



Misconceptions About Evolution in Biology Among Secondary School Students in Nigeria

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ABSTRACT

Secondary school students often hold misconceptions about evolutionary concepts due to factors such as religious beliefs, cultural influences, and inadequate educational resources. Finding out these misconceptions is central for cultivating accurate scientific understanding among students. This study employed a mixed methods approach, combining quantitative surveys and qualitative interviews. The main objective was to investigate misconceptions about evolutionary concepts among Senior Secondary Three (SS 3) students from public and private schools in Sabon Gari Local Government Area of Kaduna State, Nigeria. Data were collected using a questionnaire tagged "Misconceptions about Evolutionary Concepts (MEC)" and interview guide. Both MEC and interview guide were validated by experts. The instruments were pilot tested, and the MEC yielded a reliability coefficient of 0.85. Quantitative data from the survey were analyzed using descriptive statistics; mean, standard deviation, and frequency distributions, while qualitative data from the interviews were analyzed using thematic analysis. The findings revealed widespread misconceptions, particularly regarding natural selection, genetic variation, and common ancestry. Religious beliefs and cultural narratives were found to influence students' understanding of evolution. The study recommended including culturally sensitive content in teaching evolution to respectfully address religious and cultural perspectives while promoting scientific literacy.

INTRODUCTION

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; Suprpto, 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 present study aims to investigate the misconceptions in evolutionary concepts among secondary school students in Sabon Gari Local Government Area (LGA) of Kaduna State, Nigeria, focusing on how these misconceptions are influenced by indigenous knowledge and the formal biology core curriculum. By

identifying the specific misconceptions and their sources, this research seeks to provide understandings into how educational strategies can be improved to bridge the gap between indigenous knowledge and scientific education, nurturing a more inclusive and accurate understanding of evolution.

LITERATURE REVIEW

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 Suprpto (2020), conflicts may arise when indigenous explanations contradict scientific principles, potentially leading to confusion and misconceptions among students

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 teaching strategies (Barnes et al., 2020; Soeharto et al., 2019; Suprpto (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 concepts.

In secondary education, the biology curriculum typically includes topics related to evolutionary theory, genetics, and ecology (Jördens & Hammann, 2019). 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 (Kaloï 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.

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.

STATEMENT OF THE PROBLEM

The study area of this research, Sabon Gari LGA, is a cosmopolitan area with diverse ethnic groups. It is predominantly composed of Muslims and Christians, providing a unique cultural and religious backdrop. Despite the inclusion of evolution in the biology curriculum, many students hold inaccurate beliefs influenced by indigenous knowledge, cultural traditions, and religious views. These misconceptions hinder students' understanding and acceptance of scientific explanations of evolution, affecting their overall scientific literacy. Sabon Gari LGA offers an ideal setting to explore the impact of cultural and religious beliefs on students' understanding of evolution. Indigenous knowledge and cultural traditions often conflict with evolutionary theory, presenting challenges to students' comprehension of key evolutionary principles. Moreover, religious teachings in both Muslim and Christian communities often emphasize creationist viewpoints, which can influence students' acceptance of evolutionary

concepts. These factors contribute to the persistence of misconceptions among students regarding evolutionary theory. The coexistence of traditional beliefs and scientific education presents a significant challenge in secondary education in Sabon Gari LGA. Students' misconceptions are rooted in deep-seated cultural and religious beliefs, which may not be adequately addressed by the current biology curriculum. Understanding the prevalence and sources of these misconceptions is essential for biology teachers to improve scientific literacy while respecting cultural diversity. The main objective of the study was to investigate misconceptions about evolution in biology among secondary school students in Sabon Gari LGA of Kaduna State, Nigeria. Based on this, the following research questions were raised to guide the study;

1. What are the common misconceptions about evolutionary concepts among secondary school students in Sabon Gari LGA?
2. How prevalent are specific misconceptions related to evolutionary theory among secondary school students in Sabon Gari LGA?
3. What are the sources of misconceptions about evolutionary concepts among secondary school students in Sabon Gari LGA?
4. How do indigenous knowledge and religion beliefs intersect with and influence secondary school students' understanding of evolutionary concepts in Sabon Gari LGA?

METHODOLOGY

Research Design, Population and Sample: This study employs a mixed-methods approach, combining quantitative and qualitative data collection methods. The research design included survey and semi-structured interviews. The target population for this study comprised SS 3 students from public and private schools offering biology in senior secondary schools in Sabon Gari LGA of Kaduna State. They were targeted because they must have covered evolution as part of their biology curriculum, making them suitable for investigating misconceptions about evolutionary concepts. Guided by The Research Advisor (2006) table of sample size determination, a sample of 306 students was selected using stratified random sampling technique. This technique ensured representation across age, gender, school type, religion, and ethnic group.

Research Instruments: Two research instruments were used for data collection; 1) A structured questionnaire titled "Misconceptions about Evolutionary Concepts (MEC)" was developed to assess students' understanding of evolutionary concepts and identify common misconceptions. The MEC included two sections, Section A for demographic information (e.g., age, gender, school type) while Section B contained 15 items on misconceptions about natural selection, genetic variation and common ancestry. The items were measured on a 4-point Likert scale of Strongly Agree, Agree, Disagree and Strongly Disagree. 2) Using a developed Interview Guide, semi-structured interviews were conducted with a subset of 20 students selected from the survey participants.

The interview guide included open-ended questions to explore the sources of misconceptions. The interview questions covered indigenous knowledge, religious beliefs, cultural and peer influences. The content validity of the MEC was ensured through by two experts in the field of in Science Education and one in Measurement and Evaluation. The interview guide was also reviewed to ensure the questions were relevant and covered the necessary themes. The reliability of the MEC was tested through a pilot study with 30 students not part of the population of the study. The Cronbach's alpha coefficient for the MEC items was found to be 0.85, indicating high internal consistency.

Data Collection: Data for the study was collected in two ways; 1) Quantitative Data Collection: The MEC was administered to the selected sample of 306 students. Participants were informed about the purpose of the study and assured of the confidentiality of their responses. The MEC were distributed and collected within two weeks. However, out of the 306 questionnaires (MEC) distributed, only 279 were correctly filled and returned. 2) Qualitative Data Collection: Semi-structured interviews were conducted with 20 students from across the demographic of who participated in the survey. Interviews were scheduled at convenient times for the students to ensure candid responses. Each interview lasted approximately 30-45 minutes and were audio-recorded with the participants' consent.

Method of Data Analysis: Survey responses were analyzed using descriptive statistics, including mean, standard deviation, and frequency distribution. Misconceptions were classified based on the following criteria: High Misconception (mean score 3.0 to 4.0), Moderate Misconception (mean score 2.0 to 2.9), and Low Misconception (mean score 1.0 to 1.9). Interview transcripts were analyzed using thematic analysis. Responses were coded and categorized into themes related to the sources of misconceptions. Common themes were identified and used for the interpretation. Participants were given codes (Stud1, Stud2, Stud3...Stud20) for confidentiality and analysis purposes.

Ethical Consideration: The study adhered to ethical guidelines for research involving human subjects. Informed consent was obtained from all participants, and parental consent were sought for students under the age of 18. Participants were assured of the confidentiality and anonymity of their responses. The study was granted approval from the ethical review board.

DATA ANALYSIS AND RESULTS

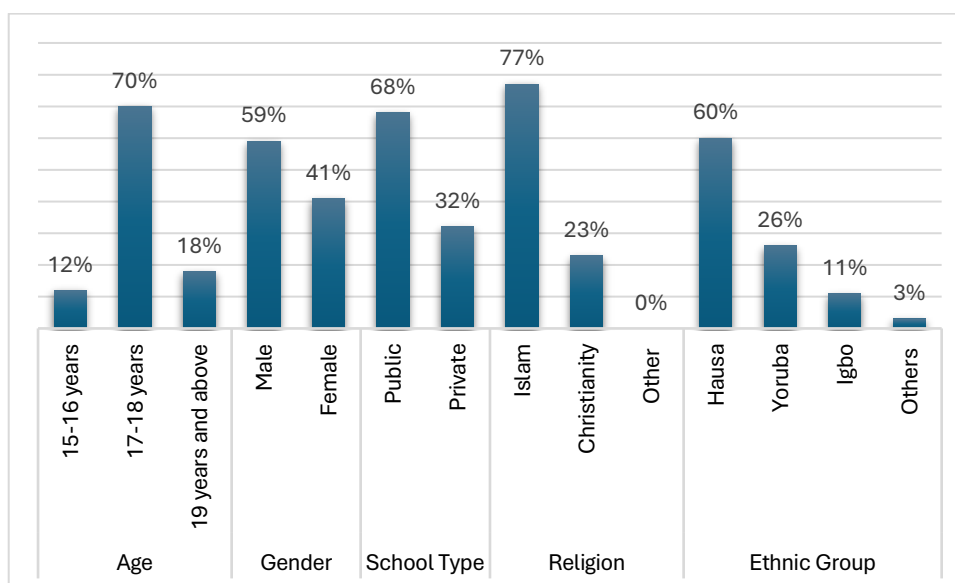


Figure 1: Demographic Characteristics of the Respondents

The demographic characteristics of the respondents (N=279) in Figure 1 show a majority of students aged 17-18 years (70%), predominantly male (59%), attending public schools (68%), and identifying as Muslims (77%). The largest ethnic group was Hausa (60%), with smaller percentages for Yoruba (25%), Igbo (11%), and other ethnic groups (4%). This distribution reflects the diverse population in Sabon Gari LGA, Kaduna State.

Research Question 1: What are the common misconceptions about evolutionary concepts among secondary school students in Sabon Gari LGA?

Table 1: Descriptive Statistics of Misconceptions about Evolution Concepts (n = 279)

Statement	Mean	SD	Decision
Natural Selection Misconceptions			
Evolution occurs because organisms want to adapt to their environments.	3.07	0.93	HM
Individuals can evolve during their lifetime through natural selection.	2.99	0.92	HM
Evolution is always progressive, leading to higher or more advanced organisms.	3.05	0.88	HM
Survival of the fittest means that only the strongest survive.	3.20	0.85	HM
Natural selection occurs because organisms need certain traits.	3.08	0.92	HM
Grand Mean \pm SD	3.08 \pm 0.90		HM
Genetic Variation Misconceptions			

Only beneficial traits are passed down through genes.	3.05	0.89	HM
Individuals can acquire traits during their lifetime and pass them down to their offspring.	2.96	0.94	HM
All mutations are harmful to an organism.	3.12	0.90	HM
Changes in an organism's environment cause changes in its DNA.	2.91	0.96	HM
Genes are the only factor that determines the characteristics of an organism.	3.01	0.91	HM
Grand Mean \pm SD	3.01 \pm 0.92		HM
Common Ancestry Misconceptions			
Humans did not evolve from earlier species; humans were created in their present form.	3.15	0.87	HM
Evolution is just a theory and has not been proven.	3.12	0.88	HM
Species cannot change over time; they remain the same as they were originally created.	3.17	0.86	HM
Adaptations in organisms happen because organisms change their behaviour.	3.10	0.90	HM
Evolution always results in organisms becoming more complex.	3.07	0.91	HM
Grand Mean \pm SD	3.12 \pm 0.88		HM

Keys: HM = High Misconception, MM = Moderate Misconception, LM = Low Misconception

The findings from Table 1 revealed substantial misconceptions among secondary school students in Sabon Gari LGA, across various categories of evolutionary concepts. For instance, students commonly held misconceptions such as Evolution occurs because organisms want to adapt to their environments (Mean: 3.07, SD: 0.93), Individuals can acquire traits during their lifetime and pass them down to their offspring (Mean: 2.96, SD: 0.94), and Humans did not evolve from earlier species; humans were created in their present form (Mean: 3.15, SD: 0.87). These statistics showed major misunderstandings of fundamental evolutionary principles, including natural selection, genetic variation, and common ancestry.

Research Question 2: How prevalent are specific misconceptions related to evolutionary theory among secondary school students in Sabon Gari LGA?

Table 2: Descriptive Statistics of Prevalence of Misconceptions about Evolution (n = 279)

Misconception Type	Grand Mean \pm SD	Prevalence (%)
Natural Selection Misconceptions	3.08 \pm 0.90	76
Genetic Variation Misconceptions	3.01 \pm 0.92	68
Common Ancestry Misconceptions	3.12 \pm 0.88	79

The data from Table 2 revealed that, 79% (3.12 ± 0.88) of students have misconceptions related to common ancestry, indicating a widespread misunderstanding of how species are interconnected through evolutionary history. More so, 76% (3.08 ± 0.90) of students indicated misconceptions about natural selection, a fundamental mechanism driving evolution, while 68% (3.01 ± 0.92) have misconceptions about genetic variation, which is fundamental for understanding evolutionary processes.

Research Question 3: What are the sources of misconceptions about evolutionary concepts among secondary school students in Sabon Gari LGA?

Sample analysis of findings on interview responses of students on sources of misconceptions

Religious Beliefs:

My religious teachings emphasize that humans were created by God in their present form. This belief makes it hard for me to accept that humans evolved from earlier species...[Stud3].

In my religion, we are taught that life forms were created as they are now and didn't evolve over time...[Stud5].

My family believes that God created all living things and that humans did not evolve from earlier species...[Stud9].

...I attend a religious school where evolution is not discussed much. Instead, we are taught that God created everything, including humans, in their present form...[Stud14].

My religious teachings emphasize that humans are unique creations and did not evolved. This belief makes it challenging for me to accept the theory of evolution...[Stud17].

In my religion, we believe that humans were created by a divine being and did not evolve from earlier life forms...[Stud19].

Lack of Understanding:

I find it difficult to understand how organisms can change over time by natural selection. The explanations in our textbooks are sometimes confusing and hard to follow [Stud1].

I think my understanding of evolutionary concepts is limited because our teachers don't always explain them clearly. I would like more practical examples to help me understand better [Stud4].

...So, I struggle to understand how genetic variation leads to changes in species over time. The concept of mutations and natural selection are not well explained in our classes [Stud7].

I think if our teachers used more visual aids and real-life examples to explain evolution, it would help me and my classmates understand it better [Stud11].

...Sometimes I get confused about how adaptations and changes in species happen over time. It's not always clear to me how natural selection works in practice...[Stud15].

...therefore, I think if our textbooks explained evolution in simpler terms and broke down the concepts into smaller parts, it would be easier for students like me to understand [Stud20].

Cultural Influences:

In our culture, elders often tell stories about how things were created in their present form. This conflicts with what I learn in school about species changing over time [Stud2].

My family believes that our ancestors have always been the same and didn't evolve from earlier forms. This belief affects my understanding of evolutionary concepts [Stud3].

Cultural stories and traditions in my community often conflict with what I learn in science class about how life started. It's confusing to hear two different explanations [Stud5].

According to my culture, species were created in their present form and didn't change over time. This makes it hard for me to accept the theory of evolution taught in school [Stud7].

I think cultural beliefs influence how people in my community view evolutionary theory. Some people don't accept it because it conflicts with their cultural beliefs [Stud10].

My community has traditional beliefs that are different from what I learn in school about how life forms evolved. It's challenging to reconcile these two different viewpoints [Stud18].

Peer Influence:

My friends and I sometimes talk about evolution, and not everyone agrees with what we learn in school. It makes me think differently about how life started and evolved [Stud3].

One of my friends told me that evolution is just a theory and not proven. It made me question whether there is any truth to what we learn in science class [Stud5].

I've heard my friends say that evolution is not real and that humans didn't evolve from earlier species. It makes me wonder if what we learn in school is accurate [Stud9].

Sometimes my friends and I have different ideas about how species changed over time. It makes me think about whether I understand evolution correctly [Stud11].

My friends and I talk about evolution, and some of them believe in different ideas about how life forms evolved. It's interesting to hear different perspectives [Stud14].

When my friends and I discuss evolution, we sometimes disagree about how life started and changed over time. It makes me think about what I believe [Stud19].

The interview responses revealed that misconceptions about evolutionary concepts among secondary school students in Sabon Gari LGA are primarily influenced by religious beliefs, lack of understanding, cultural influences, and peer influence. Religious teachings often contradict evolutionary theory, while unclear educational explanations and cultural narratives further complicate students' understanding. Peer discussions also reinforce these misconceptions.

Research Question 4: How do indigenous knowledge and religion beliefs intersect with and influence secondary school students' understanding of evolutionary concepts in Sabon Gari LGA?

Sample analysis of findings on interview responses of students on indigenous knowledge and religion beliefs intersect

Indigenous Knowledge:

Elders in my community tell stories about how different animals and plants were created by spirits. This makes me think about evolution differently because we have our own explanations for how life started [Stud1].

My parents and grandparents believe that humans were created in their present form and did not evolve from earlier species. This belief has influenced me to question what I learn in school about evolution [Stud6].

Our traditional stories explain the origins of life as acts of creation by ancestors. So, this cultural perspective makes it difficult for me to reconcile these stories with scientific explanations of evolution [Stud11].

It's common in our village to hear that the land and its creatures were made by divine beings. Thus, it is hard to accept that species can change over time through natural processes [Stud20].

Religious Beliefs:

My religion taught us that God created everything, including humans. So it's hard for me to accept evolution [Stud3].

I attend a religious school where they teach us that evolution is just a merely fabricated theory. This makes me question whether what I learn in science class is true [Stud9].

My religious education emphasizes creationism, where all life was created as it is now. This belief makes it challenging for me to understand and accept the scientific concept of evolution [Stud12].

Religious teachings in my family stress that humans are a special creation and did not evolve from other species. This directly opposes the evolutionary theory taught in school [Stud16]."

The responses indicated that 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. This intersection highlights the need for culturally sensitive educational approaches that respect students' backgrounds while promoting scientific literacy.

DISCUSSION

The findings related to research question one revealed high misconceptions about evolutionary concepts among secondary school students in Sabon Gari LGA. Students majorly misunderstand key principles, such as believing evolution occurs because organisms want to adapt, that traits acquired during a lifetime can be inherited, and that humans were created in their present form. These misconceptions indicated huge gaps in understanding natural selection, genetic variation, and common ancestry. These findings are in consistent with the study of Prayitno and Hidayati (2022), which identified widespread misconceptions about natural selection among students. Similarly, Ginnobili et al. (2020) and Kampourakis (2020) observed that students often hold teleological explanations for evolution. Also, Akolade et al. (2020) and David-Egbenusi and Omoifo (2020) identified misconceptions among Nigerian students regarding the origin of life in relation to evolution. This persistence of misconceptions may be due to cognitive and emotional factors, suggesting the need for approaches that also address underlying beliefs and values.

The data obtained for research question two revealed that misconceptions about evolutionary theory are highly prevalent among secondary school students in Sabon Gari LGA. Specifically, 79% of students hold misconceptions related to common ancestry, highlighting a widespread misunderstanding of species' interconnectedness. This finding is in line with Kampourakis and Zogza (2009), who noted similar issues and emphasized the necessity of explicit instruction on

phylogenetic trees. The present study also revealed that 76% of students indicated misconceptions about natural selection. This is consistent with the study of Prayitno and Hidayati (2022), who found that students often incorrectly view evolution as goal directed. Similarly, 68% of students misunderstand genetic variation, a key evolutionary process. Helmi et al. (2019) also reported prevalence misconceptions in evolution education,

The interview responses on research question three from secondary school students in Sabon Gari LGA revealed that misconceptions about evolutionary concepts stem from religious beliefs, lack of understanding, cultural influences, and peer discussions. Religious teachings often conflict with evolutionary theory (e.g., Stud3, Stud5, Stud9), and unclear educational explanations further complicate students' understanding (e.g., Stud1, Stud4, Stud7). Peer discussions also reinforce these misconceptions; some students noted that conversations with peers who hold alternative views about evolution (e.g., Stud5, Stud11, Stud14) challenge their understanding. Research conducted by Akolade et al. (2020) and David-Egbenusi and Omoifo (2020) reinforces these findings by revealing how cultural narratives and religious influences perpetuate misconceptions about evolution. A study by Kampourakis and Zogza (2009) recommended interventions that integrates cultural perspectives to improve students' understanding of evolutionary biology.

The interview responses to research question four indicated that indigenous knowledge and religious beliefs strongly influence secondary school students' understanding of evolutionary concepts in Sabon Gari LGA. Indigenous knowledge, rooted in cultural stories and beliefs about creation by spirits or ancestors, often conflicts with scientific explanations of evolution (e.g., Stud1, Stud6, Stud11). These traditional narratives shape students' perspectives on the origins of life and challenge their acceptance of evolutionary theory, as seen in the case of Stud20. Similarly, religious beliefs significantly shape students' views on evolution, with many struggling to reconcile creationist teachings with evolutionary science (e.g., Stud3, Stud9, Stud12, Stud16). These findings align with those of Akolade et al. (2020), Aini et al. (2020), Mantelas and Mavrikaki (2020) and Peñaloza et al. (2021), indicating that cultural and religious beliefs impedes the acceptance of evolutionary principles and concepts. David-Egbenusi and Omoifo (2020) also found that Christian and Muslim students, the dominant religious groups in Nigeria, exhibit greater skepticism towards evolution compared to creationism.

Building on these findings, Suprpto (2020) found that accurate information alone is insufficient to counter misconceptions about evolution education. Pobiner et al. (2020) reported wide variation in how teachers choose to address student resistance to learning about evolution and tensions between religious and scientific worldviews. Therefore, interventions proposed by Kampourakis and Zogza (2009) have shown promise in addressing these misconceptions through case studies and explicit instruction on common ancestry. Peel et al. (2019) stressed the need for socio-scientific discussions to effectively address these misconceptions. Reiss (2019) advocated that evolution

education should be considered and treated as a sensitive issue. Similarly, Kaloï et al. (2022), David-Egbenusi and Omoifo (2020) and Ramadhan et al. (2022) suggested faith-evolution compatibility educational approaches that respect students' backgrounds while promoting scientific literacy. Sá-Pinto et al. (2021) emphasized the use of transdisciplinary activities and early learning about evolution, while Christensen and Lombardi (2020) underscored the integration of computational thinking to enhance understanding of evolutionary concepts.

CONCLUSION

Based on the findings of this study, the study concluded that majority of secondary school students in Sabon Gari LGA misunderstand fundamental principles of evolution such as natural selection, genetic variation, and common ancestry, with widespread misconceptions prevalent across these areas. These misconceptions were found to be influenced by religious beliefs, cultural narratives, peer discussions, and lack of proper knowledge of core biology of students. Therefore, research is needed to explore effective strategies for improving evolutionary education in diverse cultural contexts in secondary schools in Sabon Gari.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made;

1. Revised biology curriculum should include explicit instruction on evolutionary concepts, with culturally sensitive content that respects diverse religious and cultural perspectives.
2. Biology teachers should be provided with professional development on effective instructional strategies for teaching evolutionary biology, including how to address misconceptions.
3. The Kaduna State Ministry of Education, in collaboration with Sabon Gari LGA, should develop and distribute educational resources to the community, such as textbooks and supplementary materials, that present evolutionary concepts clearly and address common misconceptions. This initiative will promote scientific literacy and enhance understanding of biological concepts across all demographics in the study area.
4. Establish community involvement in education by promoting dialogue between educators, religious leaders, and community members to bridge the gap between religious beliefs and scientific knowledge.

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