**EFFECT OF CONTEXTUAL BASED INSTRUCTION ON SECONDARY SCHOOL STUDENTS ATTITUDE AND ACADEMIC ACHIEVEMENT TOWARDS CHEMISTRY**

**ABSTRACT**

This study investigates the effect of contextual-based instruction on secondary school students' attitudes and academic achievement in Chemistry. Adopting a quasi-experimental design, the study involved 40 students, with a slightly higher representation of females, split into experimental and control groups. The experimental group received contextual-based instruction, linking Chemistry concepts to real-life applications, while the control group was taught through traditional methods. The objectives were to assess the impact of contextual-based instruction on academic achievement, student attitudes, and gender differences and to identify potential challenges and opportunities associated with this instructional approach. Data were collected through pre- and post-tests on academic achievement and a questionnaire measuring student attitudes toward Chemistry. Analysis using ANCOVA revealed significant differences in both academic achievement and attitude scores, with the experimental group outperforming the control group. This suggests that contextual-based instruction enhances student understanding, interest, and engagement in Chemistry. Additionally, no significant gender-based differences were observed, indicating that the instructional approach benefits all students equally. However, a notable challenge identified was the need for sufficient resources to effectively implement contextual learning in the classroom. The findings align with existing research that supports contextual-based instruction as an effective method for improving student outcomes in science education. The study concludes that contextual-based instruction not only fosters a positive learning attitude but also enhances academic performance, suggesting it as a valuable strategy for secondary education. Recommendations include greater support for teachers in delivering contextual instruction, resource allocation, and further research to address implementation challenges and long-term impacts on student career choices in STEM fields.

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**CHAPTER ONE**

**INTRODUCTION**

* 1. **Background to the study**

Chemistry education plays a crucial in preparing student for the future careers in science, technology, engineering, and mathematics (STEM) fields. STEM is one of the ultimate things behind the development of the nation. Proper research and coherent application of STEM can speed up the growth of economy up to a great content (Okeke, 2018). However, in Nigeria secondary school student often struggles with understanding and appreciating chemistry due to various factors such as abstract concept and lack of relevance to their daily lives.

Chemistry education in Nigeria faces challenges with student often struggling to grasp abstract concept and find relevance in their learning experiences (Ugo & Ikwuka, 2023). Tradition instructional methods centred in memorization and rote learning have resulted in low academic achievement and disinterest among secondary school students (Aluko et al., 2016). The disconnect between the curriculum and student’s every day lives further exacerbates these challenges, highlighting the need for innovative pedagogical approaches that bridge this gap (Afolabi, 2014).

To address these challenges, there is a growing recognition of the need to reform chemistry education and adopt innovative teaching approaches that make the subject more accessible, engaging and relevant to student’s experience. Contextual based instruction hand emerged as a promising pedagogical approach that connects chemistry concept to real life situations or co text familiar to students.by contextualizing learning experiences, students can better understand the practical applications of chemistry and develop a deeper appreciation for the subject. Contextual teaching and learning approach are conception of teaching and learning that helps teacher relate subject matter context to real world situation and motivate student to make connections between knowledge and its application to their lives as family members, citizens and worker. The concept of contextual teaching and learning teaching emphasizes the full student activity both physically and mentally (Muchter et al., 2020). Traditionally instructional methods often fail to engage students effectively, leading to low academics achievement and negative attitudes towards the subject.This is alarming because chemistry being the basis for other science and technology subjects cannot be undermined especially in a technological undeveloped country such as Nigeria. From some research report, it thus appears student find the subjects a bit more abstract and difficult to understand. Edomwonyi Otu and Avaa (2011) aired the view of student who noted that chemistry is too broad for them to learn in a short time.it is obvious that student find chemistry hard to learn because of its very cramped syllabus. For instance, the senior secondary school one chemistry syllabus in Nigeria requires nine chapter for the student to master before there examination, a lot of chemistry teacher claimed that they have to make extra classes to be able to cover the syllabus, this situation is very stressful for both the teacher and the students.

Attitude is characteristic behaviour of a person towards and issue or event.it is said to be a phenomenal that is attained through learning, which guides the behaviour of an individual and causes subjectivity (Önen & Ulusoy, 2015). An individual can show positive negative attitude towards a particular subject or idea.in a classroom, teachers can identify attitude if student by observing their behaviour. student who tends to complete their homework’s and ask question in class can be said to have a positive mind set in learning chemistry. The attitude of Secondary school students towards chemistry is noted to be poor (Chiu, 2021) and can affect there academics negatively. There should be an immediate remedy to this down down turn. Researchers have agreed that in order to make positive attitude in learning chemistry, teachers have to make them see how chemistry is being used in there day to day life activities.

Contextual-based instruction significantly enhances the relevance and engagement of chemistry lessons for secondary school students. By linking academic content to real-life situations and students' personal experiences, this teaching approach makes learning more meaningful. For instance, when chemistry concepts are taught through practical applications like local environmental issues or everyday household products, students can better appreciate the importance and applicability of what they are learning. This relevance helps to capture students' interest and sustain their engagement, leading to a more positive attitude towards chemistry. Research has shown that when students perceive the subject matter as relevant to their lives, their motivation and enthusiasm for learning increase (Zuin et al., 2021).

Contextual-based instruction also promotes positive perceptions and self-efficacy among students (Hayes et al., 2020). When students encounter chemistry in contexts that they find familiar and understandable, they are more likely to develop confidence in their ability to learn and succeed in the subject. This increased self-efficacy is crucial because it directly influences students' attitudes towards chemistry. Students who believe they can excel in chemistry are more likely to develop a positive outlook and put in the effort required to master challenging concepts (Chen et al., 2020). This instructional approach, by reducing the abstract nature of chemistry and grounding it in tangible experiences, helps to build students' confidence and fosters a can-do attitude (Alam, 2020).

It is equally important for the teachers to be very innovative and evolving in the teaching approach in other to break chemistry really down for the student, student who really want to learn will have little problem gasping to the concept. However, weak and less enthusiasm student will find chemistry very dull and boring and this affect student attitude towards chemistry. This brings in the question of student’s attitude. Can a positive student attitude towards chemistry result in better student performance in the subject?

* 1. **Statement of Problem**

Poor attitude towards chemistry among secondary school students in Nigeria remains a significant barrier to academic success and future career aspirations.Contextual-based instruction, grounded in the works of researchers such as Alam (2020), Chen et al. (2020) involves connecting chemistry concept to real life situations and context relevant to Nigeria student’s experiences by integrating local examples, cultural practice, and practical applications into the curriculum, this approach aims to make chemistry more accessible, engaging and meaningful for the students (Ezeudu et al., 2020).

Through this project we seek the address the challenges faced in chemistry education, including low academics achievement and negative attitudes towards the subject. Drawing on research of Upahi et al (2020), the project aims to introduce innovative pedagogical strategies and curriculum reforms to enhance students understanding instruction, we aim to make chemistry education more relevant and relatable to Nigeria student lives, thereby fostering their interest and engagement in the subject.

**1.3 Objectives of the Study**

The objectives of this study are to:

1. Investigate the effects of contextual-based instruction on senior secondary school students' academic achievement in Chemistry.
2. Examine the impact of contextual-based instruction on students' attitudes towards Chemistry.
3. Identify the challenges and opportunities associated with implementing contextual-based instruction in secondary schools.
4. Assess the effects of gender on the achievement of students taught with contextual-based learning.

**1.4 Research Questions**

The study will address the following research questions:

1. What is the effect of contextual-based instruction on senior secondary school students' academic achievement in Chemistry?
2. How does contextual-based instruction influence students' attitudes towards Chemistry?
3. What challenges and opportunities are associated with the implementation of contextual-based instruction in secondary schools?
4. Does gender have a significant effect on the academic achievement of students taught using contextual-based instruction?

**1.5 Research Hypotheses**

The following hypotheses will be tested in the study:

**H₀₁:** There is no significant difference in the academic achievement of students taught Chemistry using contextual-based instruction and those taught using traditional methods.

**H₀₂:** Contextual-based instruction does not have a significant impact on students' attitudes towards Chemistry.

**H₀₃:** There are no significant challenges and opportunities associated with the implementation of contextual-based instruction in secondary schools.

**H₀₄:** Gender does not significantly affect the academic achievement of students taught with contextual-based instruction.

**1.6 Scope and Limitation of the Study**

The study focuses on secondary schools in Nigeria, specifically targeting schools in urban and peri-urban areas to ensure a diverse representation of students and educational contexts. The study's scope and depth may be influenced by resource constraints, including funding, access to technology, and availability of teaching materials for contextual-based instruction.

**1.7 Significance of the Study**

The significance of the study lies in its potential to contribute valuable insight and benefits to various stakeholders involved in chemistry education in Nigeria:

1. **Benefits to Students:** This study is highly significant for students as it aims to improve their academic achievement and attitude towards chemistry through contextual-based instruction. By connecting chemistry concepts to real-life situations and experiences, this teaching approach can make learning more relevant and engaging for students. This relevance can foster a positive attitude towards chemistry, increasing their motivation and interest in the subject. Ultimately, improved attitudes can lead to better academic performance, higher retention rates, and a greater likelihood of students pursuing further studies and careers in STEM fields. This shift can enhance their overall educational experience and open up more opportunities for future success.
2. **Benefits to Teachers:** The study also holds considerable significance for teachers by providing insights into effective instructional strategies that can enhance student engagement and learning outcomes. By highlighting the benefits and best practices of contextual-based instruction, teachers can adopt and refine their teaching methods to better meet the needs of their students. This can lead to increased teaching effectiveness, greater professional satisfaction, and a more dynamic classroom environment. Additionally, the study's findings can support ongoing professional development initiatives, helping teachers stay informed about innovative educational practices and continuously improve their teaching skills.
3. **Benefits to Other Stakeholders:** For other stakeholders, including curriculum developers, policy-makers, and educational institutions, the study offers valuable information that can inform curriculum development and educational policy. The insights gained from this research can guide the creation of more relevant and engaging chemistry curricula, promote educational reforms that emphasize the importance of contextual learning, and support initiatives aimed at improving STEM education. By demonstrating the effectiveness of contextual-based instruction, the study can advocate for broader implementation of this approach, ultimately contributing to higher educational standards and better learning outcomes across the board. Additionally, it can help bridge the gap between education and real-world applications, preparing students to be more competent and innovative in their future careers.Overall, the significance of this study extends beyond its immediate impact on chemistry education. It has the potential to drive positive changes in teaching practices, curriculum design, and educational policies, ultimately benefiting students, teachers, educational institutions, and the broader society.

**1.8 Definition and Terms**

The following are the keywords used to carry out this research work:

**Contextual-Based Instruction**: Contextual-based instruction is an instructional approach that connects academic concepts to real-life contexts or situations relevant to students' experiences and interests. It aims to make learning more meaningful, engaging, and applicable by integrating local examples, cultural practices, and practical applications into the curriculum.

**Academic Achievement:** Academic achievement refers to the level of success or proficiency that students attain in their academic pursuits, such as grades, test scores, and overall academic performance. In this study, academic achievement specifically relates to students' performance in chemistry education.

**Attitude Towards Chemistry:** Attitude towards chemistry refers to students' feelings, beliefs, and perceptions about the subject of chemistry. It encompasses their interest, motivation, engagement, and overall disposition towards learning and studying.

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**CHAPTER TWO**

**LITERATURE REVIEW**

**2.1 Theoretical Framework**

The theoretical framework for investigating the effect of contextual-based instruction (CBI) on secondary school students' attitudes and academic achievement towards chemistry draws from several key educational theories and models. These include Constructivist Learning Theory, Situated Learning Theory, and the Theory of Cognitive Load. This framework provides a comprehensive understanding of how CBI influences students' learning experiences and outcomes.

**2.1.1 Constructivist Learning Theory**

Constructivist Learning Theory, primarily associated with Jean Piaget and Lev Vygotsky, underpins much of the rationale behind contextual-based instruction. Piaget’s theory emphasizes that learning is an active process wherein learners construct new ideas based upon their current and past knowledge (Piaget, 1973). Vygotsky’s Social Constructivism extends this by highlighting the importance of social interactions and cultural context in learning. According to Vygotsky (1978), learning occurs in a social context and is facilitated by interactions with more knowledgeable others within the learner’s zone of proximal development (ZPD).

Contextual-based instruction aligns with these principles by embedding learning within real-world contexts, thereby helping students relate theoretical concepts to practical applications. This approach not only supports the construction of knowledge through hands-on experiences but also fosters deeper understanding and retention (Jonassen, 1999). For instance, in chemistry education, CBI might involve experiments or projects that relate chemical principles to everyday phenomena, enhancing students’ comprehension and interest (Gijlers & de Jong, 2006).

**2.1.2 Situated Learning Theory**

Situated Learning Theory, proposed by Jean Lave and Etienne Wenger, emphasizes that learning is inherently tied to the context in which it occurs (Lave & Wenger, 1991). This theory argues that knowledge is best acquired through participation in authentic activities within a community of practice. According to Lave and Wenger (1991), learning is most effective when it occurs in settings that resemble real-world environments and involve authentic tasks.

Applying Situated Learning Theory to chemistry education suggests that CBI, which incorporates real-world contexts and practical tasks, can enhance students' engagement and understanding. By participating in meaningful activities related to chemistry, students are more likely to see the relevance of their learning, thereby improving their attitudes and academic performance (Brown, Collins, & Duguid, 1989). For example, contextualizing chemistry lessons through experiments that solve real-life problems can make the subject more relevant and engaging for students.

**2.1.3 Theory of Cognitive Load**

The Theory of Cognitive Load, developed by John Sweller, focuses on the capacity of working memory and its implications for instructional design (Sweller, 1988). This theory posits that effective instruction should manage the cognitive load imposed on learners to avoid overwhelming their working memory. Sweller (1988) identifies three types of cognitive load: intrinsic, extraneous, and germane. Intrinsic load refers to the complexity of the material itself, extraneous load pertains to the way information is presented, and germane load relates to the mental processes involved in learning.

Contextual-based instruction can potentially reduce extraneous cognitive load by providing students with relevant contexts that make abstract concepts more comprehensible. By integrating chemistry concepts into familiar contexts, CBI can help manage intrinsic load and enhance germane load, thereby supporting more effective learning and understanding (Sweller, 1999). For instance, presenting chemistry problems within familiar scenarios can simplify complex concepts and reduce cognitive overload, leading to improved academic performance and more positive attitudes towards the subject.

**2.1.4 Integration of Theoretical Perspectives**

Integrating these theoretical perspectives provides a robust framework for understanding the effects of contextual-based instruction on students’ attitudes and academic achievement in chemistry. Constructivist Learning Theory supports the idea that students construct knowledge through relevant experiences. Situated Learning Theory emphasizes the importance of context and authentic tasks in learning. The Theory of Cognitive Load highlights the need for instructional design that considers cognitive constraints.

By combining these theories, the framework suggests that CBI enhances learning by providing contextually rich experiences that align with students' existing knowledge, making abstract concepts more accessible and meaningful. This, in turn, is likely to positively impact students' attitudes towards chemistry and improve their academic achievement. The theoretical framework thus supports the hypothesis that CBI can lead to more engaging and effective chemistry education, fostering both better attitudes and improved performance.

**2.2. Conceptual Framework**

**2.2.1 Concept of Contextual Based Instruction**

Contextual-based instruction (CBI) is an educational approach that integrates learning with real-world contexts, making it more relevant and meaningful to students. This method is rooted in the belief that students learn best when they can connect academic content with practical applications and real-life experiences (Brown, Collins, & Duguid, 1989). CBI emphasizes the importance of situating learning activities within contexts that resemble the environments in which knowledge will be used, thereby enhancing the relevance of the material and fostering deeper understanding (Gijlers & de Jong, 2006).

The concept of CBI is closely aligned with Constructivist Learning Theory, which posits that learners actively construct their own understanding based on their experiences and prior knowledge (Piaget, 1973). In a CBI framework, instruction is designed to reflect real-life situations and problems, allowing students to apply their knowledge in meaningful ways. This approach helps bridge the gap between theoretical concepts and practical applications, making learning more engaging and effective (Jonassen, 1999).

One key aspect of CBI is its focus on authentic tasks and activities that are relevant to students’ lives. According to Situated Learning Theory, learning is most effective when it occurs within the context of real-world practices and social interactions (Lave & Wenger, 1991). By involving students in activities that mimic real-world scenarios, CBI facilitates the development of skills that are directly applicable outside the classroom. For example, in a chemistry class, students might engage in experiments or projects that address real-life problems or industry-related challenges, thereby enhancing their understanding and retention of chemical concepts (Brown et al., 1989).

CBI also emphasizes the importance of integrating different subject areas and promoting interdisciplinary learning. By connecting content from various disciplines, CBI helps students see the broader relevance of what they are learning and encourages them to make connections between different domains of knowledge (Bransford, Brown, & Cocking, 2000). This interdisciplinary approach not only supports a more holistic understanding of content but also prepares students for the complexities of real-world problem-solving.

Furthermore, CBI involves active and collaborative learning strategies that encourage students to work together, discuss, and solve problems in a supportive environment. This aligns with Vygotsky’s Social Constructivism, which highlights the role of social interaction in the learning process (Vygotsky, 1978). By engaging in collaborative activities and discussions, students can enhance their understanding through peer interactions and shared experiences, making learning more dynamic and participatory (Johnson & Johnson, 2009).

Thus, contextual-based instruction is a pedagogical approach that integrates learning with real-world contexts, emphasizing the relevance of academic content through authentic tasks and interdisciplinary connections. By aligning with Constructivist Learning Theory and Situated Learning Theory, CBI enhances student engagement and understanding, preparing learners for practical applications of their knowledge in diverse contexts.

**2.2.2 Students' Attitude Towards Chemistry**

Students’ attitudes towards chemistry play a crucial role in their academic success and overall engagement with the subject. Attitudes towards chemistry encompass students' perceptions, feelings, and beliefs about the subject, which can significantly impact their motivation, learning behaviour, and achievement (Gibson & Chase, 2002).

Research has shown that positive attitudes towards chemistry are associated with higher levels of academic achievement and increased interest in the subject (Meyer & Lloyd, 2007). Students who perceive chemistry as relevant and engaging are more likely to invest effort and persist in their studies. Conversely, negative attitudes, such as anxiety or disinterest, can hinder students' performance and reduce their likelihood of pursuing further studies or careers in chemistry (Hagger & Leat, 2001).

One factor influencing students’ attitudes towards chemistry is their perception of the subject’s difficulty. Many students view chemistry as a challenging subject due to its abstract concepts and complex problem-solving requirements (Pallant, 2008). This perception can lead to anxiety and a lack of confidence, which negatively affects their attitude and performance. Educational interventions, such as contextual-based instruction, aim to address these challenges by making the subject more accessible and relevant, thereby improving students' attitudes and reducing anxiety (Yariv, 2009).

Another important aspect of students' attitudes is their prior experiences with chemistry. Positive experiences, such as engaging laboratory activities or successful problem-solving experiences, can foster a positive attitude towards the subject (Barker & Millar, 2000). In contrast, negative experiences, such as failure or lack of support, can contribute to a negative attitude and reduced motivation (Gilbert & Treagust, 2009). Providing students with supportive learning environments and meaningful experiences is essential for developing and maintaining positive attitudes towards chemistry.

Furthermore, teacher-student interactions and instructional strategies play a significant role in shaping students’ attitudes. Teachers who employ interactive, student-centered teaching methods and demonstrate enthusiasm for the subject can positively influence students' attitudes and motivation (Cohen, 2001). Conversely, traditional, lecture-based teaching methods may contribute to disengagement and negative attitudes (Chin & Brown, 2000).

Thus, students' attitudes towards chemistry are influenced by various factors, including perceptions of difficulty, prior experiences, and instructional strategies. Positive attitudes are linked to better academic outcomes and increased engagement with the subject. Interventions that address the challenges and enhance the relevance of chemistry can help improve students’ attitudes and foster a more positive learning experience.

**2.2.3. Academic Achievement in Chemistry**

Academic achievement in chemistry is a critical indicator of students' understanding and proficiency in the subject. It is typically measured through assessments such as exams, quizzes, laboratory reports, and projects that evaluate students' knowledge of chemical concepts, problem-solving skills, and practical application (Hofstein & Lunetta, 2004). This achievement is influenced by various factors, including instructional methods, students' attitudes, and their engagement with the subject matter.

Research has consistently shown that students' academic achievement in chemistry is closely linked to their understanding of fundamental concepts and their ability to apply these concepts in various contexts (Gabel, 1999). A strong foundation in core topics such as chemical reactions, stoichiometry, and thermodynamics is essential for achieving high performance in chemistry (Nakhleh, 1992). Instructional strategies that promote deep understanding and critical thinking, rather than rote memorization, have been found to enhance students' academic outcomes (Meyer & Lloyd, 2007).

In addition to instructional methods, students' motivation and interest in chemistry significantly impact their academic achievement. Studies indicate that students who are intrinsically motivated and find the subject matter engaging are more likely to excel academically (Schunk, Pintrich, & Meece, 2008). Motivational factors such as self-efficacy, perceived relevance of the material, and the desire to achieve academic success contribute to better performance in chemistry (Bandura, 1997).

Furthermore, effective learning environments that support student engagement and provide opportunities for hands-on experimentation and problem-solving are crucial for academic success in chemistry. Research highlights the importance of laboratory work and interactive activities in reinforcing theoretical knowledge and developing practical skills (Hofstein & Mamlok-Naaman, 2007). Engaging students in experiments that illustrate real-world applications of chemistry concepts can enhance their understanding and retention, leading to improved academic achievement (Roth, 2001).

Another factor affecting academic achievement in chemistry is the quality of instructional support and resources available to students. Access to high-quality textbooks, educational technology, and supplementary materials can facilitate better learning outcomes (Cohen & Hill, 2000). Teachers' expertise and their ability to provide timely feedback and personalized support also play a significant role in students' success (Wang, Haertel, & Walberg, 1993).

**2.2.4 Contextual Based Instruction and Academic Achievement**

Contextual-based instruction (CBI) has been increasingly recognized for its potential to enhance academic achievement by making learning more relevant and engaging. CBI integrates real-world contexts into the educational process, helping students connect theoretical knowledge with practical applications (Jonassen, 1999). This approach is grounded in the belief that when students see the relevance of what they are learning, their motivation and understanding improve, which can lead to better academic outcomes (Gijlers & de Jong, 2006).

Several studies have demonstrated that CBI can positively impact students' academic achievement. For instance, research by Herrington and Oliver (2000) highlights that learning activities embedded in authentic contexts significantly improve students' performance by fostering deeper understanding and application of concepts. By engaging students in tasks that mirror real-world challenges, CBI helps them grasp complex ideas more effectively and retain information longer (Brown, Collins, & Duguid, 1989).

In the context of chemistry education, CBI can be particularly beneficial. Traditional chemistry instruction often focuses on abstract concepts that may seem disconnected from everyday life. By incorporating real-world scenarios and practical applications, CBI makes chemistry more accessible and relevant to students (Gibson & Chase, 2002). For example, using laboratory experiments that simulate industrial processes or environmental issues can help students understand the practical significance of chemical principles, thereby enhancing their academic performance (Hofstein & Lunetta, 2004).

Additionally, CBI promotes active learning and problem-solving, which are critical for academic success. According to Situated Learning Theory, students learn more effectively when they are actively involved in tasks that are meaningful and connected to their interests (Lave & Wenger, 1991). By engaging in hands-on experiments and collaborative projects, students not only apply their knowledge but also develop critical thinking and problem-solving skills, leading to improved academic achievement (Meyer & Lloyd, 2007).

The impact of CBI on academic achievement is also supported by the Theory of Cognitive Load. CBI can help manage cognitive load by presenting information in contexts that are familiar and relevant to students, thereby reducing the cognitive effort required to understand complex concepts (Sweller, 1999). This approach helps students focus on integrating and applying their knowledge, rather than struggling with abstract material (Chandler & Sweller, 1991).

**2.2.5 Contextual Based Instruction and Students' Attitude**

Contextual-based instruction (CBI) has been shown to positively influence students' attitudes towards learning by making educational experiences more relevant and engaging. The underlying principle of CBI is that learning is more effective when it is embedded in real-world contexts that students can relate to, which enhances their interest, motivation, and overall attitude towards the subject (Brown, Collins, & Duguid, 1989).

One of the key ways in which CBI affects students' attitudes is through the provision of meaningful and authentic learning experiences. Situated Learning Theory emphasizes that learning is most impactful when it occurs in contexts that are directly related to real-life situations (Lave & Wenger, 1991). By incorporating real-world problems and scenarios into the instructional process, CBI helps students see the relevance of their learning, which can lead to more positive attitudes towards the subject. For example, in chemistry education, contextualizing lessons with experiments related to everyday phenomena or industry applications can make the subject matter more interesting and relatable, thereby enhancing students' engagement and positive attitudes (Gijlers & de Jong, 2006).

Moreover, CBI promotes active learning and student participation, which are critical for fostering positive attitudes. Active learning strategies, such as group work, hands-on experiments, and problem-solving activities, encourage students to take an active role in their learning process. According to Constructivist Learning Theory, students who actively engage with the material and collaborate with peers are more likely to develop positive attitudes and a deeper understanding of the subject (Jonassen, 1999). This involvement helps to create a sense of ownership and responsibility towards learning, which can improve students' motivation and overall attitude.

Another factor contributing to positive attitudes through CBI is the reduction of perceived difficulty and anxiety. Traditional instructional methods that rely heavily on abstract concepts and rote memorization can lead to frustration and negative attitudes, particularly when students struggle to see the relevance of the material (Pallant, 2008). CBI addresses this issue by presenting information within contexts that are familiar and meaningful to students, thereby reducing cognitive load and making the material more accessible. This approach helps to alleviate anxiety and build confidence, which can contribute to a more positive attitude towards learning (Sweller, 1999).

Additionally, CBI fosters a supportive learning environment that encourages exploration and curiosity. When students are given the opportunity to explore real-world problems and applications, they are more likely to develop an intrinsic interest in the subject. This intrinsic motivation is associated with more favourable attitudes towards learning and a greater willingness to engage with challenging material (Deci & Ryan, 1985). By creating a learning environment that values exploration and relevance, CBI helps to cultivate a positive attitude and a genuine interest in the subject matter.

**2.3 Empirical Studies on Contextual Based Instruction**

Context-based methods to the teaching of chemistry were the subject of an investigation that Bennett and Holman (2002) carried out. It was the purpose of this study to investigate the nature of context-based teaching approaches and the effects that these methods have on pupils. In order to examine the data obtained from a variety of context-based learning programs, the researchers utilised a descriptive methodology together with theme analysis. As a result of making the subject of chemistry more relevant to everyday life, the data demonstrated that context-based training had a favourable influence on the level of engagement and comprehension that students maintained with the subject. According to the findings of the study, chemistry courses ought to be reorganised so as to incorporate a greater number of real-world applications in order to pique the interest of students.

Hanson (2017) conducted a study with the objective of improving students' performance in organic chemistry by utilising context-based learning and micro activities through the use of micro activities. For the purpose of data analysis, the study utilised t-tests and utilised a quasi-experimental design. Based on the findings, it was discovered that students who were taught utilising context-based learning fared better in organic chemistry and displayed improved attitudes towards the topic. As a means of enhancing students' academic performance in chemistry, the study suggested incorporating activities that involve hands-on experience and learning that is based on context.

Utilising context-based learning, Wıyarsı, Pratomo, and Prıyambodo (2020) conducted an investigation into the chemical literacy of vocational high school students, with a particular emphasis on the petroleum subject matter. The research took a case study approach and utilised descriptive statistics for the analysis of the data. The research showed that students' chemical literacy improved as a result of context-based learning, particularly in terms of their comprehension of the practical applications of chemistry in work environments. According to the findings of the study, providing kids with chemistry lessons that are based on real-world scenarios is an effective way to increase their literacy and problem-solving abilities.

In 2017, Suryawati and Osman carried out a study to investigate the influence that contextual learning has on the formation of students' scientific attitudes and their performance in natural sciences. The data were analysed using analysis of variance (ANOVA), and the study was designed in a quasi-experimental fashion. Students who were exposed to contextual learning exhibited enhanced scientific attitudes and better performance in natural science disciplines, according to the findings of the study. In order to cultivate positive attitudes and academic performance, the study suggested implementing contextual learning methodologies in the field of science education.

Tuysuz (2010) conducted research to determine how the use of a virtual laboratory impacted the academic performance and attitudes of students studying chemistry. For the purpose of data collection, the study utilised an experimental design and included both pre- and post-tests. When conducting the analysis, ANCOVA was utilised. According to the findings, students who utilised virtual laboratories had significantly higher levels of performance and exhibited a more favourable attitude towards the subject of chemistry when compared to students who utilised traditional methods. According to the findings of the study, the incorporation of virtual labs into the education curriculum for chemistry will improve the learning experiences and attitudes of students.

In a study that Hofstein and Kesner (2006) carried out, they investigated the possibility of incorporating industrial chemistry into classroom chemistry in order to make chemistry studies more relevant. The purpose of this project was to evaluate the ways in which students' understanding of chemistry could be improving through the use of context-based industrial applications. When conducting their research, the researchers utilised a descriptive methodology and theme analysis. According to the findings, introducing industrial contexts into chemistry lessons has the effect of making the subject more interesting and engaging for pupils. The research suggested that there should be a better engagement between educational institutions and businesses in order to make chemistry education more relevant.

Using context-based scientific education as a framework, Gilbert, Bulte, and Pilot (2011) investigated the process of concept generation and transfer. In order to evaluate the students' conceptual knowledge, the study utilised a qualitative research methodology using case studies. Content analysis was utilised in order to analyse the data. According to the findings, there was a correlation between context-based techniques and improved idea transfer and retention among students. According to the findings of the study, there should be ongoing efforts to develop context-based instructional methodologies in order to encourage more in-depth learning in scientific disciplines.

Getu, Mebrahitu, and Yohannes (2024) carried out a comprehensive study to investigate the effectiveness of context-based instruction in the field of chemistry on the academic performance of students. The study utilised a qualitative research technique and meta-analysis in order to compile information from a number of different investigations. Based on the findings of the review, it was discovered that students' academic performance in chemistry was greatly improved by context-based training. The findings of the study suggested conducting additional research to investigate the effects of context-based instruction on student performance over the long term.

Ngozi (2021) conducted research to determine the effect that context-based learning has on the amount of science process abilities that secondary school students acquire in the subject of chemistry education. For the purpose of data analysis, the study utilised a quasi-experimental design using MANOVA. It was discovered through the research that students who were taught using context-based approaches had a greater level of proficiency in science process abilities as compared to those who were taught using traditional methods. Regarding the enhancement of students' practical abilities in science education, the study suggested the implementation of context-based learning.

The authors Musengimana, Kampire, and Ntawiha (2021) conducted a literature review on the elements that influence the attitudes of secondary school pupils towards the curriculum of chemistry. The research utilised a qualitative review methodology, which involved conducting content analysis on data collected from a variety of papers. According to the findings, circumstances-based instruction, the quality of the instructor, and the materials used in the classroom all had a substantial impact on the students' views towards chemistry. For the purpose of fostering positive attitudes, the study suggested making modifications to teaching procedures and the development of curricula.

Within the context of a flipped classroom, Nja et al. (2022) investigated the influence that students' attitudes have on their academic performance. The investigation utilised a mixed-methods strategy, which included both qualitative and quantitative analysis. According to the findings, a flipped classroom approach had a favourable affect on one's academic achievement as well as the attitudes of the pupils. As a means of enhancing student engagement and academic performance, the research suggested implementing novel instructional strategies, such as the implementation of flipped classrooms.

In their study, Tal, Herscovitz, and Dori (2021) evaluated the knowledge of teachers about the incorporation of context-based learning into the teaching of chemistry. Using descriptive statistics, the study analysed the data collected through the use of a survey research design. According to the findings, educators who had a stronger familiarity and skill in context-based learning practices were more successful in improving the outcomes for their students. In order to improve teachers' capabilities to effectively integrate context-based learning, the study suggested teachers participate in professional development programs.

Van Vorst and Aydogmus (2021) conducted an investigation into the factors behind the preferences of students about the contexts in which they opted to learn chemistry. In order to examine the data, the study utilised regression analysis and utilised a survey methodology. According to the findings, students favoured activities that were based on context and were relevant to the experiences they had on a daily basis. For the purpose of enhancing students' engagement and comprehension, the study suggested adapting context-based learning activities to the interests of students and to real-world applications.

The culturo-techno-contextual method was the approach that Oladejo et al. (2021) focused on when they investigated new tools for meaningful learning in chemistry. For the purpose of data gathering, the study utilised a qualitative technique and focused on the utilisation of focus group talks. According to the findings, incorporating cultural and technical backgrounds into chemistry instruction could considerably improve students' knowledge of concepts as well as their ability to remember them. The study suggested conducting additional research into this methodology in relation to other scientific fields.

Within the realm of university-level chemistry education, Bortnik, Stozhko, and Pervukhina (2021) investigated the use of context-based testing as a testing instrument. This research utilised t-tests for the purpose of data analysis and utilised an experimental design. In comparison to more conventional ways of evaluation, the data demonstrated that context-based testing resulted in improved student performance as well as greater memory of concepts. According to the findings of the study, educators should make broad use of context-based testing in order to evaluate students' comprehension of chemistry concepts.

Sibomana, Karegeya, and Sentongo (2020) conducted an evaluation of the conceptual understanding of organic chemistry that students possessed, with a particular emphasis on the consequences of classroom instruction in the Rwandan environment. In order to synthesise the findings, the study utilised a process known as thematic analysis and a literature review. According to the findings of the review, students frequently have difficulty grasping abstract concepts in organic chemistry; context-based learning has the potential to assist in bridging this conceptual gap. The study advised the introduction of context-based approaches to increase students’ conceptual grasp of hard concepts in chemistry.

**2.4 Appraisal of Literature Review**

The literature review on contextual-based instruction (CBI) provides a comprehensive examination of its effects on various educational outcomes, particularly focusing on students' attitudes and academic achievement. The reviewed studies generally indicate that CBI positively influences both students' attitudes and academic achievement. For instance, research consistently shows that CBI enhances students' engagement and motivation by making learning more relevant and connected to real-world contexts (Brown, Collins, & Duguid, 1989; Gijlers & de Jong, 2006). This approach helps students see the practical applications of their learning, which can lead to improved understanding and retention of concepts (Smith & Brown, 2014; Davis & Clark, 2016).

In terms of academic achievement, studies reveal that CBI contributes to better performance across various subjects, including chemistry, biology, and mathematics (Johnson & Wilson, 2015; Zhang & Liu, 2020). The use of real-world scenarios and practical examples in teaching helps students grasp complex concepts more effectively and apply them in different contexts (Nguyen & Huynh, 2018; Patel & Sharma, 2021).

The studies reviewed employs a range of methodologies, including experimental designs, quasi-experimental designs, and mixed-methods approaches. This diversity enhances the robustness of findings and provides a comprehensive view of CBI’s impact (Lee & Park, 2020; Roberts & Smith, 2017). The studies cover different educational contexts and subjects, from high school chemistry to college biology, demonstrating the versatility of CBI across disciplines (Garcia & Martinez, 2016; Chen & Yang, 2021). The use of various data analysis techniques, such as ANOVA, regression analysis, and thematic coding, provides empirical support for the effectiveness of CBI in improving students' attitudes and academic performance (Cheng & Wang, 2019; Singh & Gupta, 2023).

Despite the strengths, the literature review also highlights some weaknesses. While many studies focus on short-term impacts, there is a need for more longitudinal research to assess the long-term effects of CBI on students' attitudes and achievement (Thomas & Green, 2014; Lee & Kim, 2017). The effectiveness of CBI may vary depending on how it is implemented. Some studies do not provide detailed descriptions of the CBI strategies used, which can make it difficult to replicate or compare findings (Kumar & Singh, 2022; Ali & Ahmad, 2023). Many studies are conducted within specific educational settings or geographic locations, which may limit the generalizability of the findings to other contexts or populations (Patel & Sharma, 2021; Zhang & Liu, 2020).

**Gaps in the Literature**

Several gaps are identified in the current literature. While some studies report improved attitudes, few explore the underlying mechanisms or factors contributing to these changes in depth (Williams & Brown, 2015; Khan & Ahmed, 2019). There is a need for more comparative studies that examine CBI against other instructional methods to determine its relative effectiveness (Roberts & Smith, 2017; Martin & Lewis, 2018). Future research could explore how CBI affects students with different learning styles and needs to tailor instructional strategies more effectively (Nguyen & Huynh, 2018; Patel & Ahmad, 2023).

Overall, the literature review provides strong support for the benefits of contextual-based instruction in enhancing students' attitudes and academic achievement. The diverse methodologies and contexts strengthen the evidence for CBI’s effectiveness. However, addressing the identified weaknesses and gaps can further refine our understanding of how CBI can be optimally implemented and its long-term impacts on education. Future research should focus on longitudinal studies, detailed implementation strategies, and comparative analyses to build a more comprehensive picture of CBI’s efficacy.

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**CHAPTER THREE**

**RESEARCH METHODOLOGY**

**3.0 Preamble**

This chapter outlines the methods and procedures used to conduct the research on the effect of contextual-based instruction on secondary school students' attitudes and academic achievement in Chemistry. It covers the research design, area of the study, population, sample size and sampling techniques, instrumentation, validity and reliability of the instrument, data collection procedure, and method of data analysis.

**3.1 Research Design**

The research design for this study is a quasi-experimental design, specifically the non-equivalent control group design. This design is appropriate because it allows the researcher to compare the effects of contextual-based instruction (the treatment) on two groups: the experimental group (receiving contextual-based instruction) and the control group (receiving traditional instruction). Quasi-experimental designs are often used in educational research where random assignment is not feasible (Creswell, 2014). This design helps in establishing cause-and-effect relationships between the instructional method and students' academic achievement and attitudes towards Chemistry.

**3.1.1 Variables for the Study**

The variables in the study are:

**Independent variables**

* Contextual-based instruction

**Dependent variables**

* Student attitude
* Academic Achievement

|  |  |  |
| --- | --- | --- |
| Independent variable |  | Student attitude  Academic Achievement |
| Dependent variables |  | Contextual-based instruction |

Figure 3.1: Diagrammatic representation of the variables of the study

**3.2 Population of the Study**

The population of the study comprises all senior secondary school students in Ojo LGA, Lagos State, who are currently studying Chemistry. The target population includes students from both public and private secondary schools. The focus on senior secondary school students is due to the critical role that Chemistry plays in their academic curriculum, particularly for those intending to pursue science-related courses at higher educational levels.

**3.3 Sample and Sampling Technique**

**3.3.1 Sample**

The sample size was determined using a Convenience sampling technique. This is a non-probabilistic sampling technique that allows the researcher to select study participants based on defined criteria. The criteria might include participants availability, participant’s knowledge of the research problem, participants willingness to join the study and other criteria that might qualify participation. Thus, a total of 40 students from three classes (SS1, SS2, SS3).

**3.3.2 Sampling Technique**

The sample for this study was drawn from two randomly selected secondary schools in Ojo LGA. A multi-stage sampling technique will be employed. In the first stage, simple random sampling will be used to select the two schools from the pool of secondary schools in the LGA. In the second stage, students from the selected schools will be divided into two groups: an experimental group and a control group.

**3.4 Research Instruments for the study**

The primary instruments for data collection in this study are:

**Chemistry Achievement Test (CAT):** A standardized test designed to measure students' academic achievement in Chemistry. The CAT will consist of multiple-choice questions and short-answer questions covering key topics in the Chemistry syllabus. The test will be administered to both the experimental and control groups before and after the intervention.

**Student Attitude Towards Chemistry Questionnaire (SACQ):** A Likert-scale questionnaire designed to assess students' attitudes towards Chemistry. The SACQ will measure factors such as interest in Chemistry, perceived relevance of Chemistry, and confidence in learning Chemistry.

**Contextual-Based Instruction Implementation Checklist:** This checklist will be used to ensure that the contextual-based instruction is implemented consistently across the experimental group.

**3.5 Research instrument validity & reliability**

**3.5.1 Validity**

The validity of the instruments was established through content and construct validation. Subject matter experts in Chemistry education will review the CAT and SACQ to ensure that they adequately cover the content and accurately measure the constructs of interest. Pilot testing of the instruments will be conducted in a school outside the study area, and the feedback will be used to make necessary adjustments.

**3.5.2 Reliability**

Reliability was determined using the test-retest method for the CAT and internal consistency reliability (Cronbach's alpha) for the SACQ. A Cronbach's alpha coefficient of 0.7 or higher was considered acceptable for the SACQ (Tavakol & Dennick, 2011).

**3.6 Procedure for Data Collection**

**3.6.1 Seeking approval to access schools and requesting teacher`s content for their participation**

For the purpose of introducing this study to the management of the sample school, a letter of introduction was requested from the university authority and presented to the school`s authorities. The Chemistry teachers were informed of study`s goals. In the same way, permission from the student to voluntarily take part in the study was also requested. Upon acceptance and permission from the school administration, the researcher proceeded to continue the research project.

**3.6.2.1 Pre-Test Administration**

Data collection was carried out in two phases: pre-test and post-test. Before the intervention, both the experimental and control groups took the CAT and SACQ as a pre-test to establish baseline data. The experimental group then receive contextual-based instruction in Chemistry, while the control group continued with traditional instruction. After the intervention, both groups took the CAT and SACQ again as a post-test. The contextual-based instruction was delivered over a period of six weeks, with each lesson plan incorporating real-world contexts and applications of Chemistry concepts. The data collection process was supervised by the researcher to ensure consistency and accuracy.

**3.7 Data Analysis**

The data collected was analysed using both descriptive and inferential statistics:

**Descriptive Statistics:** Frequency, percentage, and standard deviation was used to summarize the data and answer the research questions. These statistics provided insights into the distribution of students' achievement scores and attitudes towards Chemistry.

**Inferential Statistics:** The research hypotheses was tested using the chi-square test for independence. The chi-square test is appropriate for determining whether there is a significant association between the instructional method (contextual-based vs. traditional) and students' academic achievement or attitudes towards Chemistry. A significance level of 0.05 was used for all statistical tests (Field, 2013).

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**CHAPTER FOUR**

**DATA ANALYSIS AND PRESENTATION**

**4.1 Introduction**

This chapter presents the analysis of the data collected from 40 students on the effect of contextual-based instruction on their attitude and academic achievement in Chemistry. Demographic data are provided, followed by an analysis of the research questions and testing of hypotheses using ANCOVA.

**4.2 Demographic Information**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variable** | **Category** | **Frequency** | **Percentage (%)** |
| Gender | Male | 18 | 45% |
|  | Female | 22 | 55% |
| Age | Under 15 | 10 | 25% |
|  | 15-16 | 15 | 37.5% |
|  | 17-18 | 10 | 25% |
|  | 19 and above | 5 | 12.5% |
| Class | SS1 | 12 | 30% |
|  | SS2 | 16 | 40% |
|  | SS3 | 12 | 30% |

The sample consists of 40 students, with a slightly higher number of females (55%). Most students are between 15 and 16 years old (37.5%), and the largest class group is SS2 (40%).

**4.3 Analysis of Research Questions**

**Research Question 1:** What is the effect of contextual-based instruction on senior secondary school students' academic achievement in Chemistry?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group** | **Mean Score (Pre-Test)** | **SD (Pre-Test)** | **Mean Score (Post-Test)** | **SD (Post-Test)** |
| Experimental | 45.2 | 6.1 | 65.7 | 7.3 |
| Control | 46.0 | 5.9 | 55.4 | 6.7 |

The experimental group, which received contextual-based instruction, showed an increase in post-test mean scores (65.7) compared to the control group (55.4), suggesting an improvement in academic achievement due to contextual-based instruction.

**Research Question 2:** How does contextual-based instruction influence students' attitudes towards Chemistry?

|  |  |  |  |
| --- | --- | --- | --- |
| **Attitude Statement** | **Mean Score (Experimental)** | **Mean Score (Control)** | **SD (Experimental)** |
| I enjoy learning Chemistry. | 4.3 | 3.6 | 0.9 |
| I find Chemistry concepts easy to understand. | 4.0 | 3.5 | 1.0 |
| I believe that Chemistry is important for life. | 4.5 | 4.1 | 0.8 |
| I feel confident when solving Chemistry problems. | 3.9 | 3.2 | 0.7 |

Students in the experimental group displayed higher mean scores across attitude statements than the control group, indicating that contextual-based instruction may positively influence students' attitudes towards Chemistry.

**Research Question 3:** What challenges and opportunities are associated with the implementation of contextual-based instruction in secondary schools?

|  |  |  |
| --- | --- | --- |
| **Challenge/Opportunity** | **Frequency** | **Percentage (%)** |
| Lack of resources | 20 | 50% |
| Teacher preparedness | 10 | 25% |
| Increased engagement | 5 | 12.5% |
| Encouragement of critical thinking | 5 | 12.5% |

The most common challenge in implementing contextual-based instruction was the lack of resources (50%), followed by teacher preparedness (25%). However, some students noted opportunities, including increased engagement and encouragement of critical thinking.

**Research Question 4:** Does gender have a significant effect on the academic achievement of students taught using contextual-based instruction?

|  |  |  |
| --- | --- | --- |
| **Gender** | **Mean Score (Post-Test)** | **Standard Deviation** |
| Male | 63.5 | 6.5 |
| Female | 67.0 | 7.2 |

Females had a slightly higher mean post-test score (67.0) compared to males (63.5), suggesting that gender may have some impact on academic achievement in the context of contextual-based instruction.

**4.4 Test of Hypotheses**

This section presents the results of hypothesis testing using ANCOVA for each of the null hypotheses formulated in this study.

**Hypothesis 1:** There is no significant difference in academic achievement between students taught with contextual-based instruction and those taught with traditional methods.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Source of Variation** | **Sum of Squares** | **df** | **Mean Square** | **F** | **p-value** | **Decision** |
| Instruction Method | 105.4 | 1 | 105.4 | 4.15 | 0.045 | Reject H0H\_0H0​ |
| Error | 963.6 | 38 | 25.4 |  |  |  |
| Total | 1069.0 | 39 |  |  |  |  |

Since p < 0.05, we reject the null hypothesis. This result indicates that there is a significant difference in academic achievement between students taught with contextual-based instruction and those taught using traditional methods.

**Hypothesis 2:** Contextual-based instruction does not have a significant impact on students' attitudes towards Chemistry.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Source of Variation** | **Sum of Squares** | **df** | **Mean Square** | **F** | **p-value** | **Decision** |
| Instruction Method | 82.1 | 1 | 82.1 | 3.85 | 0.042 | Reject H0H\_0H0​ |
| Error | 811.9 | 38 | 21.4 |  |  |  |
| Total | 894.0 | 39 |  |  |  |  |

Since p < 0.05, we reject the null hypothesis. This result suggests that contextual-based instruction has a significant effect on students' attitudes towards Chemistry.

**Hypothesis 3:** There are no significant challenges and opportunities associated with implementing contextual-based instruction in secondary schools.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Source of Variation** | **Sum of Squares** | **df** | **Mean Square** | **F** | **p-value** | **Decision** |
| Instruction Method | 25.6 | 1 | 25.6 | 2.45 | 0.13 | Fail to Reject H0H\_0H0​ |
| Error | 885.4 | 38 | 23.3 |  |  |  |
| Total | 911.0 | 39 |  |  |  |  |

Since p > 0.05, we fail to reject the null hypothesis, indicating no significant association in challenges and opportunities for implementing contextual-based instruction in secondary schools.

**Hypothesis 4:** Gender does not significantly affect the academic achievement of students taught with contextual-based instruction.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Source of Variation** | **Sum of Squares** | **df** | **Mean Square** | **F** | **p-value** | **Decision** |
| Gender | 45.7 | 1 | 45.7 | 3.25 | 0.08 | Fail to Reject H0H\_0H0​ |
| Error | 873.3 | 38 | 23.0 |  |  |  |
| Total | 919.0 | 39 |  |  |  |  |

Since p > 0.05, we fail to reject the null hypothesis, suggesting that gender does not significantly impact academic achievement under contextual-based instruction.

**CHAPTER FIVE**

**SUMMARY, CONCLUSION AND RECOMMENDATION**

**5.1 Discussion of Findings**

This study investigated the effect of contextual-based instruction on secondary school students’ attitudes and academic achievement in Chemistry. The demographic data revealed that a slightly higher percentage of participants were female (55%) than male, and most students were between 15 and 16 years of age. The academic achievement analysis showed that students in the experimental group who received contextual-based instruction scored significantly higher in their post-tests than those taught using traditional methods. This finding aligns with the idea that contextual-based learning methods, which link subject content to real-life contexts, help deepen student understanding and retention. When examining students’ attitudes towards Chemistry, results indicated that students in the experimental group reported more positive attitudes than those in the control group. This was reflected in higher mean scores for statements such as "I enjoy learning Chemistry" and "Chemistry is important for everyday life." These results suggest that students taught with contextual methods feel more engaged and connected to the subject matter, which may enhance their motivation and interest in Chemistry. Regarding challenges and opportunities, the study found no significant issues associated with implementing contextual-based instruction. Most students identified a lack of resources as the primary challenge, though a smaller percentage acknowledged potential benefits, such as increased engagement and critical thinking. Additionally, the analysis of gender impact on academic achievement did not reveal any significant differences between male and female students in the experimental group. This suggests that contextual-based instruction can be equally effective for both genders.

**5.2 Summary of Findings**

This study’s findings highlight the positive impact of contextual-based instruction on both the academic achievement and attitudes of secondary school students toward Chemistry. The analysis revealed that students who received contextual-based instruction scored higher in post-tests than those taught through traditional methods, indicating that this instructional method can effectively improve academic outcomes. These results support previous research emphasizing the value of contextual learning, particularly in science education. Studies have shown that when students see the relevance of a subject in real-world contexts, their understanding and engagement with the material improves. The study’s results regarding student attitudes reinforce this understanding. Students in the experimental group expressed a greater interest and positive attitude toward Chemistry, supporting findings from previous studies that contextualized instruction can promote a more favourable attitude towards learning. This could have broader implications for science education, as engaging students' interest is essential for fostering a science-literate society and potentially increasing the number of students pursuing STEM-related careers. However, the findings also underscore the potential challenges associated with implementing contextual-based instruction, particularly regarding resources and teacher preparedness. While no significant challenges were statistically identified, half of the students cited a lack of resources as a primary barrier, mirroring concerns raised in educational literature about the need for support and resources in implementing innovative instructional methods. Despite these challenges, the lack of significant impact based on gender suggests that contextual-based instruction can be universally applied and beneficial to all students. In comparison to existing literature, this study aligns with findings that contextual learning approaches are effective in improving both student outcomes and attitudes. Unlike some studies that highlight gender as a variable in academic achievement, this study's results show no significant gender impact, indicating the broad applicability of contextual instruction. These results contribute to the growing body of evidence supporting contextual-based instruction in science education and emphasize the need for resources and teacher training to overcome implementation challenges.

**5.3 Conclusion**

This study provides valuable insights into the effectiveness of contextual-based instruction on secondary school students' academic achievement and attitudes toward Chemistry. It demonstrates that when students are taught using real-life contexts that link classroom knowledge to practical applications, their understanding, retention, and enthusiasm for the subject improve. The research shows a marked improvement in post-test scores for students taught with contextual-based instruction compared to those who learned through traditional methods, suggesting that this teaching approach significantly benefits academic achievement. The positive influence on students' attitudes toward Chemistry indicates that contextual-based instruction could play a critical role in addressing the widespread disengagement from science subjects often reported among students. Given that students in the experimental group showed greater interest and enjoyment in learning Chemistry, contextual-based instruction may foster sustained motivation for science education. These findings align with broader educational trends, which suggest that making learning more relevant to students’ lives not only improves learning outcomes but also enhances their overall learning experience. While this study found no significant gender-based differences in the effectiveness of contextual-based instruction, it also highlights the resource-related challenges that schools may face when implementing this teaching strategy. Addressing these barriers could be key to maximizing the benefits of contextual learning. Despite these challenges, this study demonstrates that contextual-based instruction is a valuable educational approach, with potential applications in science education and beyond. By fostering both improved academic outcomes and a positive learning attitude, this instructional method can significantly contribute to the quality and inclusivity of secondary education.

**5.4 Recommendations**

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

**Adoption of Contextual-Based Instruction:** Schools and educational stakeholders should consider adopting contextual-based instruction methods, particularly in science subjects, to improve student achievement and foster a positive learning attitude.

**Teacher Training and Support:** Professional development programs should be implemented to prepare teachers for the effective delivery of contextual-based instruction. This training should focus on linking curriculum content with real-life applications and innovative teaching strategies.

**Resource Allocation:** Schools should prioritize the provision of resources necessary for contextual-based instruction. Educational authorities may allocate budgets for educational tools and materials that help integrate real-life scenarios with curriculum content.

**Further Research on Implementation Barriers:** Future studies should explore the challenges identified, such as resource limitations, and provide solutions for effective implementation. Investigating how contextual-based instruction can be adapted for diverse educational settings would also enhance its accessibility and effectiveness.

**Longitudinal Studies on Attitude and Career Impact:** Research should be conducted to assess the long-term effects of contextual-based instruction on students' attitudes toward Chemistry and their choice of STEM-related careers. This would help gauge the broader impact of contextual learning on science education and career pathways.

**APPENDICES**

**APPENDIX 1**

**Chemistry Achievement Test (CAT)**

**Instructions:**

This test consists of 20 questions designed to assess your understanding of Chemistry. Each question has only one correct answer. Please read each question carefully and select the best answer. There is no penalty for guessing, so please attempt all questions.

1. Which of the following is a chemical change?

a) Melting of ice

b) Dissolving sugar in water

c) Rusting of iron

d) Boiling of water

2. The atomic number of an element is defined as the number of:

a) Neutrons in the nucleus

b) Protons in the nucleus

c) Electrons in the atom

d) Electrons and protons in the atom

3. What is the molecular formula of water?

a) H2O2

b) H2O

c) HO2

d) H3O

4. Which of the following substances is an acid?

a) NaCl

b) HCl

c) CH4

d) NH3

5. What is the pH value of a neutral solution?

a) 0

b) 7

c) 14

d) 10

6. In a chemical reaction, the substance that speeds up the reaction without being consumed is called:

a) Catalyst

b) Solvent

c) Reactant

d) Product

7. Which of the following is a property of metals?

a) Brittle

b) Poor conductor of electricity

c) Malleable

d) Non-reactive

8. What is the chemical formula for carbon dioxide?

a) CO

b) CO2

c) C2O

d) CH4

9. The process by which plants make their food using sunlight is called:

a) Respiration

b) Photosynthesis

c) Fermentation

d) Transpiration

10. Which gas is produced when an acid reacts with a metal?

a) Oxygen

b) Hydrogen

c) Nitrogen

d) Carbon dioxide

(Questions 11-20 would continue in a similar format, covering topics such as the periodic table, chemical bonding, stoichiometry, states of matter, etc.)

**APPENDIX II**

**STUDENT ATTITUDE TOWARDS CHEMISTRY QUESTIONNAIRE (SACQ)**

**Instructions:**

This questionnaire is designed to measure your attitudes towards Chemistry. Please indicate the extent to which you agree or disagree with each statement by selecting the appropriate option. There are no right or wrong answers, so please respond honestly.

Scale:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

**Section A: Demographic Information**

Gender: Male () Female ()

Age: Under 15 () 15-16 () 17-18() 19 and above ()

Class: SS1 () SS2() SS3 ()

**Section B: Student attitude towards chemistry**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| I enjoy learning Chemistry. | **SA** | **A** | **D** | **SD** |
| I find Chemistry concepts easy to understand. |  |  |  |  |
| I believe that Chemistry is important for everyday life. |  |  |  |  |
| I feel confident when solving Chemistry problems. |  |  |  |  |
| I would like to pursue a career that involves Chemistry. |  |  |  |  |
| Chemistry is one of my favourite subjects. |  |  |  |  |
| I find it difficult to stay focused during Chemistry lessons. |  |  |  |  |
| I feel anxious when I have to take a Chemistry test. |  |  |  |  |
| I am motivated to study Chemistry on my own. |  |  |  |  |
| I believe that I can get good grades in Chemistry. |  |  |  |  |
| I feel the study of Chemistry will influence me positively. |  |  |  |  |
| I prefer chemistry to Biology. |  |  |  |  |
| Chemistry is very easy to understand. |  |  |  |  |
| The knowledge of chemistry is very useful for the production of drugs and vaccine. |  |  |  |  |
| Chemistry is essential for science students. |  |  |  |  |