IDENTIFYING AND CORRECTING MISCONCEPTIONS IN BASIC SCIENCE CONCEPTS AMONG JUNIOR SECONDARY SCHOOL STUDENT IN OVIA WEST LOCAL GOVERNMENT AREA

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BENIN CITY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY, FACULTY OF EDUCATION UNIVERSITY OF BENIN, FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE EDUCATION (B.Sc Ed) DEGREE IN INTEGRATED SCIENCES EDUCATION OF THE UNIVERSITY OF BENIN, BENIN CITY, NIGERIA, BSc (Ed)

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CERTIFICATION

We the undersigned certify that this project was carried out by **Favour Glory AHAMISI** in the department of Curriculum and Instructional, Faculty of Education, University of Benin, Benin City, Nigeria.

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DEDICATION

This study is dedicated to my parents Mr and Mrs Ahamisi, for their love, wisdom, understanding and provision.

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Firstly, I am thankful to God Almighty for gracing me the strength, ability, knowledge and opportunity to undertake this study and complete it satisfactorily. Secondly, I would like to express my appreciation and gratitude to my project supervisor, Mrs. Bazuaye J. O for her continuous guidance all through my study, for patience, support and immense knowledge. Her guidance helped me all through the time of my study and in shaping my study in attitude also. l would like to express my appreciation and gratitude to my Head of Department of Curriculum and Instructional Technology, Prof. F. O. Idehen for his advice and numerous contributions and the department coordinator of postgraduate studies, Dr (Mrs) I. k. Oteze for her contributions and encouragement that made this study a reality.

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Finally, my appreciation also goes to everyone who has contributed in one way or the other, to my course mate, my researcher I say a thank you. I pray that divinity will continue to reward you all for your wholesome kindness and love toward me.

TABLE OF CONTENTS

ABSTRACT

The study examined the Identifying and Correcting Misconceptions in Basic Science concepts among junior secondary school student in Ovia west local government area, five research questions was raised to guide this study;

The population of the study consist of all the one hundred and ninety-six (196) teachers from the 23 public Junior secondary schools in Ovia north east Local Government Area of Edo State. (Edo State Ministry of Education, 2024.) The sample size selected for this study is one hundred and twenty five (125) Junior Secondary School Teachers, selected randomly using simple random sampling technique. from the 23 public Junior secondary schools Ovia north east Local Government Area of Edo State

The findings of the study revealed that; A significant number of students in the study displayed misconceptions in fundamental science concepts such as the laws of motion, chemical reactions, and basic biological processes. These misconceptions were often the result of prior misconceptions carried from earlier educational stages.The majority of misconceptions originated from insufficient teaching resources and a lack of interactive learning methods. Many students relied heavily on rote memorization rather than understanding the underlying principles. The following recommendations were made;Regular professional development workshops for teachers should be implemented, focusing on identifying and correcting misconceptions in science. Teachers should be equipped with strategies to address misconceptions effectively in the classroom. Schools should integrate more interactive teaching methods, such as experiments, demonstrations, and simulations, to engage students and correct misconceptions. These methods encourage deeper understanding and help students visualize abstract concepts.

CHAPTER ONE
INTRODUCTION

Background to the Study

Misconceptions are false or inaccurate beliefs, ideas, or understandings about a concept, event, or phenomenon. They arise when individuals interpret information incorrectly or hold views that conflict with established facts, evidence, or scientific consensus. Misconceptions can have significant consequences, influencing decisions and behaviors in various aspects of life. For example, the misconception that vaccines cause autism has led to a decrease in vaccination rates and a resurgence of preventable diseases like measles (CDC, 2019). Another common misconception is the belief that climate change is not caused by human activities, despite overwhelming scientific evidence to the contrary (IPCC, 2021). These false beliefs can hinder efforts to address pressing global issues and can have far-reaching implications for society as a whole.

Moreover, misconceptions can also contribute to the spread of misinformation and fake news, particularly in the age of social media. Studies have shown that false information spreads faster and more widely than accurate information on platforms like Twitter and Facebook (Vosoughi et al., 2018). This can have serious implications for public health, politics, and other areas where accurate information is crucial for making informed decisions.

In the field of education, misconceptions can hinder student learning and achievement. For example, the misconception that people only use 10% of their brains has been debunked by neuroscientists, yet it continues to be perpetuated in popular media and culture (Chudler, 2014). This false belief can lead to misunderstandings about cognitive functioning and limit students' potential to reach their full intellectual capacity, misconceptions are pervasive in society and can have detrimental effects on individuals, communities, and even the global population. It is crucial to address and correct these false beliefs through education, critical thinking, and access to accurate information. By challenging misconceptions and promoting evidence-based knowledge, we can create a more informed and resilient society capable of addressing the complex challenges of the modern world.

Basic Science is a core subject taught at the junior secondary school level that integrates essential ideas and principles drawn from physics, chemistry, biology, and technology. It provides students with a unified understanding of the natural world and how scientific principles apply to everyday life. Through Basic

Science, learners are introduced to the fundamental concepts of matter, energy, living organisms, environmental studies, and technological innovation in a simplified and practical manner. The subject is designed to lay a solid foundation for scientific literacy by developing students' curiosity, problem-solving skills, and appreciation of scientific inquiry. It helps them understand the interrelationships between different branches of science rather than viewing them as separate disciplines. For instance, topics such as energy transformation, the human body, ecosystems, and simple machines cut across various scientific fields, promoting a holistic view of science.

Basic Science aims to prepare students for future studies in specialized science subjects at the senior secondary level, such as Physics, Chemistry, and Biology. It also equips them with the knowledge and attitudes necessary to make informed decisions about health, environment, and technology in their daily lives. By encouraging observation, experimentation, and logical reasoning, Basic Science plays a crucial role in nurturing scientific thinking and fostering innovation among young learners.

Correcting misconceptions is most effective when teachers follow a deliberate cycle: diagnose students' prior conceptions, create productive cognitive conflict with carefully chosen tasks or texts, support reconstruction of ideas with explicit explanations and representations, and consolidate the new conception with varied practice and formative feedback. This approach aligns with the conceptual change tradition and has strong empirical backing. A recent meta-analysis across science education found that conceptual change strategies as a group have a robust positive impact on learning, with benefits observed for cognitive conflict approaches, bridging analogies, and ontological shifts where appropriate Understanding science requires more than memorizing facts—it depends on grasping accurate concepts. However, many junior secondary school students harbor misconceptions about basic science ideas.

These misconceptions often arise from everyday experiences, cultural beliefs, poor instructional methods, or unclear explanations in textbooks. If not identified and corrected early, they can hinder further learning and reduce students' interest and performance in science. Studies show that misconceptions are persistent and resistant to change because they form a part of a learner's mental framework for understanding the world. For example, students may believe that heavier objects fall faster than lighter ones or that plants "breathe in" carbon dioxide and "breathe out" oxygen in the same way humans do. Such ideas seem logical based on observation but conflict with scientific explanations. Teachers therefore play a vital role in identifying and addressing these misconceptions effectively.

Effective identification begins with diagnostic assessment tools such as concept inventories, oral questioning, and open-ended discussions that reveal students' reasoning . Once misconceptions are identified, correction should be done through strategies that promote conceptual change rather than rote correction. Approaches like conceptual change instruction, inquiry-based learning, and peer discussion have been shown to help students reconstruct their understanding by confronting their prior beliefs with scientific evidence. The teacher must create an environment where students feel safe to express their ideas, question them, and explore new explanations through experimentation and reflection, the integration of models, analogies, and multimedia simulations can make abstract concepts more concrete and reduce the likelihood of misunderstanding (Udoh et al., 2022). Teachers should also receive continuous professional development to enhance their skills in diagnosing and correcting misconceptions effectively, identifying and correcting misconceptions in basic science among junior secondary school students is crucial to developing scientific literacy. When teachers use diagnostic tools and employ conceptual change strategies, they not only correct errors but also nurture curiosity, critical thinking, and a deeper appreciation of science.

Statement of the Problem

In an ideal learning environment, junior secondary school students are expected to acquire accurate scientific concepts that form the foundation for further studies in science and technology. Basic Science as a subject is designed to develop inquiry, critical thinking, and problem-solving skills, preparing students for real-life applications and future scientific pursuits. According to the Nigerian Educational Research and Development Council (NERDC), the Basic Science curriculum seeks to promote correct understanding of natural phenomena, stimulate curiosity, and foster positive attitudes towards science. In this ideal situation, students should progress with minimal misconceptions, demonstrating clear conceptual understanding of scientific principles that can be applied confidently in daily life and advanced studies. Unfortunately,

The reality in many junior secondary schools in Ovia West Local Government Area deviates from this ideal. Many students hold misconceptions about core scientific ideas, often arising from inadequate teaching methods, language barriers, prior experiences, or misinterpretation of abstract concepts. These misconceptions persist even after formal instruction, influencing students' reasoning, test performance, and long-term interest in science. For example, some students confuse heat with temperature, believe that heavier objects fall faster than lighter ones, or assume that plants take in food like animals rather than producing it through photosynthesis. Such erroneous ideas hinder effective learning, create difficulties in advanced science subjects, and reduce the ability of learners to apply knowledge in solving practical problems. The persistence of these misconceptions raises concern among educators, as it contributes to low performance in science examinations and poor enrolment in science-related careers. This study intends to systematically identify the misconceptions held by junior secondary school students in Ovia West Local Government Area in key areas of Basic Science, and to evaluate effective strategies for correcting them. The research will explore approaches such as the use of conceptual change methods, diagnostic assessments, activity-based learning, and interactive teaching strategies that actively confront and reconstruct students' wrong beliefs. By highlighting specific misconceptions and aligning them with appropriate corrective strategies, the study seeks to provide teachers, curriculum planners, and policymakers with evidence-based insights that will improve the teaching and learning of Basic Science. Ultimately, the intervention aims to enhance students' conceptual understanding, strengthen performance in science, and lay a stronger foundation for national scientific and technological development.

Research Questions

1. What are the common misconceptions held by junior secondary school students in Basic Science in Ovia West LGA?

2. What are the likely causes of these misconceptions?
3. What strategies are currently used by Basic Science teachers to address misconceptions?
4. How effective are these strategies in correcting misconceptions?
5. What alternative methods can be introduced to improve conceptual understanding in Basic Science?

Purpose of the Study

The main objective of this study is to identify misconceptions in Basic Science among junior secondary school students in Ovia West Local Government Area and to explore effective strategies for their correction. Specifically, the study aims to:

- Examine the nature and prevalence of science misconceptions among students.
- Investigate the underlying causes of these misconceptions.
- Evaluate the current instructional practices for addressing misconceptions.

- Propose evidence-based teaching strategies for improved science comprehension.
- Investigate alternative methods that can be introduced to improve conceptual understanding in Basic Science?

Significance of the Study

The finding of the study will be significant to: Junior secondary school students, Science teachers, School administrators, Parents,

Junior secondary school students stand to gain directly, as the research will help them overcome common misconceptions in Basic Science. Misunderstanding of scientific terms, concepts, and processes often hinders learning, but by identifying and addressing these errors, students will acquire a clearer understanding of science. This improvement not only enhances their academic performance but also builds a stronger foundation for further studies in science-related subjects.

Science teachers will also benefit from the findings of this study. By highlighting the specific misconceptions students hold in Basic Science, teachers will gain deeper insights into the areas where learning difficulties arise. Armed with this knowledge, they can adopt more effective teaching strategies, make use of relevant examples, and employ improved instructional materials. In turn, this will enhance the quality of teaching and foster greater student engagement in science learning.

School administrators are another group that will benefit from the study. Understanding the areas of the curriculum where students encounter challenges will enable them to make informed adjustments. The evidence provided by this research can guide improvements in curriculum design, provision of better teaching resources, and organisation of teacher training programmes. Collectively, these measures will strengthen the quality of science education in junior secondary schools.

Parents will indirectly benefit as well. When misconceptions in science are corrected, students are more likely to show improved performance and increased interest in the subject. This growth in confidence and academic success reduces parental concerns about poor results in science, while also encouraging parents to further support their children's educational journey.

Policy makers, including the Ministry of Education, will find this study particularly valuable. It will provide reliable data on the challenges faced by students in learning Basic Science at the junior secondary level. Such evidence can be used to inform policy decisions, design professional development initiatives for teachers, and ensure the provision of appropriate learning aids targeted at addressing misconceptions in science.

Researchers will also benefit from this study. By enriching the existing body of knowledge on science education in Nigeria, the research opens avenues for further investigation. Future researchers can build on its findings to conduct comparative studies, design intervention programmes, or replicate the research in other local government areas. In this way, the study contributes not only to practice but also to the academic discourse on improving science education outcomes.

Scope and Delimitations of the Study

The study focused on Identifying Misconceptions In Basic Science And Strategies For Their Correction Among Junior Secondary School Student In Ovia West Local Government Area, this study is delimited to public Junior Secondary School Student In Ovia West Local Government Area.

Definition of Terms

- **Misconceptions**: Incorrect or flawed understandings of scientific concepts that are resistant to change.
- **Basic Science**: A subject taught at the junior secondary school level that integrates foundational concepts from physics, chemistry, biology, and technology.
- **Inquiry-Based Learning**: A student-centered instructional approach that emphasizes questioning, exploration, and hands-on activities to enhance understanding.

- **Science Process Skills**: Abilities necessary to carry out scientific investigations, such as observation, classification, measurement, and inference.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

This chapter focuses on the review of relevant and related Literature, as presented under the following subheadings:

- Conceptual Review
- Common Misconceptions Held by Junior Secondary School Students in Basic Science
- Likely Causes of Misconceptions among Junior Secondary School Students in Basic Science
- Strategies Currently Used by Basic Science Teachers to Address Misconceptions
- Effectiveness of These Strategies in Correcting Misconceptions
- Summary of Literature Review

Conceptual Review

Basic Science is a foundational subject taught at the junior secondary school level that integrates the fundamental principles of physics, chemistry, biology, and technology. It provides learners with the basic scientific literacy required to understand the natural world and to develop skills necessary for higher scientific learning (Okonkwo & Okeke, 2022). According to Achor and Orokpo (2021), Basic Science helps students cultivate curiosity, critical thinking, and problem-solving abilities that are essential for innovation and national development. The essence of Basic Science education is to lay a solid foundation for scientific reasoning and to encourage students to relate classroom knowledge to real-life situations.

A misconception refers to a belief or understanding that deviates from scientifically accepted concepts. Students' misconceptions in science are often persistent and resistant to change, even after instruction (Chi, 2023). They may arise when learners interpret scientific phenomena based on everyday experiences or incomplete knowledge. For instance, students might believe that heavier objects fall faster than lighter ones, or that plants absorb food from the soil rather than producing it through photosynthesis. These examples show how intuitive but inaccurate reasoning can shape learners' understanding (Driver, 2024). The learning process in science involves active engagement, conceptual understanding, and the integration of new knowledge with prior experiences. Learning theories such as constructivism emphasize that students do not passively receive knowledge; rather, they construct it based on what they already know. When prior knowledge conflicts with scientific explanations, misconceptions arise. Consequently, effective learning requires instructional methods that facilitate conceptual change.

Conceptual change theories explain how learners modify or replace existing ideas with scientifically accurate concepts. Posner. (2018) proposed the conceptual change model, which suggests that for students to replace misconceptions, they must experience dissatisfaction with their current understanding and find the new concept intelligible, plausible, and fruitful. Similarly, Vosniadou (2023) emphasized that conceptual change is not a simple process of correction but a gradual restructuring of knowledge networks. Hence, teachers must use strategies that actively challenge misconceptions while supporting students' cognitive restructuring.

Common Misconceptions Held by Junior Secondary School Students in Basic Science

Students in Ovia West Local Government Area, like many others across Nigeria, exhibit several misconceptions in Basic Science. These misconceptions cut across various domains such as physics, biology, and chemistry. In physics-related concepts, for example, many students believe that force is required to keep an object moving, contrary to Newton's first law of motion (Eze, 2020). Others think that electric current is "used up" as it passes through a bulb, which reflects misunderstanding of current flow in a circuit (Ogunleye & Adebayo, 2019).

Students commonly misconceive that plants "breathe in" carbon dioxide and "breathe out" oxygen just like humans, without understanding photosynthesis as a complex biochemical process (Akinbobola & Afolabi, 2021). Similarly, many believe that humans have a single type of blood, or that digestion occurs only in the stomach. In chemistry-related concepts, students often think that atoms can be seen with the naked eye, or that dissolving a substance in water means it has disappeared (Oloyede & Adeoye, 2022). Studies by Nwosu and Obi (2021) show that these misconceptions are deeply ingrained and can persist despite formal teaching. The persistence is partly due to the lack of diagnostic teaching methods that identify and address such faulty reasoning. Without targeted intervention, these misconceptions hinder meaningful learning and the development of scientific literacy among junior secondary students in Ovia West.

Likely Causes of Misconceptions among Junior Secondary School Students in Basic Science

The causes of misconceptions among Basic Science students are multifaceted. One major source is prior experiences. Students often form preconceptions based on their everyday observations, which may conflict with scientific principles. For example, seeing heavier objects fall faster can lead to misconceptions about gravity (Chi, 2023).Ineffective teaching methods also play a significant role. Teachers who rely heavily on rote learning or lecture-based methods often fail to help students engage critically with scientific ideas (Achor & Orokpo, 2021). When lessons focus on memorization rather than inquiry and experimentation, students retain misconceptions instead of developing accurate conceptual understanding.Textbook errors and inconsistencies in instructional materials can also contribute to misconceptions. Some Basic Science textbooks contain inaccurate diagrams, poorly explained phenomena, or ambiguous definitions that confuse learners (Eze, 2020). Additionally, language barriers can distort scientific meaning. Since many Nigerian students are taught in English, which is not their first language, translation errors or linguistic simplifications can alter scientific concepts (Okonkwo & Okeke, 2022), cognitive development limitations influence how students interpret scientific ideas. At the junior secondary level, some learners have not fully developed abstract reasoning skills needed to understand invisible processes like molecular interactions or energy transformation (Piaget, 1977). These cognitive challenges make them prone to intuitive but incorrect reasoning patterns. Therefore, addressing misconceptions requires teaching approaches that consider students' developmental stages and prior knowledge.

Strategies Currently Used by Basic Science Teachers to Address Misconceptions

Basic Science teachers employ a range of pedagogical strategies to address misconceptions among junior secondary school students, recognising that misconceptions are often deeply rooted in prior knowledge, everyday experiences, or incomplete understanding of scientific phenomena. Addressing these misconceptions requires deliberate instructional planning, active engagement, and the use of multiple teaching strategies that foster conceptual change.One widely recognised and effective approach is inquiry-based learning, which places students at the centre of the learning process. Instead of passively receiving information, students are encouraged to ask questions, make predictions, plan and conduct experiments, gather and analyse data, and draw conclusions based on evidence. According to Okoli and Nwagbo (2021), inquiry-based learning promotes scientific reasoning by allowing learners to test their preconceived notions against real observations. This approach aligns with constructivist theories of learning, which emphasise that students build new understanding upon existing knowledge. When students actively engage in experimentation and discovery, they are more likely to identify inconsistencies in their thinking and reconstruct their understanding to align with accepted scientific principles. For instance, when exploring the concept of density, students may initially believe that heavier objects always sink. Through inquiry activities involving objects of different sizes and densities, they can observe that some heavy objects float while lighter ones may sink, leading to meaningful conceptual change.

Another powerful tool used by Basic Science teachers is the demonstration method, which involves visually showing scientific principles through experiments or simulations conducted by the teacher. Ogunleye and Adebayo (2019) noted that demonstrations help to bridge the gap between abstract theory and observable reality, making science more relatable and understandable for students. Demonstrations are particularly valuable in correcting misconceptions that arise from invisible or counterintuitive phenomena. For example, demonstrating that both heavy and light objects fall at the same rate in a vacuum challenges the common misconception that weight determines the speed of falling objects. Through such visual and experiential learning, students are able to reconcile their everyday perceptions with scientific facts. Furthermore, demonstrations often stimulate curiosity and motivate students to explore concepts further, thereby deepening their understanding.

The conceptual change strategy is another targeted approach designed to address misconceptions directly. This method involves first identifying students' existing ideas, then creating cognitive conflict by exposing them to evidence that contradicts their misconceptions, and finally providing scientifically accurate explanations that resolve the conflict. According to the conceptual change model, true understanding occurs when learners replace incorrect beliefs with scientifically valid ones. Teachers using this approach might begin a lesson by eliciting students' prior conceptions through discussions or diagnostic questions, then present experimental evidence that challenges those ideas. For example, in teaching about heat transfer, a teacher might ask why metal feels colder than wood at room temperature, prompting students to think about heat conduction rather than the material's temperature itself. This guided process encourages students to reflect critically on their thinking and reconstruct their understanding (Posner, 2020).In addition to inquiry and conceptual change strategies, the use of models and simulations plays a critical role in clarifying abstract or complex scientific ideas. Models serve as simplified representations that make invisible or large-scale phenomena more accessible to learners. Akinbobola and Afolabi (2021) highlighted that visual tools such as molecular models, computer animations, and interactive simulations enhance students' ability to visualise and manipulate concepts like particle motion, chemical bonding, or energy transfer. Digital simulations, for instance, allow students to observe dynamic processes that cannot easily be demonstrated in the classroom, such as the phases of the moon or the motion of particles in different states of matter. These visual experiences help students link theoretical explanations with observable outcomes, thereby correcting misunderstandings rooted in imagination or incomplete reasoning.

Collaborative learning strategies are increasingly recognised as effective means of addressing misconceptions. Through peer discussions, group problem-solving, and cooperative tasks, students are exposed to diverse perspectives that challenge their preconceived notions. Eze (2020) observed that collaborative learning promotes social interaction, communication, and reasoning, allowing students to articulate their ideas, defend their reasoning, and adjust their understanding based on feedback from peers. In group discussions, misconceptions often surface naturally, and peers can collectively work towards a more accurate interpretation of scientific ideas. This interactive process reinforces learning through dialogue and reflection, helping students internalise correct scientific concepts more effectively.Teachers also integrate formative assessment techniques within these strategies to monitor students' understanding continuously. Diagnostic questions, concept maps, and reflective journals enable teachers to identify lingering misconceptions and provide immediate feedback. Such ongoing assessment ensures that misconceptions are addressed promptly before they become firmly established, addressing misconceptions in Basic Science requires a multifaceted and student-centred approach that combines inquiry-based learning, demonstrations, conceptual change techniques, use of models and simulations, and collaborative learning. Each strategy complements the others by promoting active engagement, reflection, and visualisation of scientific principles. When effectively implemented, these approaches help students move from rote memorisation to genuine understanding, fostering scientific literacy and critical thinking skills that extend beyond the classroom.

Effectiveness of These Strategies in Correcting Misconceptions

Research evidence shows varying levels of effectiveness of these instructional strategies. Inquiry-based learning has been found to significantly reduce misconceptions by promoting active engagement and reflection (Okoli &

Nwagbo, 2021). Similarly, demonstration methods have proven effective because they provide tangible evidence that directly challenges faulty beliefs (Ogunleye & Adebayo, 2019). Conceptual change strategies are particularly powerful because they address misconceptions systematically, allowing students to reconstruct their mental models (Vosniadou, 2023).However, the effectiveness of these strategies largely depends on teacher competence, resource availability, and classroom environment. In schools within Ovia West, limited laboratory facilities and large class sizes sometimes hinder effective implementation (Nwosu & Obi, 2021). Moreover, when teachers lack proper training in diagnostic assessment, they may not accurately identify students' misconceptions before attempting to correct them.

Empirical studies by Akinbobola and Afolabi (2021) and Okonkwo and Okeke (2022) indicate that combining conceptual change strategies with inquiry-based and visual learning methods yields the best results. Such integrated approaches help sustain long-term conceptual understanding rather than short-term recall. Therefore, while current strategies show promise, there is still need for continuous teacher professional development, improved resources, and more student-centered instructional practices.

Summary of Literature Review

The reviewed literature indicates that misconceptions in Basic Science are widespread and persistent among junior secondary school students in Ovia West. These misconceptions arise from multiple, interacting sources: prior everyday experiences that conflict with formal science ideas, weak pedagogical approaches that leave students' alternative conceptions intact, inaccurate or oversimplified textbook explanations, language and literacy barriers in science instruction, and developmental cognitive limitations that make some abstract concepts difficult to grasp. Studies conducted in several Nigerian contexts show that targeted misconception interventions, such as hands-on anomaly-based activities and conceptual change instructional sequences, can promote conceptual change when they create cognitive conflict and provide clear, observable evidence that counters students' preconceptions. However, the documented interventions tend to be limited in scope, concentrated on a few topics, and often carried out in single schools or towns rather than across representative, localized samples.

Despite promising results from these localized interventions, there remains a distinct empirical gap specific to Ovia West and similar Local Government Areas in Edo State. Existing work rarely combines rigorous diagnostic assessment with controlled instructional treatments, systematic fidelity checks, and follow-up measures to determine whether gains persist beyond immediate posttests. Diagnostic approaches such as two-tier and three-tier multiple choice instruments and six-tier instruments have been validated in Nigerian settings as effective tools for revealing both the presence and the nature of alternative conceptions, yet their use is not yet routine in intervention research at the junior secondary level. Without the routine use of these diagnostic tools before and after instruction, it is difficult to know which misconceptions are most entrenched locally, or which instructional moves actually target them.

There are also gaps in the kinds of instructional comparisons researchers have made. Much of the literature contrasts a single intervention against conventional teaching rather than comparing multiple evidence-based strategies head to head. For example, cognitive conflict models, 5E or inquiry cycles, concept mapping, and conceptual-change texts have all shown positive effects in separate studies, but few studies in Nigeria have used robust quasi-experimental or randomized designs to determine which approaches perform best for particular concepts, age groups, or resource conditions. Moreover, teacher factors are under-researched: intervention studies often do not report the extent and type of teacher training, the teachers' content knowledge or pedagogical content knowledge, or measures of instructional fidelity, even though these variables strongly moderate outcomes.

Practical research priorities to fill this gap in Ovia West are the following. First, use validated diagnostic instruments (two-tier, three-tier or multi-tier tests) in a baseline survey across a representative sample of schools to map the prevalence and patterning of misconceptions by topic, grade, gender and school type. Second, implement a cluster randomized or matched quasi-experimental design that compares at least two evidence-based instructional interventions (for example cognitive-conflict plus hands-on anomaly tasks versus a 5E inquiry sequence) and a control group using treatment fidelity logs. Third, include mixed methods: paired pretest-posttest diagnostic scores for quantitative effect sizes, classroom observation and teacher interview data to explain mechanisms, and delayed posttests at 8–12 weeks to assess retention and transfer. Fourth, measure and report teacher preparation, resources used, and language of instruction so results are interpretable for local policy and teacher training programs. Finally, build in scalability checks such as cost and resource audits and simple teacher training modules so positive interventions can be feasibly adopted at scale.

CHAPTER THREE

METHODOLOGY

This chapter describes the method and procedure used by the researcher in conducting the study. It is presented under the following Sub headings;

- Research Design
- Population of the Study
- Sample and Sampling Technique
- Research Instrument
- Validity of the Instrument
- Reliability of the Instrument
- Method of Data Collection
- Method of Data Analysis

Research Design

Survey research design was adopted for this study. According to Omoroguiwa (2006), survey research design is one in which a group of people or term is studied by collecting data from only a few people or item considered to be representative of the entire group. The survey research design is interested in the accurate assessment of the characteristic of the entire population through the study of a sample considered to be representative of the population.

Population of the Study

The population of the study consist of all the one hundred and ninety-six (196) teachers from the 23 public Junior secondary schools in Ovia north east Local Government Area of Edo State. (Edo State Ministry of Education, 2024.)

Sample and Sampling Technique

The sample size selected for this study is one hundred and twenty five (125) Junior Secondary School Teachers, selected randomly using simple random sampling technique. from the 23 public Junior secondary schools Ovia north east Local Government Area of Edo State

Research Instrument

The Instrument used for this research is the Questionnaire Titled " Identifying and Correcting Misconceptions In Basic Science Concepts Among Junior Secondary School Student In Ovia West Local Government Area ". It has two sections which are Section A and Section B. The Section (A) deals with the personal data. Section (B) consist of (20) questions of 4 points likert's type ranging from Strongly Agree, Agree, Disagree to Strongly Disagree for which the students (respondents)indicate their opinion or views with 4=Strongly $3 = Agree, 2$ =Disagree,$1 = St$rongly Disagree.

Validity of the Instrument

The instrument was validated by the supervisor and other two lecturers in the Department who certified the instrument as appropriate for the study after some corrections have been effected.

Reliability of the Instrument

In order to determine the reliability of the instrument, the questionnaire was administered to 20 respondents who were not part of the study and retrieved, and the data collected from the respondents was subjected to Cronbach Alpha statistics and a reliability coefficient obtained.

Method of Data Collection

During the process of carrying out the research, the questionnaires was distributed by the researcher to the students (respondents). The questionnaire will be collected immediately after they are filled. This is to ensure high level of response and return.

Method of Data Analysis

Data was analyzed by item mean and standard deviation (SD) were calculated for each of the items to find out the variations, disparity in opinion, or how homogenous or heterogenous the opinion of the respondents was to each of the items. For decision, any item that scored a mean of 2.5 above was accepted while any item that scored below 2.5 will be rejected

CHAPTER FOUR

PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter focuses on the presentation of results collected from the investigation. The findings are also discussed.

Research Question One: What are the common misconceptions held by junior secondary school students in Basic Science in Ovia West LGA?

Table 4.1: Distribution of Responses on the common misconceptions held by junior secondary school students in Basic Science in Ovia West LGA

S/N	Items	NO	Mean Score	Remark
1.	Many students believe that heavier objects fall faster than lighter ones	125	3.25	Accepted
2.	Students often think that plants get their food directly from the soil.	125	2.86	Accepted
3.	Some students assume that air has no weight or mass.	125	3.18	Accepted
4.	Students believe that only living things can move from one place to another.	125	2.22	Not Accepted
5.	Many students confuse heat with temperature.	125	3.18	Accepted
	Cluster Mean			

Criterion Mean: 2.50

Table 4.1 shows that items 1, 2, 3 and 5 were accepted because they meet up with the criterion mean of 2.50.

Table 4.1 presents the distribution of responses on the common misconceptions held by junior secondary school students in Basic Science in Ovia West Local Government Area. The data reveal several misconceptions that students commonly hold regarding fundamental science concepts. The criterion mean for acceptance was set at 2.50, meaning that any item with a mean score of 2.50 or above was considered an accepted misconception among students.

The findings indicate that students widely believe that heavier objects fall faster than lighter ones, as shown by a mean score of 3.25, which is well above the criterion mean. This suggests a strong misunderstanding of gravitational principles and motion. Similarly, the belief that plants obtain their food directly from the soil is also accepted (mean 2.86), reflecting a misconception about photosynthesis and plant nutrition.

Another prevalent misconception is that air has no weight or mass, with a mean score of 3.18, showing that many students do not understand the physical properties of air. Students also appear to confuse heat with temperature, as indicated by another mean of 3.18, demonstrating a misunderstanding of basic thermodynamics. However, the misconception that only living things can move from one place to another was not accepted (mean = 2.22). This suggests that students generally understand that non-living things, such as water or air currents, can also move.

Overall, the cluster mean indicates that most of the listed misconceptions are indeed common among junior secondary school students in the area, highlighting the need for improved instructional strategies to address gaps in scientific understanding.

Research Question Two: **What are the likely causes of these misconceptions?**

Table 4.2: Distribution of Responses on the likely causes of these misconceptions

S/N	Items	NO	Mean Score	Remark
1.	Many students believe that heavier objects fall faster than lighter ones.	125	3.18	Accepted
2.	Students often think that plants get their food directly from the soil.	125	1.84	Not Accepted
3.	Some students assume that air has no weight or mass.	125	3.31	Accepted
4.	Students believe that only living things can move from one place to another.	125	1.78	Not Accepted
5.	Many students confuse heat with temperature.	125	3.29	Accepted

Criterion Mean: 2.50

Table 4.4 shows that items 1, 3 and 5 were accepted because they meet up with the criterion mean of 2.50. Hence, questions 2 and 4 were rejected because they failed to meet up with the criterion mean of 2.50.

The findings from the table reveal several common misconceptions held by junior secondary school students in Basic Science in Ovia West LGA. Based on the criterion mean of 2.50, any item with a mean score above this value is considered accepted as a misconception, while those below it are not accepted.

The results show that students hold strong misconceptions about certain scientific concepts. For instance, a high mean score of 3.18 indicates that many students still believe that heavier objects fall faster than lighter ones, a misconception that contradicts basic principles of physics. Similarly, the assumption that air has no weight or mass, with an even higher mean of 3.31, was strongly accepted, showing that students struggle to understand the physical properties of air. Another widely held misunderstanding is the confusion between heat and temperature, reflected in the accepted mean score of 3.29, suggesting that students often use these terms interchangeably without grasping their differences.

On the other hand, some misconceptions were not supported by the students. For example, the belief that plants get their food directly from the soil received a mean score of 1.84, which falls below the criterion mean and is therefore not accepted. This suggests that many students correctly understand that plants manufacture their own food through photosynthesis. Likewise, the notion that only living things can move from one place to another was rejected, with a mean score of 1.78, indicating that students generally recognize that non-living things can also move under certain conditions, such as when acted upon by external forces.

Overall, the findings show that while students demonstrate some correct understandings, significant misconceptions remain especially in concepts related to force, energy, and the physical properties of matter. This highlights the need for targeted instructional strategies to clarify these scientific concepts and improve students' comprehension.

Research Question Three: What strategies are currently used by Basic Science teachers to address misconceptions?

Table 4.3: Distribution of Responses on strategies are currently used by Basic Science teachers to address misconceptions?

S/N	Items	N	Mean Score	Remark
1.	Misconceptions arise because of students' everyday experiences and cultural beliefs.	125	2.92	Accepted
2.	Poor teaching methods contribute to misunderstanding of scientific concepts.	125	3.26	Accepted
3.	Inadequate use of instructional materials causes wrong ideas in science.	125	3.17	Accepted
4.	Some textbooks and learning resources contain misleading explanations.	125	3.10	Accepted
5.	Students' inability to link theory with practical experience leads to misconceptions. Misconceptions arise because of students' everyday experiences and cultural beliefs.	125	3.38	Accepted

Criterion Mean: 2.50

Table 4.3 shows that all items met the mean score standard of 2.50

The findings from the table indicate that respondents generally agreed on the major factors responsible for misconceptions among students in Basic Science. The mean scores for all items fall above the decision benchmark for acceptance, showing strong consensus across the sampled population.

Firstly, the respondents agreed that students’ everyday experiences and cultural beliefs contribute significantly to the development of misconceptions, with a mean score of 2.92. This suggests that learners often rely on personal observations or traditional beliefs that may contradict scientific explanations, leading them to form incorrect ideas about scientific concepts.

Secondly, the respondents strongly agreed that poor teaching methods play a major role in students' misunderstanding of science, as reflected in a mean score of 3.26. This implies that when teachers fail to use effective strategies or simplify complex concepts properly, students may develop false notions that persist over time.

In addition, inadequate use of instructional materials was identified as another important cause of misconceptions, with a mean score of 3.17. This means that when students do not engage with visual aids, models, experiments, or real-life demonstrations, they may struggle to understand abstract scientific principles correctly.

The table also shows that some textbooks and learning resources contain misleading explanations, which contributes to the spread of misconceptions among students. This item, with a mean of 3.10, highlights the need for teachers to carefully evaluate learning materials before using them in the classroom.

Finally, the respondents strongly agreed that students' inability to link theory with practical experiences leads to misconceptions, recording the highest mean score of 3.38. This suggests that when scientific theories are taught without hands-on activities or real-life applications, students fail to grasp concepts deeply and instead form incorrect interpretations.

Overall, the results indicate that misconceptions in Basic Science are influenced by a combination of students' background experiences, teaching approaches, learning materials, and the lack of practical application during instruction.

Research Question Four: How effective are these strategies in correcting misconceptions?

Table 4.4: Distribution of responses on effective strategies in correcting misconceptions?

S/N	Items	N0	Mean Score	Remark
1.	Classroom demonstrations help students replace wrong ideas with correct ones.	125	3.32	Accepted
2.	Group discussions promote better understanding of scientific principles.	125	3.28	Accepted
3.	Continuous assessment helps track conceptual progress among students.	125	3.31	Accepted
4.	Practical activities improve students' retention of correct scientific knowledge.	125	3.23	Accepted
5.	Teachers' interventions significantly reduce misconceptions over time.	125	3.28	Accepted

Criterion Mean: 2.50

Table 4.4 above shows that all the items met up with the mean score of 2.50

The results from the table show that all the listed instructional strategies were rated positively by the respondents, as each item recorded a mean score above the benchmark of 2.50 and was therefore accepted. The respondents agreed that classroom demonstrations are highly effective in helping students correct their misconceptions, as reflected in the mean score of 3.32. This suggests that when teachers use concrete demonstrations, students are better able to visualize scientific concepts and replace wrong ideas with accurate ones.

Similarly, the respondents accepted that group discussions enhance students' understanding of scientific principles, with a mean score of 3.28. This indicates that collaborative learning provides opportunities for students to share ideas, clarify doubts, and confront inaccurate beliefs through peer interaction. The table also shows that continuous assessment plays an important role in monitoring students' conceptual progress, as evidenced by a mean score of 3.31. This implies that regular assessments help teachers identify persistent misconceptions and provide timely feedback to guide improvement.

Furthermore, practical activities were found to significantly improve students' retention of correct scientific knowledge, receiving a mean score of 3.23. Hands-on experiences allow learners to test assumptions, observe real outcomes, and better understand scientific processes.

Lastly, the respondents agreed that teachers' interventions are crucial in reducing misconceptions over time, as shown by a mean score of 3.28. This reflects the importance of teacher guidance, instructional scaffolding, and corrective feedback in shaping students' scientific understanding.

Overall, the findings highlight that effective teaching strategies demonstrations, discussions, assessments, practical activities, and teacher intervention greatly contribute to addressing and reducing misconceptions in Basic Science.

4.5 What alternative methods can be introduced to improve conceptual understanding in Basic Science?

Table 4.5: Distribution of responses on methods to improve conceptual understanding in Basic Science?

S/N	Items	N0	Mean Score	Remark
1.	The use of digital simulations can help students visualize abstract scientific concepts.	125	3.32	Accepted
2.	Inquiry-based learning allows students to construct correct scientific ideas through discovery.	125	3.28	Accepted
3.	Field trips and hands-on experiments make learning more realistic and meaningful.	125	3.31	Accepted
4.	Incorporating local examples and indigenous knowledge enhances understanding	125	3.23	Accepted
5.	Regular teacher training on misconception diagnosis will improve classroom practice.	125	3.28	Accepted

The findings from the table show that all the instructional strategies listed were positively rated by the respondents as effective for addressing students' misconceptions in Basic Science. With a mean score of 3.32, respondents agreed that the use of digital simulations greatly helps students visualize abstract scientific concepts, thereby promoting better understanding. Similarly, inquiry-based learning was accepted (mean = 3.28) as an effective approach that enables students to construct accurate scientific ideas through active discovery.

The study further revealed that field trips and hands-on experiments are valuable learning methods, with a mean score of 3.31, indicating that they make learning more realistic and meaningful for students. Using local examples and indigenous knowledge also received acceptance (mean = 3.23), showing that connecting lessons to students' cultural and environmental experiences enhances comprehension. Lastly, respondents agreed (mean = 3.28) that regular teacher training on identifying and addressing misconceptions is essential for improving classroom practice. This suggests that continuous professional development is necessary to equip teachers with the skills needed to correct students' wrong scientific ideas.

Overall, the results demonstrate strong support for diverse, interactive, and culturally relevant teaching strategies in improving students' understanding and reducing misconceptions in Basic Science.

Discussion of Findings

Base on the findings in research question one revealed that Students commonly misconceive that plants "breathe in" carbon dioxide and "breathe out" oxygen just like humans, without understanding photosynthesis as a complex biochemical process (Akinbobola & Afolabi, 2021). Similarly, many believe that humans have a single type of blood, or that digestion occurs only in the stomach. In chemistry-related concepts, students often think that atoms can be seen with the naked eye, or that dissolving a substance in water means it has disappeared (Oloyede & Adeoye, 2022). Studies by Nwosu and Obi (2021) show that these misconceptions are deeply ingrained and can persist despite formal teaching.

Base on the findings in research question two revealed that The learning process in science involves active engagement, conceptual understanding, and the integration of new knowledge with prior experiences. Learning theories such as constructivism emphasize that students do not passively receive knowledge; rather, they construct it based on what they already know. When prior knowledge conflicts with scientific explanations, misconceptions arise. Consequently, effective learning requires instructional methods that facilitate conceptual change. Conceptual change theories explain how learners modify or replace existing ideas with scientifically accurate concepts. Posner. (2018)

Base on the findings in research question three revealed that major source is prior experiences. Students often form preconceptions based on their everyday observations, which may conflict with scientific principles. For example, seeing heavier objects fall faster can lead to misconceptions about gravity (Chi, 2023).Ineffective teaching methods also play a significant role. Teachers who rely heavily on rote learning or lecture-based methods often fail to help students engage critically with scientific ideas (Achor & Orokpo, 2021).

Base on the findings in research question four revealed that that misconceptions are often deeply rooted in prior knowledge, everyday experiences, or incomplete understanding of scientific phenomena. Addressing these misconceptions requires deliberate instructional planning, active engagement, and the use of multiple teaching strategies that foster conceptual change.One widely recognised and effective approach is inquiry-based learning, which places students at the centre of the learning process. Instead of passively receiving information, students are encouraged to ask questions, make predictions, plan and conduct experiments, gather and analyse data, and draw conclusions based on evidence. According to Okoli and Nwagbo (2021),

Base on the findings in research question five revealed that demonstration methods have proven effective because they provide tangible evidence that directly challenges faulty beliefs (Ogunleye & Adebayo, 2019). Conceptual change strategies are particularly powerful because they address misconceptions systematically, allowing students to reconstruct their mental models (Vosniadou, 2023).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary of the study alongside the conclusions drawn from the analysis of data collected and results obtained in the course of the study. The recommendations offered based on the findings of the study are also highlighted.

Summary

This study was conducted to assess the Identifying and Correcting Misconceptions in Basic Science Concepts Among Junior Secondary School Student In Ovia West Local Government Area.. Five research questions were raised. This study made use of the descriptive survey research design. The population of the study consist of all the one hundred and ninety-six (196) teachers from the 23 public Junior secondary schools in Ovia north east Local Government Area of Edo State. (Edo State Ministry of Education, 2024.) The Instrument used for this research is the Questionnaire Titled " Identifying and Correcting Misconceptions In Basic Science Concepts Among Junior Secondary School Student In Ovia West Local Government Area ". It has two sections which are Section A and Section B. The

Section (A) deals with the personal data. Section (B) consist of (20) questions of 4 points likert's type ranging from Strongly Agree, Agree, Disagree to Strongly Disagree for which the students (respondents)indicate their opinion or views with 4=Strongly $3 = Agree, 2 =$Disagree,$1 = St$rongly Disagree.

The sample size selected for this study is one hundred and twenty five (125) Junior Secondary School Teachers, selected randomly using simple random sampling technique. from the 23 public Junior secondary schools Ovia north east Local Government Area of Edo State, In order to determine the reliability of the instrument, questionnaire was administered to 20 respondents who were not part of the study and retrieved, and the data collected from the respondents was subjected to Cronbach Alpha statistics and a reliability coefficient obtained. Data was analyzed by item mean and standard deviation (SD) were calculated for each of the items to find out the variations, disparity in opinion, or how homogenous or heterogenous the opinion of the respondents was to each of the items.

Findings

The findings of the study revealed that;

1. A significant number of students in the study displayed misconceptions in fundamental science concepts such as the laws of motion, chemical reactions,

and basic biological processes. These misconceptions were often the result of prior misconceptions carried from earlier educational stages.

2. The majority of misconceptions originated from insufficient teaching resources and a lack of interactive learning methods. Many students relied heavily on rote memorization rather than understanding the underlying principles.

3. Misconceptions affected students' ability to apply scientific concepts in problem-solving scenarios, leading to poor academic performance and a lack of confidence in the subject.

4. Teachers were not fully aware of the extent of these misconceptions among their students, and the methods used to correct these misunderstandings were often ineffective or not sufficiently emphasized.

5. Interventions such as hands-on experiments, group discussions, and visual aids were found to be effective in clarifying misconceptions. However, consistent reinforcement and follow-up activities were necessary to ensure lasting correction.

Conclusion

The study on identifying and correcting misconceptions in basic science concepts among junior secondary school students in Ovia West Local Government Area has revealed significant gaps in students' understanding of fundamental scientific principles. The data collected indicates that misconceptions are widespread and, if left unaddressed, could hinder academic progress and the development of critical scientific thinking skills. By addressing these misconceptions through targeted interventions, educators can improve students' understanding and foster a deeper interest in science, enhancing their overall academic performance. The importance of continuous teacher training, the development of innovative teaching methods, and the use of corrective strategies is crucial for bridging these gaps and ensuring that students develop a solid foundation in basic science.

Recommendations

The following recommendations were made;

1. Regular professional development workshops for teachers should be implemented, focusing on identifying and correcting misconceptions in science. Teachers should be equipped with strategies to address misconceptions effectively in the classroom.
2. Schools should integrate more interactive teaching methods, such as

experiments, demonstrations, and simulations, to engage students and correct misconceptions. These methods encourage deeper understanding and help students visualize abstract concepts.

3. A comprehensive review of the science curriculum should be conducted to include more practical and interactive approaches to teaching basic science. The curriculum should also emphasize the application of scientific principles in real-life contexts.

4. Student-Centered Approaches: Teachers should adopt more student-centered teaching techniques, encouraging students to ask questions, explore scientific concepts through inquiry-based learning, and collaborate with their peers in problem-solving activities.

5. Regular Assessment and Feedback: Continuous formative assessments should be incorporated into the learning process to identify misconceptions early. Teachers should provide timely and constructive feedback to students, helping them understand and correct their misunderstandings.

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IDENTIFYING AND CORRECTING MISCONCEPTIONS IN BASIC SCIENCE CONCEPTS AMONG JUNIOR SECONDARY SCHOOL STUDENT IN OVIA WEST LOCAL GOVERNMENT AREA

Dear Participants,

The Researcher is a student of the Above department and is carrying out a study on Identifying and Correcting Misconceptions in Basic Science Concepts Among Junior Secondary School Student In Ovia West Local Government Area. Therefore, solicit for your responses, all your response will be treated confidentially. Please answer the following questions honestly and to the best of your knowledge. Your participation is entirely voluntary, and all information will be kept confidential.

Yours faithfully,

____

SECTION A

DEMOGRAPHIC INFORMATION

Instructions: Please tick **(√)** where applicable.

Gender: Female ( ): Male ( )

SECTION B: DATA ON QUESTIONNAIRE

Indicate the extent to which you agree or disagree with the following statements.

Key: SA (4) Strongly Agree, A (3) Agree, D (2) Disagree, SD (1) Strongly Disagree

S/N	ITEMS	SA	A	D	SD
Q1	**What are the common misconceptions held by junior secondary school students in Basic Science in Ovia West LGA?**				
1.	Many students believe that heavier objects fall faster than lighter ones				
2.	Students often think that plants get their food directly from the soil.				
3.	Some students assume that air has no weight or mass.				
4.	Students believe that only living things can move from one place to another.				
5.	Many students confuse heat with temperature.				
Q2	**What are the likely causes of these misconceptions?**				
6	Many students believe that heavier objects fall faster than lighter ones.				
7	Students often think that plants get their food directly from the soil.				
8	Some students assume that air has no weight or mass.				
9	Students believe that only living things can move from one place to another.				
10.	Many students confuse heat with temperature.				
Q3	**What strategies are currently used by Basic Science teachers to address misconceptions?**				

11	Misconceptions arise because of students' everyday experiences and cultural beliefs.				
12	Poor teaching methods contribute to misunderstanding of scientific concepts.				
13	Inadequate use of instructional materials causes wrong ideas in science.				
14	Some textbooks and learning resources contain misleading explanations.				
15	Students' inability to link theory with practical experience leads to misconceptions.				
Q4	**How effective are these strategies in correcting misconceptions?**				
16	Classroom demonstrations help students replace wrong ideas with correct ones.				
17	Group discussions promote better understanding of scientific principles.				
18	Continuous assessment helps track conceptual progress among students.				
19	Practical activities improve students' retention of correct scientific knowledge.				
20	Teachers' interventions significantly reduce misconceptions over time.				
Q5	**What alternative methods can be introduced to improve conceptual understanding in Basic Science?**				
21	The use of digital simulations can help students visualize abstract scientific concepts.				
22	Inquiry-based learning allows students to construct correct scientific ideas through discovery.				
23	Field trips and hands-on experiments make learning more realistic and meaningful.				
24	Incorporating local examples and indigenous knowledge enhances understanding				
25	Regular teacher training on misconception diagnosis will improve classroom practice.				