

**AN ASSESSMENT OF SECONDARY SCHOOL STUDENTS ATTITUDE  
TOWARDS CHEMISTRY LEARNING IN EGOR LOCAL GOVERNMENT  
AREA**

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BENIN CITY, NIGERIA**

**NOVEMBER, 2025.**

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**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF  
CURRICULUM AND INSTRUCTIONAL TECHNOLOGY, FACULTY OF  
EDUCATION, UNIVERSITY OF BENIN, BENIN CIT IN PARTIAL  
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BACHELOR OF SCIENCE EDUCATION IN CHEMISTRY (BSC.ED)CHEM OF  
THE UNIVERSITY OF BENIN, BENIN CITY,NIGERIA.**

**NOVEMBER, 2025.**

## CERTIFICATION

We, the undersigned, certify that this research project was carried out by **Igudia Oruchukwu Precious** with matriculation number; **EDU2102065** in the Department of Curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin city, Edo state

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## **DEDICATION**

It is with deep feelings of gratitude to God that this project work is specially and wholly dedicated to my parents Rev. and Mrs Samuel Igudia and my siblings Sharon and Ebenezer.

It is also dedicated to God almighty for his infinite mercy, compassion and love that has kept me, my family and also for making this research work a huge success

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Finally, and not the least important are my lecturers in the department of curriculum and instructional technology, I am grateful to all my friends, Ahanor Frank Peter, Osas Obakpolor, Micheal Egbo, Eghosa Idahosa, Benjamin LoveGod, Favour Iyare, victory Idehen, Oosasere Edogiawerie, Obehi Ogbeide, Molly, Isoken Omoruyi, Deborah Anota, Iden favour, to my course mate Vera Lily Chisom, Divine and others to my senior colleague Captain Emma to my wonderful 100 – 400L roommates Blessing, Success, Kristen, Tegiri, Mercy, Deborah, Benedictal, Victory Eghomwanre, Victory Johnson and so many to mention by name are hereby acknowledge May the good lord bless you all, amen.

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## ABSTRACT

This research was carried out for the purpose of assessing the attitude of secondary school students towards the learning of chemistry a case study of secondary schools in Egor local government area

The study used the descriptive survey design using 20-item questionnaire as instrument of data collection and fifty (50) respondents were selected from 5 schools in Egor local government area. The study adopted percentage, mean standard deviation to analyse the research questions from data collected, Data analyzed using descriptive statistics, with a mean score of 2.50 indicating a positive attitude or agreement.

This study analyzed the attitudes of secondary school students towards chemistry learning in the Egor Local Government Area and investigated the influence of teaching methods and style, curriculum topics, and the sex of the chemistry teacher on these attitudes.

Key Findings showed that Students generally hold a positive attitude towards chemistry ( $\bar{x} = 3.18$ ), driven primarily by the recognition of the subject's usefulness for future careers ( $\bar{x} = 3.68$ ).

Also the Teaching methods exert a strong positive influence on student attitudes ( $\bar{x} = 3.76$ ), with students highly favoring active and student-centered methods like encouraging questions, group work, and using real-world examples.

While students appreciated practical applications, a significant proportion agreed the curriculum is "too focused on theoretical concerns" ( $\bar{x} = 3.48$ ), suggesting a disconnect in curriculum delivery.

The direct influence of a teacher's sex on overall attitude was inconclusive ( $\bar{x} = 2.96$ ), but students did perceive that male and female teachers employ different teaching styles ( $\bar{x} = 3.60$ ), with female teachers perceived as slightly more supportive ( $\bar{x} = 3.26$ ).

The study concludes that pedagogy is paramount, with active, collaborative, and contextualized teaching methods being the most critical factors. It is recommended that chemistry teachers prioritize student-centered methods and contextualize content to reinforce career utility. Furthermore, curriculum planners should review the theoretical load to ensure practical work and applications receive adequate time. The finding on teacher sex suggests that all teachers should be trained to foster a nurturing and supportive classroom environment, regardless of gender.

# CHAPTER ONE

## INTRODUCTION

### **Background to the Study**

Chemistry is a fundamental science subject that plays a crucial role in understanding the world around us. It is a vital component of the secondary school curriculum even at the higher institution, as it equips students with the knowledge and skills necessary to comprehend the properties, composition, and reactions of matter. Despite its importance, chemistry remains a challenging subject for many students, often due to its abstract nature and the requirement for practical application. Where chemistry is a central to many science -related courses offered in Nigeria at the universities and other tertiary institution these courses include biochemistry medicine pharmacy optometry engineering and many more.

Attitude, in the context of learning, refers to the predisposition to respond in a favorable or unfavorable manner with respect to a given attitude object (Oskamp and Schultz 2005). The attitude of students towards chemistry learning is a significant factor that influences their academic performance and interest in the subject. A positive attitude towards chemistry can enhance students' motivation, engagement, and overall academic achievement that is, Positive attitudes towards a subject like chemistry can lead to increased motivation, engagement, and ultimately, better academic performance. Conversely, negative attitudes can result in disinterest, anxiety, and poor achievement. Where a negative attitude can lead to poor performance and a lack of interest in pursuing

chemistry-related courses or careers. A solid foundation in chemistry is therefore essential for students aspiring to pursue careers in science-related disciplines

In secondary schools, chemistry is typically introduced as a fundamental science subject, which aims to equip students with basic chemical concepts, principles, and practical skills. where the learning of chemistry is often seen as been difficult by students Factors such as the abstract nature of some concepts, the use of symbolic representations (e.g., chemical formulas and equations), and the mathematical concepts can contribute to negative attitudes towards the studying of the subject, Chemistry is a functional subject which relates to our daily activities . Despite its importance, many secondary school students struggle with chemistry, often due to a lack of interest or negative attitudes towards the subject (Osborne et al., 2003). Research has shown that student attitudes towards chemistry can significantly impact their academic performance and future career choices (Koballa & Glynn, 2007).

Several factors can influence student attitudes towards chemistry, including teaching methods and styles, curriculum design, and teacher characteristics. Effective teaching methods and styles can engage students and promote deeper learning, while a well-designed curriculum can help students see the relevance and importance of chemistry in their lives. Additionally, research has suggested that teacher characteristics, such as sex, may also impact student attitudes and learning outcomes (Hedges & Nowell, 1995).

Understanding and addressing the factors that influence students' attitudes towards chemistry is therefore crucial for improving teaching and learning outcomes. Many

factors could contribute to student's attitude towards studying Chemistry such as; age, career interest, social view of science and scientists, social implications of Chemistry or cognitive styles of students (Uzum, 2018). Salta & Koulougliotis (2011) identified the factors that could positively influence students' attitude to learn Chemistry; these factors could be organized into three main categories: teaching approaches, educational tools, and non-formal educational material curriculum topic and activities. Science teachers bear on their shoulders a huge responsibility of promoting and developing students' positive attitudes regarding science as a school subject (Delmang & Gongden, 2016). (Adesoji, 2008) reported that there is a relationship between attitude and methods of instruction, and also between attitude and achievement; and that it is possible to predict achievement from attitude scores. this study will discuss the importance of good teaching method, and determining if the gender of the teachers influences the students attitude, the influence of suitable curriculum topics for various level in secondary school and the importance of availability of laboratory facilities for effective teaching and learning of chemistry in school in Nigeria, specifically within Edo State particularly in Egor local government area. this study tends to relate the performance of students in science subjects, particularly chemistry, which has been a subject of concern in national examinations. While highlighting various factors that contribute to it, teacher factors, school factors and students' attitude is believed to play a significant role towards chemistry teaching and learning

## **Statement of the Problem**

The learning of chemistry specifically had been a subject of concern likewise the teaching of chemistry. Many students in secondary schools in Nigeria, particularly in the Egor Local Government Area of Edo State, seem to struggle with chemistry, portraying negative attitudes towards the subject. This study aims to assess the attitudes of secondary school students towards chemistry learning in the Egor Local Government Area, Edo State, with a view to identifying the factors that influence these attitudes and proposing proper and better strategies for improvement.

Despite the importance of chemistry in scientific and technological development, many secondary school students exhibit negative attitudes towards its learning. This can manifest as a lack of interest, fear of the subject's complexity, and a perception of it being difficult and irrelevant to their future aspirations which could result from the teaching method and style, availability of adequate and up to date facilities and equipment. These negative attitudes can significantly impede students' motivation to learn, their engagement in classroom activities, and ultimately, their academic performance in chemistry. many secondary school students in Nigeria exhibit negative attitudes towards the subject, which can lead to poor academic performance and a lack of interest in pursuing careers in science, technology, engineering, and mathematics (STEM) fields. While previous research has explored various factors that influence student attitudes towards chemistry, there is a need for more specific investigation into the impact of

teaching methods, teaching style, curriculum, and sex of chemistry teachers on student attitudes in the Nigerian context.

Past evidence and general observations within the educational system in Edo State suggest that chemistry is often viewed as a challenging and less preferred subject by many secondary school students. Without a clear understanding of the specific attitudes held by students in this locality, it becomes difficult to develop targeted and effective strategies to address any existing negative perceptions and subject achievement and promote a more positive learning environment for chemistry.

Therefore, this study seeks to address by assessing the attitudes of secondary school students towards chemistry learning in Egor Local Government Area, Edo State.

### **Research Questions**

The following research questions were raised to guide this study:

1. What are the attitudes of secondary school students towards chemistry learning in the Egor Local Government Area, Edo State?
2. Does the different teaching methods and styles influence student attitudes towards chemistry learning
3. Does the chemistry curriculum topics influence student attitudes towards chemistry learning
4. Does the sex of the chemistry teacher influence student attitudes towards chemistry learning, and are there any differences in teaching methods or styles between male and female chemistry teachers?

## **Purpose of the Study**

The broad objective of this study is to investigate the attitudes of secondary school students towards chemistry learning in the Egor Local Government Area, Edo State.

Specifically, the study seeks to:

1. Identify the various factors that influence students' attitudes towards chemistry learning.
2. identify effective teaching methods and styles that promote positive attitudes towards chemistry learning
3. examine the relationship between the chemistry curriculum topics and student attitudes towards the subject
4. explore potential differences in teaching approaches between male and female chemistry teachers and how it influences student attitudes and perceptions

## **Significance of the Study**

The need to assess the attitude of students towards chemistry learning cannot be underestimated in recent years and the product of this research work will be of benefit to government agencies principals of all school teacher, parents and guardians and the society at large

The findings can help teachers and educators understand the specific attitudes and challenges faced by students in learning chemistry. This research can be used to adapt teaching methods, develop more engaging instructional materials, and create a more positive learning environment. Insights into students' perceptions of different aspects of

chemistry learning can inform curriculum and topic developers about areas that may need to be revised or emphasized to enhance student interest and understanding thus curbing poor attitude of study towards chemistry senior secondary school student in egor local government area edo state

The study's findings can provide valuable information to policymakers and educational administrators in making informed decisions regarding resource allocation, teacher training, and the implementation of strategies to improve science education outcomes.

The study can raise awareness among parents, school administrators, and the wider community about the importance of fostering positive attitudes towards science subjects like chemistry.

### **Scope of the Study and Delimitation**

This study will focus on secondary school students in the Egor Local Government Area, Edo State, Nigeria. The target population will be students in senior secondary school (specifically, SS1 to SS3) offering chemistry as a subject in selected public and private secondary schools within the Local Government. Investigating the attitudes of students towards chemistry learning, identifying the factors that influence these attitudes but with a particular emphasis on the role or influence of the sex of the chemistry teacher, availability of laboratory facilities, curriculum topics and the teaching methods and style of the teacher

The study is delimited to:

Geographical area: Egor Local Government Area, Edo State.

Population: Senior secondary school students (SS1-SS3) offering chemistry in selected schools.

Subject matter: assessing Students' attitudes specifically towards chemistry learning

Factors such teaching methodologies employed by specific teachers, and the availability of laboratory resources, the influence of gender of the teacher and curriculum topics will be our primary focus

### **Operational Definition of Terms**

For clarity and consistency, the following terms are operationally defined within the context of this study:

1. **Attitude:** A student's disposition or feeling towards chemistry learning, which can be positive, negative, or neutral.
2. **Learning:** The process of acquiring knowledge and skills in chemistry, including understanding chemical concepts, principles, and processes.
3. **Secondary School Students:** Students enrolled in senior secondary school (specifically, SS1 to SS3) within the selected schools in Egor Local Government Area.
4. **Gender:** the characteristics of women, men, girls and boys that are socially constructed
5. **Facilities and equipment:** they are structures designed and built to serve a particular purpose and tools machinery and other items used within to carry out tasks

6. **Student:** a young individual usually a male or female who are duly registered as learners in a school to engage in learning process
7. **Chemistry teacher:** an educator specializing in teaching chemistry
8. **Curriculum topic:** covers a range of topics including atomic structure chemical bonding state of matter chemical reaction stoichiometry and periodic trends
9. **Teaching method:** refers to diverse strategies and technique teacher employ to facilitate learning in students
10. **Teaching styles:** refer to the different approaches educators use to deliver knowledge and facilitate learning
11. **Egor Local Government Area:** An administrative division within Edo State, Nigeria, which serves as the geographical focus of this study located at south-south geopolitical zone with the headquarter located at Uselu, Okhoro, Usen ,Uwelu, Iguikpe, Ugighoko, Iguediaye, Evbougide, Oghediavbiobaa Towns and Villages make up the Egor Local Government Area.

## CHAPTER TWO

### LITERATURE REVIEW

This chapter reviews relevant literature on students' attitudes towards chemistry learning focusing on some factors that influence these attitudes. Specifically, it delves into the influence of teaching methods and styles, sex of the teacher, curriculum topic and availability of laboratory resource. The review of related literature will be carried out under the following subheadings

- Theoretical framework
- Conceptual framework
- Intertwined concepts, and aspects of effective chemistry teaching and learning
- Students attitude towards chemistry
- Factors influencing student attitude towards chemistry teaching and learning
- The Influence of Teaching Methods and Styles
- The influence of sex of teacher on students attitude towards chemistry learning
- The Influence of Availability of Laboratory Facilities
- The influence of chemistry curriculum topic
- Related empirical studies
- Summary of review.

#### **Theoretical Framework**

These theories out of many other have been chosen as a guide on student attitude towards the learning of chemistry. The theories are

**Attitude Theory by Allport Gordon 1935:** he stipulated that “Attitudes are complex mental states that influence an individual's behavior and decision-making processes” (Allport,1935). In the context of learning chemistry, attitudes can affect students' motivation, engagement, and overall academic performance he proposed a theory called the Attitude Theory (Tripartite Model) which is a widely accepted model posing that an attitude comprises three components:

**Cognitive Component:** This refers to the beliefs, thoughts, and knowledge an individual hold about the attitude object (in this case, chemistry learning). For example, a student might believe that chemistry is a difficult subject requiring strong mathematical skills.

**Affective Component:** This encompasses the feelings and emotions associated with the attitude object. Examples include feeling excited, anxious, or bored when thinking about or engaging in chemistry activities.

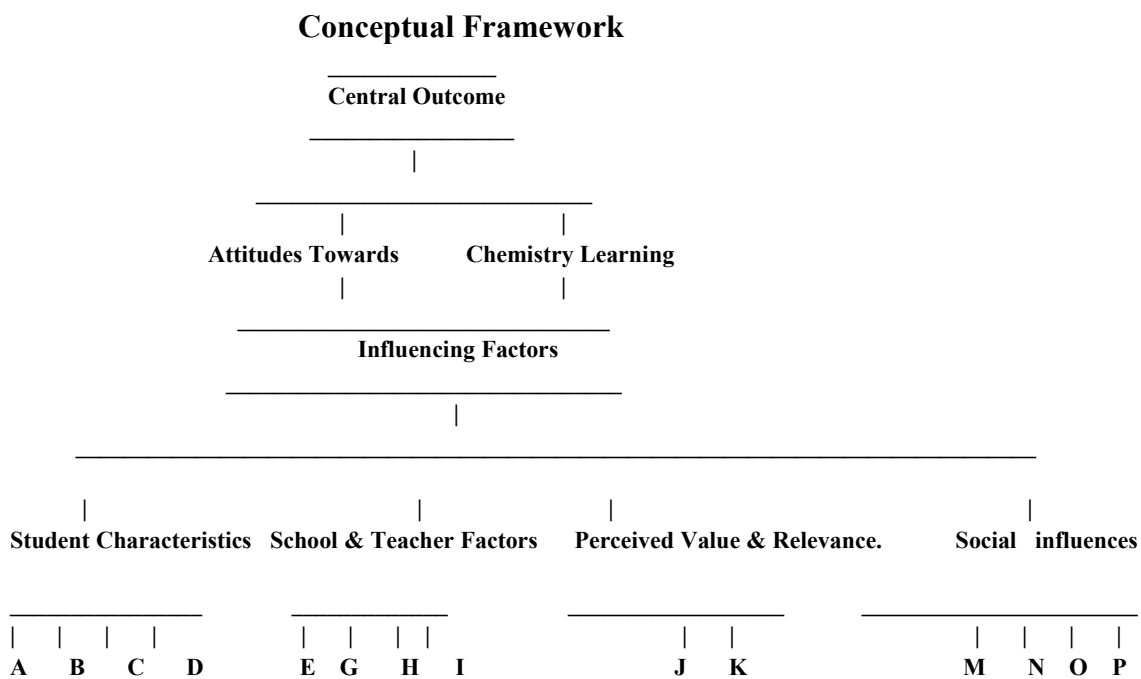
**Behavioral Component:** This refers to the individual's tendency to act in a certain way towards the attitude object. This could manifest as actively participating in chemistry lessons or tasks likewise avoiding chemistry-related tasks.

**Social Cognitive Theory by bandura 1986:** Students' attitudes towards chemistry can be influenced by their social environment, including their peers, teachers, and family members (Bandura, 1986). Social Cognitive Theory (Bandura) emphasizes the role of observational learning, social experiences, and reciprocal determinism (interaction between behavior, personal factors, and environment) in shaping attitudes. Students' attitudes towards chemistry can be influenced by observing the attitudes of peers,

teachers, and family members, as well as their own past experiences of success or failure in chemistry.

**Self-Determination Theory (Deci & Ryan):** This theory focuses on intrinsic and extrinsic motivation. Students who find chemistry learning intrinsically motivating (enjoyable and focused interesting) are more likely to have positive attitudes compared to those who are just grades

### Conceptual framework



A flow chart representation

### Student Characteristics

A[Socio-economic Background] --> F(Attitudes towards Chemistry);

B[Prior Academic Performance (Science)] --> F;

C[Gender] --> F;

D[Perceived Self-Efficacy in Chemistry] --> F;

E[Interest in Science/STEM] --> F

#### School & Teacher Factors

G[Teacher Quality & Teaching Methods] --> F;

H[Availability of Resources (Labs, Textbooks)] --> F;

I[School Climate & Support for Learning] --> F

#### Perceived Value & Relevance

J[Perceived Utility of Chemistry] --> F;

K[Perceived Relevance to Future Goals] --> F

L[Intrinsic Interest in Chemistry Topics] --> F;

#### Social Influences

M[Parental Attitudes & Support] --> F;

N[Peer Attitudes towards Chemistry] --> F;

O[Cultural Norms & Beliefs about Science] --> F;

Central Outcome: The central element is F is the attitudes towards chemistry teaching and learning

- Independent Variables: Teaching methods (e.g., hands-on activities, project-based learning), curriculum design (e.g., relevance, challenge)

- Dependent Variables: Student attitudes towards chemistry (e.g., interest, motivation, confidence)
- Moderating Variables: Sex of chemistry teacher, student prior knowledge and experiences

### **Intertwined Concepts and Aspects of Effective Chemistry Teaching and Learning**

Chemistry, at its core, delves into the nature of matter, exploring what it's made of, how it behaves in reactions, its structure, and the changes it undergoes. Chemistry as described by science buddies (2017), is the exploration of matter its composition behavior properties and transformation during chemical reactions It's deeply rooted in physics and branches out to influence numerous other fields like biology, engineering, technology, earth sciences, and medicine. Consequently, chemistry graduates find fulfilling careers in diverse sectors, including pharmaceuticals, metallurgy, commercial labs, research, forensics, universities, healthcare, food processing, the petroleum industry, biotechnology, toxicology, waste management, manufacturing, mining, medicine, agriculture, and forestry.

Chemistry bridges various disciplines, hence its graduates often collaborate with engineers, physicists, and biologists to tackle a wide array of societal challenges. Globally, chemistry is considered a foundational subject for those pursuing studies in engineering, medicine, and other fundamental and applied sciences in higher education. In fact, Oloruntegbe and Oduntuyi (2008) suggest that students lacking a strong

chemistry background, even with good grades in other sciences, will likely face difficulties in science, medicine, and engineering programs at the university level.

The teaching and learning of chemistry is a multifaceted process involving the effective transmission of chemical knowledge, the development of problem-solving skills, and the cultivation of positive attitudes towards the subject. It encompasses various pedagogical approaches, learning theories, and the unique characteristics of the chemical discipline.

Chemistry, often perceived as a challenging subject, necessitates a multifaceted approach to both teaching and learning for genuine understanding to flourish. Moving beyond rote memorization, effective chemistry education hinges on a dynamic interplay of content mastery, pedagogical skill, strategic instruction, insightful assessment, and the cultivation of a positive learning environment. Similarly, successful learning in chemistry involves conceptual understanding, robust problem-solving skills, practical laboratory experience, the ability to visualize abstract concepts, and metacognitive awareness. These aspects, though presented separately, are deeply interconnected and contribute synergistically to a rich and meaningful educational experience in chemistry.

At the heart of effective chemistry teaching lies content knowledge. This extends beyond a mere recall of facts and formulas; it requires a profound and accurate understanding of fundamental chemical concepts, principles, and theories, as highlighted by Shulman (1986). The instructor must not only possess this knowledge but also grasp the intricate connections between different ideas within the discipline. This interconnected

understanding allows the teacher to present the subject matter in a cohesive and meaningful way, rather than as a collection of isolated facts.

However, possessing deep content knowledge alone is insufficient. Pedagogical Content Knowledge (PCK), as Grossman (1990) emphasizes, is equally crucial. PCK involves the ability to transform subject matter knowledge into comprehensible forms for students. This includes understanding common student misconceptions, employing effective analogies and models, and selecting appropriate instructional strategies tailored to specific chemical concepts. A teacher with strong PCK can anticipate student difficulties and present information in a way that bridges the gap between the abstract nature of chemistry and the students' existing understanding.

The implementation of instructional strategies forms the practical manifestation of PCK. A diverse range of teaching methods can be employed in chemistry, including lectures, demonstrations, laboratory experiments, group work, discussions, and the integration of technology such as simulations and online resources. The selection of these strategies must be deliberate, aligning with the learning objectives and the nature of the content being taught. Effective instruction actively engages students, promotes critical thinking, and facilitates the development of a deeper understanding of chemical principles.

Assessment plays a vital role in gauging the effectiveness of both teaching and learning. Effective teaching incorporates ongoing assessment to monitor student understanding, identify areas of difficulty, and provide timely and constructive feedback. This can take various forms, including formative assessments like quizzes and in-class activities, as

well as summative assessments such as exams and projects. Assessment should not be viewed merely as a means of assigning grades but as an integral part of the learning process, providing valuable information for both the teacher and the student.

Finally, creating a positive learning environment is paramount for fostering a classroom atmosphere that encourages curiosity, inquiry, and active participation. Reducing anxiety related to the subject and promoting student confidence are essential for effective chemistry learning. When students feel comfortable asking questions, exploring ideas, and even making mistakes, they are more likely to engage deeply with the material and develop a genuine interest in chemistry.

Mirroring the key aspects of effective teaching are the crucial elements of successful chemistry learning. Conceptual understanding stands as the cornerstone, moving beyond the simple memorization of facts and algorithms. Meaningful learning in chemistry involves developing a deep understanding of underlying concepts and the ability to apply them in different contexts, as Bednar (1986) suggests. Students should strive to grasp the "why" behind chemical phenomena, not just the "what."

Developing strong problem-solving skills is another essential aspect of learning chemistry. Chemistry, by its nature, is a problem-solving discipline. Learning chemistry involves developing the ability to analyze problems, apply chemical principles, and use quantitative reasoning to arrive at solutions. This skill is not only crucial for academic success but also for real-world applications of chemical knowledge.

Laboratory skills form a practical and vital component of chemistry learning. Engaging in hands-on experiments allows students to develop manipulative skills, make observations, collect data, and interpret experimental results. This direct interaction with chemical phenomena helps to connect abstract concepts to real-world occurrences and fosters a deeper understanding of the scientific process.

The ability to engage in visualization and representation is particularly important in chemistry due to the abstract nature of many concepts. Chemistry often deals with entities (atoms, molecules) and processes (chemical reactions) that are not directly observable. Effective learning requires the ability to visualize these concepts through models, diagrams, and symbolic representations (Johnstone, 1991). This skill helps students bridge the gap between the macroscopic world they experience and the microscopic world of atoms and molecules.

Furthermore, developing metacognitive skills is crucial for students to become effective and independent learners of chemistry. Metacognition involves the ability to monitor one's own learning, identify strengths and weaknesses, and employ effective learning strategies. Students who are Metacognitively aware can take ownership of their learning and adapt their approach to overcome challenges.

It is important to acknowledge the inherent challenges involved in chemistry learning. The abstract nature of concepts, dealing with entities that are not directly observable, and the symbolic language of formulas, equations, and systematic nomenclature can be

overwhelming for beginners. Recognizing these difficulties and employing teaching strategies that address them directly is crucial for fostering student success.

## **Students Attitude towards Chemistry Learning**

What is Attitude?

In psychology and social sciences, an attitude refers to a relatively enduring organization of beliefs, feelings, and behavioral tendencies towards socially significant objects, groups, events, symbols, or ideas (Allport, 1935). It represents how an individual evaluates something, whether positively, negatively, or neutrally.

There are Positive Attitudes that students can have Towards Learning Chemistry which includes

**Curiosity:** Chemistry naturally sparks interest in students who want to understand how the world works at a molecular level. They are eager to learn about chemical reactions, molecules, and their properties.

**Perseverance:** Because chemistry can be challenging, students who are willing to work hard and keep trying even when concepts are difficult are more likely to have a positive attitude towards it.

**Creativity:** Learning chemistry can involve problem-solving and designing experiments, which students who enjoy this type of thinking may find appealing and develop a positive attitude.

Real-world relevance: Chemistry concepts have many practical applications, which can be interesting and motivating. Learning how chemicals interact in the environment can inspire students who care about environmental sustainability.

So also secondary school student may have Negative Attitudes Towards Learning Chemistry and they include

Lack of interest: Some students might find chemistry uninteresting and lacking in motivation.

Difficulty: Chemistry can be a challenging subject for students who struggle with understanding abstract ideas or the mathematical aspects involved.

Perception of chemistry: Students might see chemistry as a boring or irrelevant subject without real-life applications, leading to negative feelings.

Negative past experiences: Prior negative experiences with chemistry, such as low grades or negative feedback, can contribute to a negative attitude towards the subject.

Lack of confidence: Some students may lack the confidence to learn chemistry, which can hinder their learning and lead to negative attitudes.

Students' attitude towards chemistry encompasses their feelings, beliefs, and behavioral tendencies related to the subject. This attitude can range from enthusiasm and interest to anxiety and avoidance. A positive attitude is often associated with increased motivation, deeper learning, and a greater likelihood of pursuing further studies or careers involving chemistry (Osborne et al., 2003). Conversely, a negative attitude can lead to disengagement, poor performance, and a reluctance to engage with the subject matter.

Interest and Enjoyment play a crucial role in shaping a student attitude the level of intrinsic motivation and pleasure students experience when learning about chemistry can significantly influence their willingness to delve deeper and persevere through furthermore Perceived Relevance and Value of chemistry are critical determinant of attitude Students attitudes are more likely to develop a positive outlook when they understand how chemistry relates to their lives, future careers, and broader societal issues. Students who feel confident in their ability to understand and succeed in chemistry are strongly linked to positive attitude. Students who feel capable are more likely to approach the subject with enthusiasm and resilience Conversely Anxiety and Fear often stemming from Negative experiences, perceived difficulty, or societal stereotypes can lead to a negative attitude towards chemistry finally, a student's attitude can influence Behavioral Intention affecting their willingness to participate in chemistry-related activities, seek help when needed, or choose chemistry-related courses in the future.

### **Factors Influencing Students' Attitude towards Chemistry Learning**

Previous research has identified several interconnected factors that significantly influence students' attitudes towards chemistry. These factors can be broadly categorized into teacher-related, curriculum and content-related, student-related, and socio-cultural and environmental factors.

#### **Teacher-Related Factors**

A teacher's characteristics, including their enthusiasm, pedagogical skills, and ability to create a supportive learning environment, play a crucial role. Engaging, interactive, and

student-centered teaching approaches promote understanding and application, fostering positive attitudes. In contrast, teacher-centered approaches can lead to negative attitudes ([Hatiya, 2013]). Studies have shown that demonstrations, experiments, and group work are more effective than traditional lectures. A teacher's genuine interest in chemistry can also positively influence students' attitudes ([Rand et al, 2007]). Teachers' qualifications and experience also impact students' attitudes ([Darling-Hammond, 2000]). A supportive teacher who builds rapport with students creates a more positive learning environment. Clear explanations of concepts and expectations increase student confidence, and the use of effective analogies and models enhances understanding.

### **Curriculum and Content-Related Factors**

Students are more likely to have positive attitudes if they perceive the chemistry curriculum as relevant to their lives and future aspirations. The abstract nature and symbolic language of chemistry can contribute to negative attitudes if not addressed effectively. Connecting chemistry concepts to real-world applications and students' interests increases engagement ([Gilbert, 2006]). Hands-on experiments make learning more enjoyable ([Abrahams, 2009]), and assessment methods that focus on understanding rather than just recall can reduce anxiety.

### **Student-Related /school factors**

Students with a strong foundation in science and mathematics are more likely to develop a positive attitude. A general interest in science also makes students more receptive to chemistry. Teaching methods that cater to diverse learning styles enhance engagement.

Students' beliefs in their ability to succeed significantly influence their attitudes. Prior success in chemistry also fosters positive attitudes. Pre-existing anxiety towards science or mathematics can negatively impact attitudes.

### **Socio-Cultural and Environmental Factors**

The attitudes and beliefs of family members and peers can shape a student's attitude. Negative stereotypes about chemistry can influence students' perceptions. Media portrayals of science and scientists can also impact students' interest. Access to well-equipped laboratories, quality learning materials, and a supportive school environment positively influence attitudes ([Hodson, 1996])

### **The Influence of Teaching Methods and Styles**

The pedagogical approaches employed by teachers are widely recognized as significant determinants of students' engagement, comprehension, and ultimately, their attitude towards a subject like chemistry. Traditional, teacher-centered methods, often characterized by lectures and rote memorization, have been critiqued for fostering passive learning and potentially negative attitudes (Akinbobola & Afolabi, 2010). Conversely, student-centered approaches, which encourage active participation, critical thinking, and problem-solving, are often associated with improved attitudes and academic performance. Research highlights various teaching methods and styles that can positively or negatively impact students' attitudes towards chemistry

**Lecture-Based vs. Activity-Based Learning:** While lectures can be useful for introducing concepts, an over-reliance on them can lead to boredom and disengagement

(Duit & Treagust, 2003). Activity-based learning, which includes practical experiments, group work, demonstrations, and real-world applications, has been shown to make chemistry more tangible, interesting, and relatable for students. For instance, a study by Obebe (2011) found that students exposed to activity-based teaching methods exhibited significantly more positive attitudes towards science, including chemistry, compared to those taught through conventional lecture methods.

**Inquiry-Based Learning:** This method encourages students to ask questions, design experiments, collect and analyze data, and draw conclusions. By engaging students in the process of scientific inquiry, it can foster curiosity, critical thinking, and a deeper understanding of chemical principles, thereby enhancing their attitude towards the subject (Bybee, 2014). Students become active constructors of knowledge rather than passive recipients, which can lead to increased confidence and enjoyment.

**Cooperative Learning:** This involves students working together in small groups to achieve a common goal. This method promotes peer interaction, discussion, and collaborative problem-solving. Research by Johnson and Johnson (1999) consistently shows that cooperative learning leads to higher achievement, more positive attitudes towards the subject matter, and greater social skills. In chemistry, cooperative learning can facilitate the understanding of complex concepts through peer explanation and shared responsibility.

**Use of Instructional Materials and Technology:** The effective use of visual aids, models, simulations, and educational technology (e.g., interactive whiteboards,

educational software, virtual labs) can make abstract chemical concepts more concrete and engaging (Yusuf & Onasanya, 2014). For example, visualizing molecular structures through 3D models or simulating chemical reactions can significantly enhance understanding and make learning more exciting, thereby improving attitudes. However, the mere presence of technology is not enough; its integration must be pedagogically sound.

**Teacher Enthusiasm and Communication Style:** A teacher's enthusiasm for chemistry can be infectious. Teachers who demonstrate passion, communicate clearly, use relatable examples, and encourage questions tend to cultivate more positive attitudes among their students (Fraser & Walberg, 1991). Conversely, a monotonous delivery or a dismissive attitude can quickly disengage students. The clarity of explanations, the ability to simplify complex ideas, and the provision of constructive feedback are also crucial aspects of effective communication that influence student attitudes.

**Relevance and Real-World Connections:** Students are more likely to be interested in chemistry when they perceive its relevance to their daily lives and future careers. Teachers who connect chemical concepts to real-world phenomena, industrial applications, environmental issues, and health implications can significantly improve student attitudes (Bennett & Hogarth, 2009). Demonstrating how chemistry underpins everyday products, medical advancements, or environmental solutions can make the subject more meaningful and appealing.

## **The Influence of Sex of Teacher on Students Attitude towards Chemistry Learning**

The influence of a teacher's sex on student attitudes towards learning, particularly in subjects like chemistry, is a topic that has garnered attention in educational research. While the primary emphasis in effective teaching is often placed on pedagogical skills, subject matter expertise, and interpersonal qualities, some studies have explored whether a teacher's gender plays any role in shaping student perceptions and engagement.

**Role Model and Identification:** One perspective suggests that teachers of a particular sex might serve as role models for students of the same sex, potentially leading to increased engagement or a more positive attitude towards the subject (Shakeshaft & Nowell, 1984). For instance, female students might feel more comfortable or inspired in a chemistry class taught by a female teacher, especially in a field historically perceived as male-dominated. This can be particularly relevant in encouraging girls to pursue STEM subjects. However, empirical evidence supporting this direct link in terms of attitude rather than participation rates can be mixed.

**Perceived Teaching Style and Attributes:** Some research has explored whether students perceive differences in teaching styles or attributes between male and female teachers. For example, some studies, though not universally conclusive, have suggested that female teachers might be perceived as more nurturing, supportive, or empathetic, which could foster a more positive learning environment for some students (Beilock et al., 2010). Conversely, male teachers might be perceived as more authoritative or direct. However, these are generalizations, and individual teacher characteristics far outweigh any potential

gender-based stereotypes. A teacher's individual personality, teaching philosophy, and classroom management style are far more significant than their sex.

**Student Gender and Teacher Gender Interaction:** It's also possible that the interaction between student gender and teacher gender might influence attitudes. For example, a study by Dee (2007) found that both male and female students perform better when taught by female teachers in elementary school, but this effect becomes more nuanced in higher grades and across different subjects. In the context of chemistry, some qualitative studies suggest that some female students report feeling more encouraged or less intimidated in classes with female chemistry teachers. However, these findings are often anecdotal and not consistently supported by large-scale quantitative research directly linking teacher sex to improved student attitudes towards chemistry. It is then noted that many studies conclude that the sex of the teacher, in isolation, has little to no significant direct impact on student attitudes towards a subject, including chemistry, when other factors are controlled (e.g., teaching experience, qualifications, pedagogical effectiveness). The quality of teaching, regardless of the teacher's sex, is consistently found to be the most critical factor (Ehrenberg et al., 1995). A highly skilled, enthusiastic, and supportive teacher, whether male or female, is more likely to foster positive student attitudes. Factors such as clarity of instruction, ability to explain complex concepts, fairness in grading, and creating an engaging classroom environment are far more influential than the teacher's sex.

## **The Influence of Availability of Laboratory Facilities**

The availability and functionality of chemistry laboratory facilities are critical factors that profoundly influence secondary school students' attitudes towards chemistry learning. Chemistry is an experimental science, and practical work in a well-equipped laboratory is indispensable for a comprehensive understanding of its concepts, principles, and applications. Without adequate laboratory exposure, students are often left with a theoretical and abstract understanding that can lead to disinterest and negative attitudes.

**Bridging Theory and Practice:** A well-equipped laboratory allows students to bridge the gap between theoretical knowledge learned in the classroom and the practical realities of chemical phenomena (Amazigo, 2020). "Seeing is believing" holds true in chemistry; when students can observe reactions, manipulate chemicals, and conduct experiments, abstract concepts become concrete and meaningful. This hands-on experience enhances understanding and retention, making the subject less daunting and more engaging (Oladipo, 2021). Studies consistently show that practical activities contribute significantly to students' understanding and recall of concepts (Etiubon & Udoh, 2017).

**Fostering Scientific Skills and Attitudes:** Chemistry practicals provide opportunities for students to develop essential scientific skills, such as observation, measurement, data recording, analysis, interpretation, hypothesis formulation, and problem-solving (Dangbin, 2014; Tesfamariam et al., 2014). Beyond skills, laboratory experiences cultivate crucial scientific attitudes like curiosity, critical thinking, objectivity, skepticism, precision, confidence, and perseverance (Musa, 2000; Shana & Abulibdeh, 2020). When

students actively engage in scientific inquiry, they develop a sense of ownership over their learning and a more positive disposition towards chemistry.

**Enhanced Engagement and Motivation:** The interactive nature of laboratory work can significantly boost student engagement and motivation. Unlike traditional lecture methods, practical activities offer a dynamic and exciting learning environment. Students often look forward to practical sessions as they provide a break from conventional classroom routines and allow for active participation and discovery (Akanwa et al., 2018). This increased interest can translate into a more positive overall attitude towards the subject.

It is worthy to note that Despite the recognized importance of laboratory facilities, many secondary schools in Nigeria face significant challenges regarding their availability and functionality. These challenges often include:

**Inadequate Funding** which a pervasive issue is the lack of sufficient government funding for constructing, equipping, and maintaining chemistry laboratories (ResearchGate, 2025; Yusuf & Onasanya, 2014). This leads to dilapidated structures, obsolete equipment, and a severe shortage of essential chemicals and reagents. Another is **Poor Maintenance and Utilization**, even when laboratories exist, they may be poorly maintained, with broken equipment or expired chemicals (Dangbin, 2014). Furthermore, some teachers may not adequately utilize the available facilities due to a lack of training, heavy workload, or a preference for theoretical instruction (Opara, 2008). So also there is **Lack of Qualified Laboratory Staff** where Many schools lack dedicated and qualified laboratory assistants

or technologists, who are crucial for preparing experiments, maintaining equipment, and ensuring safety (ResearchGate, 2025). This often burdens the chemistry teacher with additional responsibilities, limiting their time for effective practical instruction. A very common challenge is Overcrowded Classrooms, Large class sizes often make it difficult to conduct meaningful practical work, as there may not be enough equipment or space for all students to participate actively and safely (ATBU Journal of Science, Technology and Education, 2023).

### **The Influence of Chemistry Curriculum Topic**

The design and content of the chemistry curriculum play a pivotal role in shaping students' attitudes towards the subject. A well-structured curriculum that is relevant, engaging, and appropriately challenging can foster positive attitudes, while a poorly designed or abstract curriculum can lead to disinterest, frustration, and negative perceptions. In Nigeria, the Senior Secondary School Chemistry curriculum, often guided by bodies like the Nigerian Educational Research and Development Council (NERDC) and the West African Examinations Council (WAEC), aims to provide students with a foundational understanding of chemistry concepts and their applications.

One of the most significant influences of curriculum topics on student attitude is the perceived difficulty of certain concepts. Research in Nigeria and globally consistently indicates that some chemistry topics are inherently more challenging for students, leading to a sense of inadequacy and disinterest. Common examples of such difficult topics often include:

Mole Concept and Stoichiometry: These quantitative aspects of chemistry, involving calculations and abstract thinking, are frequently cited as stumbling blocks for students (AASCIT, n.d.; ResearchGate, 2024). The inability to grasp these fundamental concepts can hinder understanding of subsequent topics.

Chemical Bonding and Structure: The abstract nature of atomic and molecular structures, types of bonds, and intermolecular forces can be challenging for students to visualize and comprehend without adequate models or visual aids (Pedagogical Research, 2024).

Organic Chemistry (e.g., Nomenclature, Isomerism, Reaction Mechanisms): The extensive nomenclature, isomerism, and often complex reaction mechanisms in organic chemistry can be overwhelming for students, leading to rote memorization rather than conceptual understanding (ResearchGate, 2024).

Electrochemistry (e.g., Redox Reactions, Electrolysis, Electrochemical Cells): These topics involve abstract concepts of electron transfer, potentials, and cell setups, which students often find difficult to relate to real-world applications without practical demonstrations (ERIC, n.d.).

Thermodynamics and Chemical Kinetics: Concepts like enthalpy, entropy, reaction rates, and equilibrium, which involve mathematical reasoning and abstract principles, are often perceived as highly difficult (ResearchGate, 2024).

When students repeatedly encounter topics they perceive as difficult, it can lead to a feeling of being overwhelmed, a lack of confidence, and ultimately, a negative attitude

towards chemistry. This is often exacerbated by teaching methods that rely heavily on rote learning rather than conceptual understanding and problem-solving (ERIC, n.d.).

**Relevance and Application of Content:** The extent to which curriculum topics are perceived as relevant to students' daily lives and future aspirations significantly influences their attitude. A curriculum that is seen as purely theoretical and detached from real-world applications can lead to disengagement (Greenresearch, n.d.). Conversely, when teachers connect chemistry concepts to everyday phenomena, industry, environmental issues, and career opportunities, students are more likely to appreciate the subject's value and develop a positive attitude.

For instance, topics related to water treatment, food chemistry, everyday consumer products (soap, detergents, cosmetics), pharmaceuticals, or environmental pollution can be made highly relevant and engaging. However, a common criticism of the current curriculum implementation is the failure to adequately emphasize these real-world connections (ResearchGate, 2024).

**Depth vs. Breadth of Content:** The Nigerian chemistry curriculum, like many others, is often criticized for being too broad, covering a vast array of topics without sufficient depth (AASCIT, n.d.). This "mile wide and inch deep" approach can lead to superficial learning and an inability for students to grasp core concepts thoroughly. When the curriculum is overloaded, teachers may rush through topics, relying on lectures and rote memorization rather than fostering deep understanding and critical thinking. This can frustrate students and contribute to negative attitudes. Some researchers suggest that "less

is actually more" when it comes to curriculum content, allowing for deeper engagement and understanding (SciELO México, n.d.).

**Emphasis on Practical Work and Inquiry:** The curriculum's explicit and implicit emphasis on practical work and inquiry-based learning also influences student attitudes. While the Nigerian curriculum outlines practical activities, the actual implementation often falls short due to resource constraints and teacher limitations (ResearchGate, 2025). A curriculum that merely lists topics without adequately facilitating hands-on exploration and problem-solving can perpetuate the perception of chemistry as an abstract and uninteresting subject. Students' engagement and positive attitudes are significantly boosted when they can actively participate in experiments and investigations related to curriculum topics (ResearchGate, 2025; Pedagogical Research, 2024). Moreover the logical sequencing and coherence of topics within the curriculum are crucial. If concepts are introduced without a clear prerequisite foundation, students can quickly become lost and demoralized. For example, a strong understanding of atomic structure is essential before delving into bonding or periodic trends. A curriculum that ensures a logical progression of ideas, building from simpler to more complex concepts, can enhance understanding and prevent negative attitudes arising from confusion.

### **Related Empirical Studies**

A study by Yunus and Ali (2012) stated that there are many factors that contribute to students' success which among there is the students' attitude towards learning. The result reveals that most students have positive attitude towards learning Chemistry when they

conduct experiment in laboratory and teachers' teaching style while some show negative attitude towards Chemistry because of lacking interest in the subject and also the syllabus itself. Some researchers reported that the low performance in chemistry is attributed to the negative attitude towards learning and teaching chemistry and ineffective use of instructional techniques and teaching aids by chemistry teachers (Musengimana et al., 2021; Nidup et al., 2021; Timilsena et al., 2022) A research by Arniezca & Ikhsan, (2021) states that students have positive attitude towards Chemistry when it comes to the relevance of the subject, They further suggest that teachers need to motivate and enhance Chemistry teaching to increase students' positive attitude towards Chemistry as a subject. These factors can cause variation in students' attitudes and academic achievement in chemistry. concrete evidence and insights into the issues

In Obebe, B. J. (2011) work titled Effect of Activity-Based Teaching Method on Students' Achievement and Attitude Towards Science in Secondary Schools in Southwestern Nigeria, this study investigated the effect of activity-based teaching method on students' achievement and attitude towards science (including chemistry) in secondary schools. and The findings revealed that students exposed to activity-based teaching methods exhibited significantly more positive attitudes towards science compared to those taught through conventional lecture methods. The hands-on activities, practical demonstrations, and student-centered approaches fostered greater engagement and interest, translating into improved attitudes. This outcome supports the notion that active

learning strategies are more effective in cultivating positive attitudes than traditional, passive methods.

In another work by Ajayi, A. T. (2024) effects of Hands-On Teaching Strategy on Senior Secondary Chemistry Students' Attitude toward Organic Chemistry The study specifically examined the impact of a hands-on teaching strategy on senior secondary school students' attitude towards organic chemistry, a topic often perceived as difficult. And the study revealed that students' attitude towards Chemistry was negative before treatment (hands-on strategy) and became significantly positive after treatment. Students taught with the hands-on strategy performed better and showed more positive attitudes than those taught using conventional methods. This reinforces the effectiveness of practical, hands-on approaches in improving attitudes, particularly for complex topics like organic chemistry. In another study On the Effect of Contextual Based Instruction on Secondary School Students Attitude and Academic Achievement Towards Chemistry, the study investigated how teaching chemistry by relating concepts to real-world contexts and daily life influences student attitudes. Studies in this domain generally indicate that when chemistry is taught with a focus on its real-world relevance and applications (e.g., chemistry of food, water, environment, everyday products), students perceive the subject as more useful and interesting. This relevance-based instruction is found to lead to a more positive attitude towards chemistry, as students can see the practical value of what they are learning.

Ojobola, S. O., Ogundare, S. F. & Babalola, S. F. (2023) Gender Influence as a Determinant of Chemistry Teachers' Academic and Professional Competencies in Southwestern Nigeria, while not directly measuring student attitude towards teacher's sex, this study explored whether male and female chemistry teachers differ in their academic and professional competencies, which indirectly influences teaching effectiveness and subsequently student attitudes. The study revealed that while male and female teachers were not significantly different in their academic competencies, female teachers were significantly more competent in their professional competencies (professional knowledge, skills, values, attitude, and conduct) than their male counterparts. This suggests that female teachers might exhibit certain professional qualities (e.g., nurturing, classroom management, pedagogical approaches) that could indirectly contribute to a more positive learning environment and potentially influence student attitudes, though this study does not directly measure the impact on student attitude based on teacher gender.

Sibomana, J. D., & Nsanzabaganwa, M. (2021) Effect of Gender Perspective towards Performance of Chemistry Education in Secondary School (A case study of Kigali, Rwanda). This study investigated various factors influencing chemistry performance, including gender-related aspects of teachers' attitudes and student perceptions.

The study found a slight difference in attitude between boys and girls, with both generally having positive attitudes towards chemistry education. While the study primarily focused on performance, it indirectly touched on teacher attitudes towards girls in chemistry. Teachers showed a generally positive attitude towards girls in science,

confirming that girls get equal opportunities. However, some teachers held negative views, such as girls not participating as actively or fearing chemistry. This implies that while teacher gender itself might not be a direct determinant, prevailing gender stereotypes or teacher expectations (regardless of their own sex) can subtly influence student attitudes and participation. The study points to the need for gender-sensitive training for teachers

The Determinant of Educational Outcome in Chemistry Practical in Secondary Schools in Ibadan Less City, Nigeria. (Authors likely from the Department of Teacher Education, University of Ibadan, as per the journal's focus) (2025 - recent publication). This study examined if laboratory adequacy and students' attitudes predict students' educational outcomes in chemistry practical. The study revealed "inadequate laboratory facilities" as a significant issue. While it found both positive and negative student attitudes towards chemistry practical, it concluded that "laboratory facilities ( $\beta=.022$   $P>.05$ )" and "students' attitude ( $\beta=.102$   $P>.05$ )" were weak predictors of students' achievement in chemistry practical. This outcome, surprisingly, suggests that despite the inadequacy, the direct statistical correlation between facility availability and attitude/achievement might be weak in this specific context, possibly due to other overriding factors or coping mechanisms (e.g., improvisation by teachers). However, the study still advocates for improved facilities, recognizing their inherent importance for quality practical work.

Inadequate Laboratory Facilities and Utilization: Pedagogical Hindrance to Students' Academic Performance in Biology in Senior Secondary Certificate Examination in Zaria

Metropolis, Kaduna State, Nigeria by Lakpini, M. A., & Atadoga, M. S. (2015) While primarily on Biology, the findings regarding laboratory inadequacy are highly relevant to Chemistry. It assessed the availability and utilization of laboratory facilities and their relationship with student performance. The study revealed "inadequate availability and utilization of laboratory facilities" in senior secondary schools. It concluded that inadequate facilities "affect meaningful teaching and learning in schools and hinder academic performance." Although the direct impact on attitude was not the primary focus, the link between inadequate facilities, hindered learning, and ultimately poor performance strongly implies a negative influence on student attitude towards practical-oriented subjects like chemistry. The study found a significant relationship between laboratory facilities and student performance.

Identification of Difficult Topics in Chemistry Curriculum as Perceived by Secondary School Students in Ado Ekiti, Nigeria by Olugbuyi, E. A., Hamed, O. S., & Adaramoye, R. R. (2024 - appears as a 2023 publication in some databases). This study aimed to identify the chemistry topics perceived as difficult by secondary school students in Ado Ekiti, Ekiti State, and explore the reasons for these difficulties. The study identified "carbonyl compounds, polymerization, esterification, and thermodynamics" as among the top difficult concepts. The factors contributing to this difficulty included "methods of teaching used by the teacher, lack of well-equipped laboratory, and misconception of principles and concepts." This directly links the perceived difficulty of curriculum topics

to factors that can negatively impact student attitudes. When topics are consistently difficult due to teaching methods or lack of resources, students develop negative attitudes.

Perception of Difficult Topics in Chemistry Curriculum by Senior Secondary School (II) Students in Imo State, Nigeria. by AASCIT (American Association for Science and Technology) (n.d. - often cited in older reviews) This study explored the extent to which SS2 students in Owerri Municipal Council perceive chemistry topics as difficult and the reasons for these difficulties. The study found that students perceived topics like "Mass volume relationship (Stoichiometry), hydrocarbons, and alkanols" as difficult. Key reasons identified for these difficulties included "students are not often exposed to practicals, excursion/field trips, teachers do not take time in explaining the basic terminologies in Chemistry, lack of proper supervision by the teachers to students to know their area of difficulties makes the students have a laissez-faire attitude towards Chemistry." This study explicitly links the difficulty of curriculum topics, lack of practical exposure, and inadequate teaching approaches to the development of a "laissez-faire attitude" (negative or indifferent) towards chemistry.

### **Summary**

This chapter delves into the several elements within the research landscape concerning student attitudes towards chemistry learning and the factors surrounding it. Theoretical frameworks were established for understanding the multifaceted aspects and drawing conceptual framework in which the relationship explored Effective chemistry teaching and learning as intricately linked processes that go beyond the simple transmission and

reception of information. Successful chemistry teaching and learning requires instructors to possess deep content knowledge and pedagogical content knowledge, employ diverse and engaging instructional strategies, utilize assessment as a tool for learning, and cultivate a positive and supportive classroom environment. Similarly, effective chemistry learning involves developing conceptual understanding, strong problem-solving and laboratory skills, the ability to visualize abstract concepts, and metacognitive awareness.

The literature review highlights the complexity of students' attitudes towards chemistry learning. By understanding the factors that influence attitudes indicating how educators can create a more engaging and effective learning environment for students agreeing that these factors affect students in some ways and it is possible to draw conclusion from the literature review that attitude towards chemistry and factors surrounding are very correlated.

These empirical studies provide a strong foundation for understanding the multifaceted influences on secondary school students' attitudes towards chemistry learning in Nigeria, emphasizing the critical roles of teaching methodologies, availability of practical facilities, and the inherent nature and presentation of curriculum topics. effective chemistry teaching moves beyond mere content delivery to encompass strategies that actively involve students, make the subject relatable, and foster a sense of discovery. When teachers adopt diverse, student-centred and engaging methodologies, students are more likely to develop a positive and lasting attitude towards chemistry learning. the chemistry curriculum, through its content, perceived difficulty of topics, emphasis on

relevance and practical work, and overall structure, significantly impacts students' attitudes. For a positive attitude to flourish, the curriculum needs to be seen as manageable, relevant, and conducive to active, hands-on learning, allowing students to genuinely engage with and understand chemical principles rather than merely memorize facts. The availability of well-equipped and functional chemistry laboratories, coupled with their effective utilization, is not merely an advantage but a fundamental requirement for fostering positive attitudes and promoting meaningful learning among secondary school students in chemistry. Investment in laboratory infrastructure and teacher training in practical pedagogy is crucial for improving chemistry education outcomes in Nigeria, while the idea of role-model or perceived gender-specific teaching attributes might suggest a potential influence of teacher sex, the overwhelming consensus in educational research is that the effectiveness of teaching, characterized by strong pedagogical skills, deep subject knowledge, and positive teacher-student relationships, is paramount. Any observed differences attributable to the sex of the teacher are often marginal and overshadowed by the individual teacher's competence and dedication. Therefore, while it is a variable worth considering, the sex of the teacher is generally not considered a primary determinant of student attitudes towards chemistry learning.

## **CHAPTER THREE**

### **METHODOLOGY**

This chapter outlines and describes the methodology used in the study which are the research design, population, sample, sampling technique, research instrument, validity and reliability of instrument data collection procedure, and data analysis plan for the study on assessment of secondary school students' attitudes towards chemistry learning in the Egor Local Government Area, Edo State.

#### **Design of the Study**

This research employed a descriptive survey design. This approach was chosen because the study aimed to explain an existing phenomenon -which involved collecting data from a sample of participants to describe the characteristics, attitudes, or behaviors of a population. The survey design is suitable for this study because it allows for the collection of data from a large number of participants, providing a comprehensive understanding of secondary school students' attitudes towards chemistry learning in Egor local government area Edo state with set of fixed questions relating to the research question.

#### **Population**

The population of this study consists of all secondary school students in the Egor Local Government Area, Edo State, Nigeria.

#### **Sample and sampling procedure**

A sample of 50 secondary school students was selected from 5 secondary schools in the Egor Local Government Area using a multi-stage sampling technique. The sampling

technique involved the following stages: Stage 1 Random selection of 5 schools from the list of secondary schools in the Egor Local Government Area, Stage 2 Random selection of 50 students from all selected school. The sample consisted of 50 students selected from 5 randomly chosen secondary schools in egor local government area from which 10 students from each of the five selected schools were similarly randomly selected from egor LGA that were used. The respondents were administered a questionnaire, and they were assured that their responses would be voluntary

### **Research Instrument**

A questionnaire titled "Secondary School Students' Attitude towards the Learning of Chemistry" (SSACTLQ). was the instrument used for data collection. This questionnaire was divided into two sections: Section A, which gathered demographic information (sex, class school name and type,) and Section B, 20 Items measuring students' attitudes towards chemistry learning which contained structured questions related to the research questions (Strongly Agreed to Strongly Disagreed).

### **Validity of the Instrument**

The questionnaire's validity was ensured through review and was validated by the project supervisor and two experts in measurement and evaluation, necessary corrections were made based on their objective recommendations and the corrections were effected in the final draft of instrument

### **Reliability of the Instrument**

A pilot test was used to establish the reliability and was done using the test-retest method. The questionnaire was administered to 10 students who were part of the population of the study but did not form part of the main sample in Egor. The reliability coefficient was determined using the test-retest method, indicating that the instrument was trustworthy and reliable.

### **Methods of Data Collection**

The researcher personally administered the questionnaires to the respondents and collected them directly on spot this helped to guide against the risk of non-return. All necessary instruction was made available to the respondents on how to duly complete the instrument A total of 50 copies of the questionnaire were distributed to and retrieved from the students.

### **Method of Data Analysis**

The collected data will be analyzed using descriptive and inferential statistics the data collected for this study were analyzed using simple percentages and standard deviation. These statistical methods were employed to answer the research question.

## CHAPTER FOUR

### PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter presents the analysis of data collected secondary school students in Egor local government area on their attitude towards chemistry learning, presentation and analysis of data gathered through the use of questionnaire distributed to the respondents, which was structured according to the four research questions that guided the study. During the survey fifty questionnaire was administered and was returned completed. The data is presented using frequency distributions percentages mean scores and standard deviation.

The results of the analysis are tabulated below.

#### Presentation of results

**Research question 1:** What is the attitude of secondary school students towards the learning of chemistry in Egor Local Government Area?

**Table 1:** present mean and standard deviation on attitude of secondary school students towards the learning of chemistry in Egor Local Government Area (N=50)

| S/N | Items   | Responses |    |    |     | No | Mean      | STD                | Decision    |        |
|-----|---|-----------|----|----|-----|----|-----------|--------------------|-------------|--------|
|     |   | SA%       | A% | D% | SD% | N  | $\bar{X}$ | STANDARD DEVIATION | HIGH        | OR LOW |
| 1.  | Chemistry is an interesting subject, I enjoy learning chemistry and look forward to chemistry lessons | 42        | 56 | 2  | 0   | 50 | 3.80      | 0.44               | High/agree  |        |
| 2.  | Chemistry is a useful   | 64        | 20 | 0  | 8   | 50 | 3.68      | 0.81               | High /agree |        |

|    |   |    |    |    |    |    |      |      |              |
|----|---|----|----|----|----|----|------|------|--------------|
|    | subject for my future career, and I believe chemistry is important for everyday life  |    |    |    |    |    |      |      |              |
| 3. | I feel anxious or nervous when doing chemistry. Chemistry makes me feel frustrated, and I am not motivated to learn chemistry | 4  | 18 | 42 | 36 | 50 | 1.96 | 0.99 | Low/disagree |
| 4. | I have a negative attitude towards chemistry learning   | 0  | 6  | 38 | 56 | 50 | 1.54 | 0.74 | Low/disagree |
| 5. | I have a positive attitude towards chemistry learning   | 48 | 48 | 4  | 2  | 50 | 3.92 | 0.28 | High         |

CLUSTER MEAN: 3.18 indicating an overall positive attitude

**Research Question 2:** Does the different teaching methods and styles impact student attitudes towards chemistry learning

**Table 2:** Present mean and standard deviation on student attitude towards learning of chemistry to the different teaching methods and style

| S/N | Items   | Responses |    |    |     | No | Mean      | STD                | Decision    |
|-----|---|-----------|----|----|-----|----|-----------|--------------------|-------------|
|     |   | SA%       | A% | D% | SD% |    |           |                    |             |
|     |   |           |    |    |     | N  | $\bar{X}$ | STANDARD DEVIATION | HIGH OR LOW |
| 6.  | <b>Do you think</b> group work in chemistry class helps you understand the material better? | 54        | 36 | 8  | 2   | 50 | 3.76      | 0.58               | High /agree |
| 7.  | Does your chemistry teacher incorporate real-world examples into lessons?                   | 36        | 56 | 6  | 2   | 50 | 3.64      | 0.59               | High /agree |

|     |  |    |    |    |   |    |      |      |             |
|-----|--|----|----|----|---|----|------|------|-------------|
| 8.  | Do you feel your chemistry teacher adapts their teaching methods and style to meet different learning needs? | 62 | 24 | 10 | 4 | 50 | 3.68 | 0.74 | High /agree |
| 9.  | Do you think your chemistry teacher's teachings method and styles influences your attitudes?                 | 42 | 48 | 4  | 6 | 50 | 3.80 | 0.57 | High /agree |
| 10. | Does your teacher encourage questions and discussions in class   | 48 | 50 | 2  | 0 | 50 | 3.90 | 0.35 | High/agree  |

CLUSTER MEAN: 3.76

**Research question 3:** Does the chemistry curriculum topics influence student attitudes towards chemistry learning

**Table 3:** Present mean and standard deviation on students attitude towards chemistry learning as pertinent to chemistry curriculum topics.

| S/N | Items  | Responses |    |    |     | No | Mean | STD  | Decision    |
|-----|--|-----------|----|----|-----|----|------|------|-------------|
|     |  | SA%       | A% | D% | SD% |    |      |      |             |
| 11. | The current chemistry curriculum provides opportunities for hands-on learning                    | 34        | 56 | 6  | 4   | 50 | 3.58 | 0.73 | High/agree  |
| 12. | The chemistry curriculum promotes positive attitudes towards chemistry                           | 40        | 48 | 8  | 4   | 50 | 3.64 | 0.72 | High/agree  |
| 13. | The chemistry curriculum provides opportunities for students to explore real-world applications. | 34        | 64 | 2  | 0   | 50 | 3.88 | 0.37 | High /agree |

|     |  |    |    |    |    |    |      |      |             |
|-----|--|----|----|----|----|----|------|------|-------------|
| 14. | The chemistry curriculum is too focused on theoretical concepts thus challenging for some students | 44 | 40 | 6  | 10 | 50 | 3.48 | 0.92 | High /agree |
| 15. | The chemistry curriculum needs to be revised to better engage students                             | 44 | 44 | 10 | 2  | 50 | 3.72 | 0.69 | High /agree |

CLUSTER MEAN:3.66

Research question 4: Does the sex of the chemistry teacher influence student attitudes towards chemistry learning, and are there any differences in teaching methods or styles between male and female chemistry teachers?

**Table 4:** present mean and standard deviation on student attitude towards chemistry learning on the influence of the sex of chemistry teacher and if their teaching methods and styles differ between male and female chemistry teacher

| S/N | Items  | Responses |    |    |     | No<br>N | Mean<br>$\bar{X}$ | STD<br>STANDARD<br>DEVIATION | Decision               |           |
|-----|--|-----------|----|----|-----|---------|-------------------|------------------------------|------------------------|-----------|
|     |  | SA%       | A% | D% | SD% |         |                   |                              | HIGH                   | OR<br>LOW |
| 16. | The sex of the chemistry teacher has no impact on student attitudes towards chemistry            | 32        | 12 | 16 | 20  | 50      | 2.96              | 1.18                         | Neutral/slightly agree |           |
| 17. | The sex of the chemistry teacher influences student motivation towards chemistry                 | 28        | 14 | 24 | 34  | 50      | 2.72              | 1.15                         | Neutral                |           |
| 18. | Male chemistry teachers are more effective than female chemistry teachers at promoting students' | 22        | 24 | 24 | 30  | 50      | 2.68              | 1.17                         | Neutral                |           |

|     | engagement  |    |    |    |    |    |      |      |             |
|-----|---|----|----|----|----|----|------|------|-------------|
| 19. | Male and female chemistry teachers have different teaching styles         | 48 | 30 | 14 | 8  | 50 | 3.60 | 0.83 | High /agree |
| 20. | Female chemistry teachers are more supportive of students' learning needs | 18 | 42 | 24 | 16 | 50 | 3.26 | 0.93 | High/agree  |

CLUSTER MEAN: 3.04

### **Discussion on /Student Attitudes towards Chemistry (RQ1)**

The findings revealed a generally positive attitude among secondary school students towards chemistry learning ( $\bar{x} = 3.18$ ), largely driven by the strong agreement that the subject is "useful for future career" ( $\bar{x} = 3.68$ ).

This result is highly consistent with the established literature on the affective domain of science learning. Several studies confirm that the perceived utility of a subject is a far stronger predictor of positive attitude and continued enrolment than inherent interest alone. For example, research by Osborne et al. (2003) highlights that the primary reason students maintain a positive attitude toward science is the recognition of its vocational and academic relevance. Similarly, a Pakistani study on student attitudes towards chemistry by Amar et al. (2021), which used a similar Likert scale, also emphasized the high importance students place on the subject's usefulness for future career pathways.

Furthermore, the low mean scores on anxiety and frustration items ( $\bar{x} = 1.96$ ) suggest that the current learning environment is relatively non-threatening, counteracting common

issues noted in older literature where chemistry was often associated with high fear and difficulty.

### **Discussion on the Influence of Teaching Methods (RQ2)**

The study strongly confirms that teaching methods and styles significantly influence student attitudes ( $\bar{x} = 3.80$ ). Students showed high agreement on the positive impact of methods like encouraging questions and discussions ( $\bar{x} = 3.90$ ) and group work ( $\bar{x} = 3.76$ ).

This outcome strongly supports the effectiveness of student-centred, active learning pedagogies.

Active Learning: Research by Barchok, Too, & Ngeno (2013) demonstrated the positive effect of collaborative concept mapping (a form of group work) on student attitudes towards chemistry in selected secondary schools. They concluded that active, collaborative strategies increase engagement and improve the affective connection to the subject.

Contextualization: The positive feedback on teachers incorporating real-world examples ( $\bar{x} = 3.64$ ) is supported by the literature on Context-Based Learning (CBL). Bennett and Lubben (2008) found that CBL approaches, which link chemistry concepts to students' daily lives and societal issues, successfully improve student motivation and attitude by increasing perceived relevance. The data thus affirms that teachers are employing strategies that align with modern constructivist educational models, which is crucial for fostering positive attitudes.

### **Discussion on the Influence of Chemistry Curriculum Topics (RQ3)**

While students gave positive feedback on the curriculum's provision for real-world applications ( $\bar{x} = 3.88$ ), a significant finding was the agreement that the curriculum is "too focused on theoretical concept" ( $\bar{x} = 3.48$ ).

This tension reflects a recognized systemic challenge in science education globally: the difficulty of balancing curriculum content coverage with conceptual understanding. This theoretical Overload finding aligns with the arguments of Adesoji (2008), who noted that a heavy focus on the theoretical and abstract components of chemistry, often driven by examination requirements, can lead to increased student frustration and a reduced willingness to engage.

The high agreement that the "curriculum needs to be revised to better engage students" ( $\bar{x} = 3.72$ ) suggests that students perceive a gap between the curriculum's potential (hands-on, real-world) and its actual delivered experience (theoretical). As NCERT guidelines (2008) for chemistry highlight, the success of a curriculum depends on the teachers' initiatives to encourage practical work and diffuse the sharp boundaries between abstract theory and real-world experience.

### **Discussion on the Influence of Teacher Sex (RQ4)**

The results regarding teacher sex are nuanced: the direct influence on attitude is inconclusive, but students highly agree that "male and female teachers have different teaching styles" ( $\bar{x} = 3.60$ ) although the sex of the chemistry teacher has no influence on

student attitude ( $\bar{x}=2.96$ ). Furthermore, the students agreed that "Female teachers are more supportive" ( $\bar{x}=3.26$ ).

This result suggests that pedagogical approach, not gender itself, is the influential factor.

Researches on classroom interactions, such as that by Kelly (1988), suggests that students often perceive differences in the way male and female science teachers interact with them, which shapes the classroom environment.

The finding that female teachers are perceived as more supportive is consistent with gender-role literature in education. Ryan and Weinstein (2009)'s self-determination theory posits that supportive relationships with teachers are essential for student progress. My finding indicates that female teachers are perceived to deliver this crucial emotional and instructional support slightly more effectively in the context of chemistry learning.

Therefore, the influence of teacher sex is mediated by the pedagogical practices they employ, confirming that supportive teaching methods are key, regardless of the teacher's gender

### **Summary of Key Findings**

Based on the analysis, the major findings of the study are:

**Positive Attitudes:** Secondary school students in the Egor Local Government Area generally hold a positive attitude towards chemistry, largely due to their recognition of its usefulness for future careers.

Strong Influence of Teaching Methods: Active and inclusive teaching methods (e.g., group work, real-world examples, and encouraging discussion) are perceived by students as having a strong positive influence on their attitudes.

Curriculum Challenge: While the curriculum is viewed as providing opportunities for hands-on learning, a significant number of students find it too theoretical and challenging, suggesting a potential barrier to fully positive attitude formation.

Inconclusive Direct Sex Influence, but Perceived Style Differences: The direct influence of the teacher's sex on attitude is inconclusive, but students widely perceive that male and female teachers employ different teaching styles, with female teachers being slightly more perceived as supportive.

The study concludes that students possess a generally favourable disposition towards chemistry, which is significantly enhanced by teacher adoption of student-centred and applied teaching methods. While the curriculum is largely effective, efforts should be made to further integrate practical and relatable elements to mitigate the perceived theoretical overload. The difference in teaching styles based on teacher sex warrants further qualitative investigation to understand the specific components of those styles and their differential impact on learning outcomes

## CHAPTER FIVE

### SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter provides an overview of the study's key findings, conclusions, and recommendations made in light of this research regarding assessing student attitudes towards chemistry learning

#### **Summary of Findings**

The purpose of this study was to analyze the attitudes of secondary school students towards chemistry learning in the Egor Local Government Area and to investigate the influence of teaching methods, curriculum topics, and the sex of the chemistry teacher on these attitudes.

A descriptive survey design was employed, utilizing a 20-item questionnaire administered to 50 secondary school students. The data were analyzed using descriptive statistics, specifically frequencies, percentages, mean scores ( $\bar{x}$ ), and standard deviations (SD), with a decision rule of a mean score of 2.50 indicating agreement or a positive attitude.

The key findings, structured around the research questions, were:

Attitudes towards Chemistry (RQ1): Students hold a generally positive attitude towards chemistry

( $\bar{x}$  =3.18), primarily driven by the recognition of the subject's usefulness for future careers ( $\bar{x}$  =3.68).

Influence of Teaching Methods (RQ2): Teaching methods and styles exert a strong positive influence on student attitudes with a cluster mean of ( $\bar{x}$  =3.76). Students highly favor active and student-centered methods such as encouraging questions, group work, and the use of real-world examples.

Influence of Curriculum Topics (RQ3): While students appreciated the curriculum's practical applications, a significant proportion agreed that it is "too focused on theoretical concerns" ( $\bar{x}$  =3.48), suggesting a tension between curriculum design and practical delivery.

Influence of Teacher Sex (RQ4): The direct influence of teacher sex on overall attitude was inconclusive as the students were neutral and slightly agreed that the sex of the teacher has no impact on the student attitude towards chemistry ( $\bar{x}$ =2.96). However, students highly perceived that male and female teachers employ different teaching styles ( $\bar{x}$  =3.60), with female teachers perceived as slightly more supportive ( $\bar{x}$  =3.26).

## **Conclusions**

Based on the summary of findings, the following conclusions were drawn regarding secondary school students' attitudes towards chemistry learning in the Egor Local Government Area:

Attitude is Practical: Student attitudes towards chemistry are largely positive and pragmatic, indicating that educational success in chemistry is fundamentally tied to students' belief in its career relevance and practical utility.

Pedagogy is Paramount: Active, collaborative, and contextualized teaching methods are the most critical factors influencing a positive attitude toward chemistry. Teachers who adapt their styles and encourage interaction are most effective at maintaining student engagement.

Curriculum Implementation Needs Review: The chemistry curriculum faces a challenge in its implementation. While designed to be practical, the prevalent focus on abstract theoretical concepts in its delivery is a recognized hurdle that can lead to frustration and hinder the full development of positive attitudes.

Style, Not Sex: The influence of the teacher's sex is indirect. Student attitudes are not determined by whether the teacher is male or female, but rather by the supportive and pedagogical styles they adopt. The perception of female teachers as more supportive suggests a need to promote and train all teachers, regardless of gender, in nurturing and student-centered interaction patterns.

## **Recommendations**

Based on the conclusions of this study, the following recommendations are put forth to enhance student attitudes and improve the quality of chemistry education:

For Chemistry Teachers:

**Prioritize Student-Centered Methods:** Teachers should consistently adopt active learning strategies, such as inquiry-based learning, problem-solving, and mandatory group activities. They must move away from didactic lecture-style delivery.

Contextualize Content: Every chemistry topic must be linked to real-world applications and local industries to continually reinforce the subject's career utility and relevance, thereby sustaining positive attitudes.

Be a Supportive Figure: All teachers, particularly male teachers based on student perception, should be trained to foster a nurturing and supportive classroom environment, actively encouraging questions and adapting their teaching to meet diverse learning needs.

For Curriculum Planners and Education Policy Makers:

Review Theoretical Load: The curriculum should be periodically reviewed to reduce the sheer volume of purely theoretical content. Revisions should emphasize the conceptual depth of core ideas over exhaustive coverage, ensuring practical work and applications receive adequate time

Invest in Resources: Government and school management should invest adequately in laboratory infrastructure and materials to ensure that "hands-on learning" opportunities (which students agreed are important) can be executed effectively and regularly.

### **For Further Research**

Qualitative Study on Teacher Style: A qualitative study (e.g., focus group interviews or classroom observation) is recommended to explore how male and female chemistry teachers' pedagogical styles specifically differ, and what elements of a female teacher's supportiveness resonate most with students, to create a model for effective teacher support training.

Impact of Curriculum Delivery: Future research should investigate the correlation between teachers' subject matter knowledge and their perceived teaching style to determine if a teacher's struggle with content is a cause of the theoretical overload perceived by students.

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**APPENDICES**  
**DEPARTMENT OF CURRICULUM AND**  
**INSTRUCTIONAL TECHNOLOGY**  
**CHEMISTRY EDUCATION**  
**FACULTY OF EDUCATION**  
**UNIVERSITY OF BENIN**  
**BENIN CITY, NIGERIA.**

**Dear respondent**

I am a final year student of the above named department carrying out a research on the topic an assessment of secondary school student attitude towards chemistry learning in egor local government area edo state

Please respond to these items and be sure your responses will be treated in strict confidence

Thanks for your cooperation

Yours faithfully

**Igudia Oruchukwu Precious**  
Researcher

**QUESTIONNAIRE ON: An assessment of secondary school Students' Attitudes**  
**Towards the learning of Chemistry in Egor Local Government Area**

(To be completed by students)

Instructions: Please read each question carefully and provide your honest answer. Your responses are confidential and will only be used for research purposes. There are no right or wrong answers.

Section A: Demographic Information

Gender: male..... female .....

Name of school \_\_\_\_\_

School Type: public \_\_\_\_ private \_\_\_\_

class SS1 \_\_\_\_ SS2 \_\_\_\_ SS3 \_\_\_\_

Section B:

Instructions: Please indicate the extent to which you agree or disagree with each statement about chemistry learning BY CAREFULLY ticking in the appropriate column

(SD = Strongly Disagree, D = Disagree, A= Agree, SA = Strongly Agree)

| S/N | Questions   | Responses |   |   |    |
|-----|---|-----------|---|---|----|
|     |   | SA        | A | D | SD |
|     | <b>What are the attitudes of secondary school students towards chemistry learning in the Egor Local Government Area</b>       |           |   |   |    |
| 1.  | Chemistry is an interesting subject, I enjoy learning chemistry and look forward to chemistry lessons                         |           |   |   |    |
| 2.  | Chemistry is a useful subject for my future career, and I believe chemistry is important for everyday life                    |           |   |   |    |
| 3.  | I feel anxious or nervous when doing chemistry. Chemistry makes me feel frustrated, and I am not motivated to learn chemistry |           |   |   |    |
| 4.  | I have a negative attitude towards chemistry learning   |           |   |   |    |
| 5.  | I have a positive attitude towards chemistry learning   |           |   |   |    |
|     | <b>Do the different teaching methods and styles influence student attitudes towards chemistry learning</b>                    |           |   |   |    |
| 6.  | Do you think group work in chemistry class helps you understand the material better?  |           |   |   |    |
| 7.  | Does your chemistry teacher incorporate real-world examples into lessons?   |           |   |   |    |
| 8.  | Do you feel your chemistry teacher adapts their teaching methods and style to meet different learning needs?                  |           |   |   |    |
| 9.  | Do you think your chemistry teacher's teachings method and styles influences your attitudes?                                  |           |   |   |    |

|     |  |  |  |  |  |
|-----|--|--|--|--|--|
| 10. | Does your teacher encourage questions and discussions in class   |  |  |  |  |
|     | <b>Do the chemistry curriculum topics influence students' attitudes towards chemistry learning</b>   |  |  |  |  |
| 11. | The current chemistry curriculum provides opportunities for hands-on learning  |  |  |  |  |
| 12. | The chemistry curriculum promotes positive attitudes towards chemistry   |  |  |  |  |
| 13. | The chemistry curriculum provides opportunities for students to explore real-world applications.   |  |  |  |  |
| 14. | The chemistry curriculum is too focused on theoretical concepts thus challenging for some students   |  |  |  |  |
| 15. | The chemistry curriculum needs to be revised to better engage students   |  |  |  |  |
|     | <b>Does the sex of the chemistry teacher influence students' attitudes towards chemistry learning, and are there any differences in teaching methods and styles between male and female chemistry teachers</b> |  |  |  |  |
| 16. | The sex of the chemistry teacher has no impact on student attitudes towards chemistry  |  |  |  |  |
| 17. | The sex of the chemistry teacher influences student motivation towards chemistry   |  |  |  |  |
| 18. | Male chemistry teachers are more effective than female chemistry teachers at promoting students' engagement  |  |  |  |  |
| 19. | Male and female chemistry teachers have different teaching styles  |  |  |  |  |
| 20. | Female chemistry teachers are more supportive of students' learning needs  |  |  |  |  |