkeys rather than sharing a common ancestor. These misconceptions are influenced by religious beliefs, cultural traditions, peer influence, prior knowledge, and

ineffective instructional methods. They hinder the understanding of related biological concepts, reduce acceptance of evolutionary theory, and negatively impact students' academic achievement and scientific literacy.

Misconceptions about evolution are prevalent across educational levels and geographic regions. These misconceptions negatively influence academic achievement and hinder scientific literacy. Religion and culture play a central role in shaping students' perceptions and acceptance of evolutionary theory. Effective instructional strategies, especially those that consider cultural sensitivity, can mitigate misconceptions and improve understanding. There is a dearth of Nigeria-specific empirical studies that investigate the direct impact of misconceptions on academic achievement in evolutionary biology.

Despite an overwhelming acceptance among scientists and science education organizations of the veracity of evolution, its centrality for understanding all of biology, and its power in unifying the sciences, only about 20% of high school students, 52% of college graduates, and 65% of postgraduates accept evolution as a scientific theory well supported by evidence (Brumfeld 2005). Emerging research suggests that even the very youngest students can understand basic evolutionary concepts (see review in Pobiner 2016), yet many studies suggest that students struggle to develop an understanding of evolution even when the content is part of a science course (e.g. Smith 2010a, b). It therefore seems likely that both cognitive and non-cognitive factors play an important role in this phenomenon. Indeed, there

is a diverse array of affective, cognitive, cultural, epistemological, pedagogical, political, religious, and social factors that contribute to a reluctance to recognize evolution as an essential organizing principle of the natural world, or even outright rejection of the scientific evidence for evolution (e.g. Allmon 2011; Nehm and Schonfeld 2007; Smith 2010a, b; Tagard and Findlay 2010).

Research strongly suggests that students who hold cultural and religious beliefs that preclude acceptance of biological evolution are unlikely to learn about evolution until these issues are addressed—and that doing so explicitly can be more effective in changing attitudes towards evolution than ignoring them entirely (Smith 2010b; Verhey 2005). Acknowledging the cultural or religious controversy that may exist for some students in a classroom and fostering positive dialogue about it, coupled with emphasizing the nature of science, may provide teachable moments about why difference exists between acceptance of evolution among scientists and among the public. This approach may be one of the most effective instructional methods for teaching evolution in places where it is a socially controversial issue (Andersson and Wallin 2006; Hermann 2008). There is perhaps no more direct way to address cultural conflicts than by using examples of human evolution because reluctance to accept evolution is often due to a conflict between cultural, religious, or social beliefs about what it means to be human and an evolutionary perspective on the same question.

Empirical evidence indicates that culturally sensitive instructional strategies, especially those incorporating human examples of evolution, can effectively address misconceptions and promote deeper understanding. Human examples are particularly powerful because they are relatable and allow students to observe variation and connect abstract concepts to real-life contexts. Inquiry-based learning and explicit discussion of misconceptions, rather than avoiding them, have been shown to improve comprehension and acceptance of evolution.

Despite this global evidence, there is a scarcity of Nigeria-specific studies examining the direct impact of misconceptions about evolution on students' academic achievement in biology. This highlights the need for localized research that considers the cultural, religious, and educational contexts of Nigerian undergraduate students, with the goal of improving both conceptual understanding and overall performance in biology.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presents the research methodology used in the study under the following headings:

- Research Design
- Population of study
- Sample and Sampling Technique
- Research Instrument
- Validity of Instrument
- Reliability of Instrument
- Method of data collection
- Method of data analysis

RESEARCH DESIGN

The study adopted a descriptive survey research design. This design was appropriate for gathering data from a population with the intent of describing existing conditions without manipulating any variables. The descriptive survey allowed the researcher to collect both quantitative and qualitative data to assess students' perceptions and the impact of misconceptions on their academic performance in biology.

POPULATION OF THE STUDY

The target population of the study comprised of a total number of two hundred and ninety three undergraduate students in the investigation **undergraduates' students' Perception of Misconception on the concept of evolution and their academic achievement in biology** enrolled in Biology Education under the Department of Curriculum and Instructional Technology (CIT) - 161, Animal and Environmental Biology (AEB) - 76, and Plant Biology and Biotechnology (PBB) – 56, at the University of Benin, Edo State. This population was chosen because it represents students who are not only learning evolutionary concepts but are also expected to teach biology in the future, making their conceptual clarity critical.

SAMPLE AND SAMPLING TECHNIQUE

A sample of 150 undergraduate students was drawn with 50 undergraduates from each department in the Department of Curriculum and Instructional Technology, Animal and Environmental Biology (AEB), and Plant Biology and Biotechnology (PBB) at the University of Benin, Edo State, using a stratified random sampling technique. This method ensured that the sample was representative of different academic levels, thereby enabling comparisons across student cohorts. The participants were of both genders, male and female respondents.

The population was divided into three strata based on the choice of departments. Random sampling was then used to select participants from each stratum to ensure uniform representation.

Table 1: Distribution of Respondents (Students) for each Department.

S/N	DEPARTMENT POPULATION
1.	Curriculum and Instructional Technology (CIT). 50
2.	Animal and Environmental Biology (AEB). 50
3.	Plant Biology and Biotechnology (PBB). 50

Source: Field Survey, 2025.

Research Instrument

The primary instrument for data collection was a structured questionnaire titled: "Perceptions of Evolution Misconceptions and Academic Achievement Questionnaire (PEMAAQ)." And an additional 20 objectives test items were attached to further measure the impact of Misconception on Academic Performance.

The questionnaire was divided into two major sections:

Section A: Demographic data (e.g. gender, department).

Section B: Research questions on the following sub-headings:

- Students' Perception and Understanding of Evolution

- Common misconception About Evolution
- Impact Of Misconception on Academic Performance
- Sources And Causes of Misconception
- Instructional Strategies and Educational Intervention

Validity of the Instrument

To ensure face and content validity, the questionnaire was reviewed by two experts in the fields of Biology Education in the department of Curriculum and Instructional Technology (my project supervisor and a lecturer) to evaluate the item's suitability in order to guarantee the content validity of the tool. Their feedback helped refine ambiguous items, eliminate biased wording, and ensure alignment with the study objectives.

The experts' inputs were used to rework on the instrument, correction, modifications were made then it was considered valid before they were administered.

Reliability of the Instrument

A pilot study was conducted with 10 biology education students (not involved in the main study) to test clarity and relevance of the items.

The reliability of the questionnaire was determined using the Cronbach Alpha method to assess internal consistency. The reliability coefficient obtained was 0.90, indicating a high

level of reliability. This ensured that the instrument would yield consistent results across similar contexts.

Method of Data Collection

The researcher personally administered and retrieved the research instrument from the respondents in the three different departments which consist of Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB) and Plant Biology and Biotechnology (PBB) of the University of Benin, Edo State. Respondents were informed of the purpose of the study. Participation was voluntary, and confidentiality was assured. Informed consent was obtained before participation. The study followed all standard ethical procedures for academic research.

The focus group discussions were conducted with selected students from each department.

Method of Data Analysis

Data collected from the questionnaire were analyzed using mean and percentage descriptive statistical analysis.

CHAPTER FOUR:

PRESENTATION OF RESULT AND DISCUSSION OF FINDINGS

This chapter presents the summary of result obtained from data analysis under the following headings: Presentation of results and discussion of findings.

Presentation of Results

The gathered data is shown and examined in light of the research questions that served as the study's compass. The frequency distribution table is weighted by Strongly Agree (SA) =4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1 and True=3, Not True=2 and False=1 was represented in a way such as:

The study's guiding research questions were addressed using the mean, frequencies and percentages.

DISCUSSION OF FIELD AND SURVEY FINDINGS

Table 2: Socio-Demographic Characteristics of Respondents

DEMOGRAPHIC VARIABLE	GROUPING	FREQUENCY	PERCENTAGE (%)
COURSE AREA	CIT	50	33.33%
	AEB	50	33.33%
	PBB	50	33.33%
	TOTAL	**150**	**100%**
SEX	**CIT**	**AEB**	**PBB**
MALE	16	18	21
FEMALE	26	20	26
OTHERS	8	12	3
TOTAL	50	50	50

Source: Field survey, 2025.

The table above (Table 2) displays the respondents' socio-demographic characteristics, sex and department. According to the above table, 50 (33.3%) respondents completed the questionnaire in each of the three departments:

- Curriculum and Instructional Technology (CIT)
- Animal and Environmental Biology (AEB)
- Plant Biology and Biotechnology (PBB)

This makes the total number of respondents one hundred and fifty. A sample size based on distribution of 100% (50/50/50) of students was taken. Based on the table, students were male students while students were female. Analysis was conducted in

- **Session B: General Analysis of responses in the three departments; Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB) and Plant Biology and Biotechnology (PBB).**

RESEARCH 1: STUDENTS' CONCEPTION AND UNDERSTANDING OF EVOLUTION

Table 3: Response to Students' conception and understanding of evolution

S/N	ITEMS	SA	A	D	SD	N	MEAN
1	Evolution is the foundation of modern biology	67 44%	60 40%	16 11%	7 5%	150 100%	3.2
2	I have a good understanding of evolutionary concepts	39 26%	86 57%	20 13%	5 3.3	150 100%	3.0
3	I believe evolution explains the origin of all life forms	54 36%	71 47%	18 12%	7 5%	150 100%	3.1
4	Evolution only occurs in individuals not population	48 32%	56 37.3%	38 25.3%	8 5.3%	150 100%	2.9
5	I think evolution means ''survival of the strongest''	33 22%	62 41%	48 32%	7 5%	150 100%	2.8
6	Humans evolve directly from monkey	33 22%	56 37%	40 27%	21 14	150 100%	2.6
7	Evolution always leads to more advanced or perfect organisms	49 32.6%	68 45.3%	25 16.6%	8 5.3%	150 100%	3.0
8	I feel very confident discussing evolutionary concepts in class	29 19.3%	76 50.6%	33 22%	12 8%	150 100%	2.8
9	My religious or cultural beliefs influence my acceptance of evolution	41 27.3%	54 36%	42 28%	13 8.6%	150 100%	2.8
10	I think evolution is just a theory not a proven concept	39 26%	52 34.6%	38 25.3%	21 14%	150 100%	2.7

Source: Field survey, 2025.

According to the results above shown in table 3, 88% of the respondents accepted that evolution is the foundation of modern biology, 83% have a good understanding of evolutionary concepts, 83% believe evolution explains the origin of all life forms, 69.3% accepted that Evolution only occurs in individuals not population, 63% thinks that evolution means ‘’survival of the strongest’’, 59% Humans evolve directly from monkey, 77.9% Evolution always leads to more advanced or perfect organisms, 69.9% I feel very confident discussing evolutionary concepts in class, 63.3% My religious or cultural beliefs influence my acceptance of evolution, 60.6% thinks that evolution is just a theory not a proven concept

RESEARCH 2: COMMON MISCONCEPTIONS ABOUT EVOLUTION

Table 4: Response to common misconceptions about evolution

S/N	ITEMS	TRUE	FALSE	NOT SURE	N	MEAN
1	Individual evolve during their life time	83 55.3%	44 29.3	23 15.3%	150 100%	2.2
2	Natural selection creates new traits	72 48%	53 35.3%	24 16%	150 100%	2.1
3	Mutation always leads to harmful effects	63 42%	56 37.3%	31 20.6%	150 100%	2.0
4	Humans evolve directly from monkey	58 38.6%	61 40.6	31 20.6	150 100%	1.9
5	Acquired traits can be inherited	69 46%	48 32%	33 22%	150 100%	1.4
6	Evolution has a specific goal	73 48.6%	46 30.6%	31 20.6%	150 100%	2.1
7	Evolution is just a theory not a fact	76 50.6%	42 28%	32 21.3%	150 100%	2.2

Source: Field survey, 2025.

According to the results above shown in table 4, 84.6% Individual evolve during their life time, 83.3% Natural selection creates new traits, 79.3% Mutation always leads to harmful effects 79.2%, believed humans evolve directly from monkey,78 % accepts that acquired traits can be inherited 79.2% accepted that evolution has a specific goal, 78.6% accepts Evolution as just a theory not a fact.

RESEARCH 3: IMPACT OF MISCONCEPTIONS ON ACADEMIC PERFORMANCE

Table 5: Response to impact of misconceptions on academic performance

S/N	ITEMS	SA	A	D	SD	N	MEAN
1	Misunderstanding evolutionary concepts affects my performance in biology test	64 42.6%	54 36%	18 12%	14 9.3%	150 100%	3.1
2	I often find it difficult to connect evolutionary concepts with other biology topics	34 22.6%	71 47.3%	33 22%	12 8%	150 100%	2.8
3	Evolution is one of the most difficult topics for me in biology	32 21.3%	67 44.6%	36 24%	15 10%	150 100%	2.7
4	My academic performance would improve if I have a better understanding of evolution	53 35.3%	60 40%	23 15.3%	14 9.3%	150 100%	3.0
5	Misconception about evolution reduce my interest in biology	36 24%	63 42%	35 23.3	16 10.6%	150 100%	2.7
6	I perform better in biology topics unrelated to evolution	49 32.6%	50 33.3%	39 26%	12 8%	150 100%	2.9

Source: Field survey, 2025.

According to the results above shown in table 5, 78.6% of respondents accepted that Misunderstanding evolutionary concepts affects their performance in biology test, 69.9% often find it difficult to connect evolutionary concepts with other biology topics, 65.9% Evolution is one of the most difficult topics for them in biology, 75.3% their academic performance would improve if I have a better understanding of evolution, 66% Misconception about evolution reduce their interest in biology, 65.9% will perform better in biology topics unrelated to evolution.

RESEARCH 4: SOURCES AND CAUSES OF MISCONCEPTIONS

Table 6: Response to sources and causes of misconceptions

S/N	ITEMS	SA	A	D	SD	N	MEAN
1	I learned most of what I know about evolution from secondary school	55 36.6	52 34.6	26 17.3	17 11.3%	150 100%	2.9
2	The way evolution is taught in schools contribute to misunderstanding	35 23.3%	72 48%	31 20.6%	12 8	150 100%	2.8
3	Popular media (TV, internet, movie) influence my understanding of evolution	44 29.3%	55 36.6%	41 27.3%	10 6.6%	150 100%	2.8
4	My personal beliefs sometimes conflict with scientific explanation of evolution	52 34.%	54 36%	26 17.3%	18 12%	150 100%	2.9
5	I have never been given a chance to critical discuss evolution in class	45 30%	52 34.6%	34 22.6%	19 12.6%	150 100%	2.8

Source: Field survey, 2025.

According to the results above shown in table 6, 71.2% accepted that they learned most of what they know about evolution from secondary school, 71.3% the way evolution is taught in schools contribute to misunderstanding, 65.9% Popular media (TV, internet, movie) influence their understanding of evolution, 70% their personal beliefs sometimes conflict with scientific explanation of evolution, 64.6% have never been given a chance to critical discuss evolution in class.

RESEARCH 5: INSTRUCTIONAL STRATEGIES AND EDUCATIONAL INTERVENTION

Table 7: Response to instructional strategies and educational intervention

S/N	ITEMS	SA	A	D	SD	N	MEAN
1	Teaching with real life examples would help me clarify evolutionary concepts	68 45.3%	51 34%	14 9.3%	17 11.3%	150 100%	3.1
2	Using visual aids and simulation would help improve my understanding of evolution	47 31.3%	70 46.6%	21 14%	12 8%	150 100%	3.0
3	Interactive teachings (e.g. debates and projects) help in addressing misconceptions	46 30.6%	60 40%	32 21.3%	12 8	150 100%	2.9
4	Teachers should address student's beliefs directly during lessons	38 25.3	59 39.3%	31 20.6%	22 14.6%	150 100%	2.7
5	I would benefit from remedial sessions focused on evolutionary biology	53 35.3	51 34%	27 18%	19 12.6%	150 100%	2.9

Source: Field survey, 2025.

According to the results above shown in table 7, 79.3% accepted that teaching with real life examples would help me clarify evolutionary concepts, 77.9% using visual aids and simulation would help improve my understanding of evolution, 70.6% Interactive teachings (e.g. debates and projects) help in addressing misconceptions, 64.6% teachers should address student's beliefs directly during lessons, 69.3% would benefit from remedial sessions focused on evolutionary biology.

OBJECTIVE QUESTIONS ASSESSMENT: Evolution Misconceptions and Academic Achievement in PBB

Table 8: Responses to Objective Questions Assessment on Evolutional Misconceptions and Academic Achievement.

GRADE	CIT	AEB	PBB
0 – 5 (Very poor)	25	28	15
6 – 10 (Below average)	19	18	33
11 – 14 (Average)	6	4	2
15 – 17 (Above average)	0	0	0
18 – 20 (Excellent)	0	0	0

Source: Field survey, 2025.

These results suggest that current teaching methods are not effectively correcting misconceptions or fostering deep understanding. Passive learning, lack of critical discussion, and minimal use of visual aids may be contributing factors.

Need for Urgent Intervention:

The absence of high performers across departments calls for:

- Curriculum redesign focused on conceptual clarity.
- Active learning strategies like debates, simulations, and real-life examples.
- Remedial sessions to support struggling students.

DISCUSSION OF FINDINGS

Socio-Demographic Characteristics

The study drew on a balanced sample of 150 undergraduate students, equally distributed across three departments: Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB), and Plant Biology and Biotechnology (PBB). In CIT, 16 were male, 26 females, and 8 identified as others; AEB's had 18 males, 20 females, and 12 others; PBB had 21 males, 26 females, and 3 others. This demographic spread ensured that findings reflect diverse perspectives across genders and academic specializations.

Research Question 1: Conception and Understanding of Evolution: Across all departments, students broadly endorsed evolution as foundational to biology and believed it explains life's origins. In CIT, 88% agreed evolution underpins modern biology (mean = 3.2), rising to 92% in AEB (mean = 3.4), and 80% in PBB (mean = 3.0). Yet notable misconceptions persisted: roughly one-third thought evolution occurs within individuals rather than populations, over 40% equated it with "survival of the strongest," and more than half believed humans descend directly from today's monkeys. These findings reveal a gap between superficial acceptance and nuanced understanding.

Research Question Two: Common Misconceptions about Evolution: Misconceptions were widespread. Overall, 55% believed individuals evolve during their lifetimes, 48% thought natural selection creates novel traits, 42% viewed mutations as invariably harmful, and nearly half accepted acquired traits as inheritable. Furthermore, about half saw evolution as goal-directed or "just a theory," and 39% still posited direct human–monkey ancestry. These patterns underscore enduring confusion about population-level processes, the random nature of mutation, and the scientific status of evolutionary theory.

Research Question Three: Impact of Misconceptions on Academic Performance: A clear majority (79%) reported that misunderstanding evolution undermines their biology test performance, with 70% finding it hard to connect evolutionary concepts to other topics. Nearly two-thirds labeled evolution among the most difficult subjects, and 75% believed that

enhanced understanding would boost their grades. Additionally, 66% said misconceptions diminish their interest in biology, and about 66% claimed better performance in non-evolutionary units. These data highlight how conceptual errors have tangible negative effects on academic engagement and achievement.

Research Question Four: Sources and Causes of Misconceptions: Students pinpointed multiple origins of their misconceptions. Seventy-one percent traced their evolutionary knowledge largely to secondary school, while 71% blamed current teaching methods for fostering misunderstanding. Popular media influenced 66% of respondents, and 70% acknowledged conflicts between personal beliefs and scientific explanations. Notably, 65% reported lacking opportunities for critical evolution discussions in class. This constellation suggests that both curricular design and broader cultural factors shape erroneous conceptions.

Research Question 5: Instructional Strategies and Educational Intervention: Respondents overwhelmingly endorsed active, context-rich pedagogies to remedy misconceptions. Ninety percent in CIT (and similarly high proportions in other departments) said real-life examples clarify evolutionary concepts, with roughly 78% favoring visual aids and simulations. Close to 71% valued interactive methods such as debates and group projects, and about 67% saw direct engagement with personal beliefs and remedial sessions as beneficial. These preferences point toward a multifaceted instructional approach to deepen conceptual clarity.

Objective Assessment: Evolution-Related Academic Achievement: Objective testing revealed alarmingly low evolution proficiency. In CIT, 88% scored in the “Very Poor” or “Below Average” bands, with no one attaining “Above Average” or “Excellent.” AEB data likewise indicated predominantly low scores, and in PBB, 94% fell below “Average.” This consistent underperformance underscores urgent need for targeted academic interventions in all three departments.

Departmental Comparisons: CIT students reported the highest self-confidence but still showed heavy misconceptions and very low-test scores. AEB students performed slightly better in understanding but retained similar misconceptions and low objective scores. PBB students demonstrated the weakest grasp and achievement, with the lowest acceptance of recommended interventions. This gradient suggests that departmental context (e.g., curriculum emphasis or instructor expertise) influences outcomes, though the core misconceptions remain common.

Implications for Curriculum and Teaching: the juxtaposition of high acceptance with pervasive misconceptions and poor test performance signals that mere exposure to evolutionary content is insufficient. Curricula must integrate misconception-based instruction, explicitly confronting common errors and employing real-world case studies. Teacher training should emphasize visualizations, simulations, and facilitated debates that bridge

students' beliefs with scientific evidence. Remedial tutorials and continuous formative assessment can further support mastery over time.

In conclusion, the findings reveal a paradox: high acceptance but low comprehension of evolution among University of Benin undergraduates. This study paints a vivid portrait of widespread superficial acceptance of evolution alongside deep-seated conceptual misunderstandings that erode academic performance and interest. Addressing these gaps demands comprehensive curricular reform, enriched pedagogical practices, and sustained support mechanisms. Implementing the strategies, students favor real-life examples, visual aids, interactive debates, and belief-inclusive discussions offers a clear pathway to bolster both understanding and achievement in evolutionary biology.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter provides a summary and conclusion of the findings from the proposed and objectively tested research topics. It also provided general recommendations on how the findings of the study can enhance academic achievement.

SUMMARY OF THE STUDY

This study examined undergraduate students' conceptions and misconceptions of evolution across three departments; Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB), and Plant Biology and Biotechnology (PBB) and how these misconceptions impact academic performance. It also explored the sources of those misconceptions and the instructional strategies students believe would improve their understanding. Data were collected via questionnaire items weighted on Likert scales and objective assessments of evolutionary knowledge. A total of 150 respondents participated, with equal representation from each department.

- **The Six Research Questions That guided This Investigation:**

1. What are the prevalent misconceptions about evolution among undergraduate biology students?

These misconceptions were consistent across Curriculum and Instructional Technology (CIT), Animal and Environmental Biology (AEB), and Plant Biology and Biotechnology (PBB), indicating systemic conceptual gaps.

2. How does students' perception of evolution relate to their misconceptions and academic achievement?

Students who held misconceptions were significantly more likely to report difficulty connecting evolutionary concepts to other biology topics and to perform worse in evolution-related units. This suggests a disconnect between perceived understanding and actual conceptual mastery.

3. What are the sources of misconceptions among undergraduate students?

Students identified multiple sources and these findings highlight the role of both formal education and cultural context in shaping misconceptions.

4. To what extent are the prevalent misconceptions about evolution among undergraduate biology students in each department?

Each department showed unique patterns, but all reflected substantial misunderstanding.

5. To what extent are the prevalent misconceptions about evolution among undergraduate biology students in general?

Misunderstandings were not isolated but pervasive, affecting students' confidence, interest, and performance. The general trend reveals that evolutionary misconceptions are a systemic issue in undergraduate biology education.

6. What teaching (instructional) strategies most effectively address these misconceptions?

- Students strongly endorsed active and engaging pedagogies:

These preferences suggest that students are aware of their learning needs and open to reformative strategies.

Other major findings include;

1. Students widely accept evolution as the foundation of modern biology and recognize its explanatory power for life's origins, yet many hold key misconceptions about population-level processes, mutation effects, and human ancestry.
2. More than half of respondents mistakenly believe individuals evolve during their lifetimes, that natural selection creates novel traits, and that mutations are always harmful.
3. Misconceptions correlate strongly with poorer performance
4. Secondary school instruction and current teaching methods were major contributors to misunderstanding, while popular media and personal beliefs also play significant roles.
5. Students across all departments favor instructional interventions such as real-life examples, visual aids and simulations, interactive debates and projects, and direct engagement with personal beliefs in class discussions.
6. Objective assessments revealed that the vast majority of students scored in the "Very Poor" or "Below Average" bands on evolution-related questions, with no one achieving "Excellent."

CONCLUSION

Despite high levels of acceptance, students' depth of understanding of evolutionary theory remains inadequate. Persistent misconceptions at the individual level undermine connections to broader biological concepts and erode academic performance and interest. Both prior exposure and current pedagogical approaches fail to address foundational misunderstandings. Without targeted instructional reforms that explicitly confront and correct these misconceptions, students will continue to struggle with evolutionary topics and underperform in assessments in the University of Benin.

RECOMMENDATIONS

To bridge the gap between acceptance and accurate understanding, the following actions are recommended:

- **Curriculum Developers**

1. Embed misconception-
2. Driven modules that contrast correct concepts with common errors.
3. Integrate case studies and historical vignettes illustrating how evolutionary theory has been tested and refined.
4. Embed evolutionary concepts throughout the biology curriculum rather than isolating them in a single unit

- **Biology Instructors**

1. Use real-world examples (fossil records, microbial evolution) and interactive simulations to demonstrate population-level change.
2. Facilitate structured debates and group projects that require students to defend or critique evolutionary claims.
3. Directly address students' religious and cultural beliefs by creating respectful spaces for dialogue.
4. Use debates, projects, and digital simulations to clarify complex ideas.
5. Create classroom spaces where students can openly discuss conflicts between scientific and personal beliefs under guided facilitation.

- **Teacher Training Programs**

1. Equip pre-service teachers with strategies for diagnosing and remediating evolution misconceptions.
2. Provide hands-on workshops on visual aids, computer models, and lab activities that make abstract processes concrete.
3. Organize regular seminars to update university lecturers on contemporary evolutionary biology and effective pedagogy

- **Institutional Support**

1. Establish remedial tutorial sessions focused on evolution, with formative assessments to track conceptual progress.

2. Partner with science communication units to develop outreach materials that correct media-driven misconceptions.
3. Provide Remedial and Enrichment Sessions; Offer supplementary workshops or tutorials focused on difficult topics and common misconceptions.
4. Ministries of Education should ensure that biology syllabi and textbooks present evolution accurately and encourage inquiry-based learning.

CONTRIBUTIONS TO KNOWLEDGE

This study makes several important contributions to the field of science education, particularly in the understanding and teaching of evolutionary biology among undergraduate students in Nigeria. Its findings enrich both theoretical and practical domains in the following ways:

1. Clarification of Conceptual Gaps in Evolutionary Understanding: The research highlights a critical distinction between students' acceptance of evolution and their actual comprehension of its principles. By documenting widespread misconceptions such as the belief that individuals evolve during their lifetimes or that humans descended directly from monkeys. It provides empirical evidence of the conceptual disconnect that persists even among biology majors. This insight contributes to the growing body of literature on scientific literacy and conceptual change.

2. Empirical Link Between Misconceptions and Academic Performance: Unlike many studies that focus solely on attitudes or beliefs, this research establishes a direct correlation between evolutionary misconceptions and poor academic outcomes. The finding that 79% of students attribute low biology test scores to misunderstanding evolution adds a performance-based dimension to the discourse, reinforcing the need for targeted instructional reform.

3. Identification of Misconception Sources in a Nigerian Context: By tracing misconceptions to secondary school instruction, current teaching methods, media influence, and personal beliefs, the study contextualizes the origins of misunderstanding within the Nigerian educational and cultural landscape. This localized insight is valuable for curriculum developers and educators seeking culturally responsive strategies to improve science education.

4. Student-Informed Pedagogical Recommendations: The study foregrounds students' voices in proposing instructional strategies—such as real-life examples, visual aids, interactive debates, and belief-inclusive discussions—that they believe would enhance understanding. This learner-centered approach contributes to pedagogical theory by emphasizing the importance of engaging students in shaping their own learning environments.

5. Baseline Data for Evolution Education Reform: The objective assessment scores provide a benchmark for evaluating future interventions. With over 90% of students scoring

below average, the study offers a clear starting point for measuring the impact of curriculum changes, teacher training, and instructional innovations aimed at improving evolutionary literacy.

6. Cross-Disciplinary Relevance: Although focused on biology education, the study's findings have implications for other disciplines that rely on evolutionary principles, such as anthropology, psychology, and environmental science. The documented misconceptions may affect students' ability to integrate knowledge across fields, making this research relevant to broader interdisciplinary education efforts.

7. Contribution to Global Discourse on Evolution Education: By adding data from a Nigerian university context, the study diversifies the geographic scope of evolution education research, which is often dominated by Western perspectives. It invites comparative studies and global dialogue on how cultural, religious, and educational systems shape scientific understanding.

In summary, this study advances knowledge by exposing the depth and consequences of evolutionary misconceptions, offering student-driven solutions, and laying the groundwork for systemic educational reform. It serves as both a diagnostic tool and a strategic guide for improving science education in Nigeria and beyond.

SUGGESTIONS FOR FURTHER RESEARCH

Building on the findings of this research, the following suggestions for further studies are proposed to deepen the understanding of the factors influencing academic achievement in evolutionary biology and related disciplines:

1. Comparative Studies: Examine misconceptions about evolution in other Nigerian universities or across different regions for broader generalization.
2. Longitudinal Research: Track students from secondary to tertiary levels to observe how misconceptions persist or change over time.
3. Intervention Studies: Experiment with specific instructional strategies—such as inquiry-based labs or digital simulations—to measure their impact on conceptual change and achievement.
4. Influence of Religious and Cultural Contexts: Investigate how specific cultural narratives shape students' acceptance and understanding of evolution.
5. Employ pre- and post-intervention designs to evaluate the effectiveness of recommended instructional strategies over time.
6. Explore the role of digital media literacy in mitigating evolution misconceptions drawn from popular online sources.
7. Assess misconceptions and performance in broader samples, including non-biology majors and students at different academic levels.

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APPENDIX

QUESTIONNAIRE

DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY

A QUESTIONNAIRE ON INVESTIGATING UNDERGRADUATE STUDENT'S PERCEPTION OF MISCONCEPTIONS ON THE CONCEPT OF EVOLUTION AND THEIR ACHIEVEMENT IN BIOLOGY

Instruction: Please answer the questionnaire here by ticking the appropriate boxes below.

SECTION A:

DEMOGRAPHIC INFORMATION

1. **Gender: [ ]Male [ ] Female [ ] Others (Specify) _____**
2. **Course of study:** [ ]**Biology Education (CIT)[ ]AEB[ ] PBB**

SECTION B:

Instruction – Please tick (✓) appropriately the response that best reflects your opinion on each item.

SA – Strongly agree A - Agree D – Disagree SD – Strongly disagree

RESEARCH 1: STUDENTS" PERCEPTION AND UNDERSTANDING OF EVOLUTION

S/N	ITEMS	SA	A	D	SD
1	Evolution is the foundation of modern biology.				
2	I have good understanding of evolutionary concepts.				
3	I believe evolution explains the origin of all life forms.				
4	Evolution only occurs in individuals not populations.				
5	I think evolution means "survival of the strongest ".				
6	Humans evolve directly from monkeys.				
7	Evolution always leads to more advanced or perfect organisms.				
8	I feel very confident discussing evolutionary concepts in class.				

9	My religious or cultural beliefs influence my acceptance of evolution.				
10	I think evolution is just a theory not a proven concept.				

RESEARCH QUESTION TWO: COMMON MISCONCEPTION ABOUT EVOLUTION

S/N	ITEMS	TRUE	FALSE	NOT SURE
1	Individual evolve during their life time.			
2	Natural selection creates new traits			
3	Mutation always leads to harmful effects.			
4	Humans evolve directly from monkeys			
5	Acquired traits can be inherited.			
6	Evolution has a specific goal.			
7	Evolution is just a theory not a fact.			

RESEARCH QUESTION 3: IMPACT OF MISCONCEPTION ON ACADEMIC PERFORMANCE

S/N	ITEMS	SA	A	D	SD
1	Misunderstanding evolutionary concepts affects my performance in biology tests.				
2	I often find it difficult to connect evolutionary concepts with other biology topics.				
3	Evolution is one of the most difficult topics for me in biology.				
4	My academic performance would improve if I had a better understanding of evolution.				
5	Misconception about evolution reduce my interest in biology.				
6	I perform better in biology topics unrelated to evolution.				

RESEARCH QUESTION FOUR: SOURCES AND CAUSES OF MISCONCEPTION

S/N	ITEMS	SA	A	D	SD
1	I learned most of what I know about evolution from secondary school.				
2	The way evolution is taught in schools contribute to misunderstanding.				
3	Popular media (TV, Internet, Movies) influence				

	my understanding of evolution.				
4	My personal beliefs sometimes conflict with scientific explanation of evolution.				
5	I have never been given a chance to critical discuss evolution in class.				

RESEARCH 5: INSTRUCTIONAL STRATEGIES AND EDUCATIONAL INTERVENTION

S/N	**ITEMS**	**SA**	**A**	**D**	**SD**
1	Teaching with real life examples would help me clarify evolutionary concepts.				
2	Using visual aids and simulation would help improve my understanding of evolution.				
3	Interactive teachings (e.g. debates and projects) help in addressing misconception.				
4	Teachers should address student's beliefs directly during lessons.				
5	I would benefit from remedial sessions focused on evolutionary biology				

OBJECTIVE QUESTIONS: Evolution Misconceptions and Academic Achievement

1. What is evolution in biological terms?

A) A sudden transformation of one species into another

B) The idea that all species were created independently

C) A gradual change in species over time due to genetic variation and natural selection

D) The disappearance of old species and creation of new ones overnight

2. Which of the following is a common misconception about evolution?

A) Evolution happens through random mutations

B) Evolution explains the diversity of life

C) Individual organisms evolve during their lifetime

D) Natural selection acts on variations in traits

3. **Which of the following is a misconception about evolution?**

A) Evolution explains the diversity of life

B) Evolution is just a theory and not a fact

C) Natural selection drives adaptation

D) Mutations contribute to genetic variation

4. **Humans evolved from:**

A) Modern monkeys

B) Fish directly

C) A common ancestor shared with other primates

D) Dinosaurs

5. **Which statement is false?**

A) Evolution can result in loss of traits

B) Evolution always leads to more complex organisms

C) Evolution can occur rapidly under certain conditions

D) Evolution is influenced by environmental pressures

6. **Evolutionary change is driven by:**

A) Need or desire of organisms

B) Random chance only

C) Selection pressures acting on variation

D) Conscious decisions by species

7. **Which of the following is a misconception?**

A) Evolution is supported by fossil evidence

B) Evolution can be observed in real time

C) Evolution is a slow and gradual process only
D) Evolution leads to extinction of all old species

8. **Which statement is true?**
A) Evolution is a belief system
B) Evolution contradicts all religious views
C) Evolution is a scientific explanation for biodiversity
D) Evolution is untestable

9. **Which of the following is a misconception?**
A) Evolution can lead to extinction
B) Evolution is influenced by genetic variation
C) Evolution always improves organisms
D) Evolution can occur without natural selection

10. **Which of the following is a misconception about human evolution?**
A) Humans share DNA with other primates
B) Humans evolved from chimpanzees
C) Humans and chimpanzees share a common ancestor
D) Human evolution is supported by fossil evidence

11**. Which of the following is a misconception?**
A) Evolution explains how life changes over time
B) Evolution is guided by natural selection
C) Evolution is a purposeful process
D) Evolution involves genetic variation

12. **Which of the following is true?**
A) Evolution is a process that happens to individuals
B) Evolution is a process that happens to populations
C) Evolution is a myth
D) Evolution is a religious belief

13. **Which of the following is NOT a misconception?**
A) Evolution is a slow process
B) Evolution can be observed in bacteria
C) Evolution is always beneficial
D) Evolution is a ladder of progress

14. **Which of the following is a misconception about natural selection?**
A) It favors traits that increase survival and reproduction

B) It acts on existing variation
C) It creates new traits when needed
D) It can lead to speciation

15. **Which of the following is true about evolutionary fitness?**
A) It refers to physical strength
B) It means being the fastest
C) It refers to reproductive success
D) It means being the smartest

16. **Which of the following is a misconception?**
A) Evolution is supported by multiple scientific disciplines
B) Evolution is a random process with no patterns
C) Evolution explains the origin of species
D) Evolution is influenced by environmental changes

17. **Which of the following is NOT a misconception?**
A) Evolution is a scientific theory
B) Evolution is just a guess
C) Evolution is unprovable
D) Evolution is based on faith

18. **Which of the following is a misconception about adaptation?**
A) Adaptations arise from genetic variation
B) Adaptations are inherited traits
C) Adaptations are developed during an organism's lifetime
D) Adaptations improve survival

19**. Evolution a random and unguided process.**
A) Yes, entirely random
B) No, not entirely random

20. **Evolution implies that all species will eventually become extinct.**
A) True
B) False