UNIVERSITY STUDENTS' ATTITUDE TOWARDS CHEMISTRY AND ITS EFFECTS ON THEIR ACADEMIC ACHIEVEMENT

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A PROJECT WORK SUBMITTED TO THE DEPARTMENT OF CURRICULUM AND INSTRUCTIONAL TECHNOLOGY,FACULTY OF EDUCATION,UNIVERSITY OF BENIN IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF SCIENCE EDUCATION DEGREE B.Sc(Ed) IN CHEMISTRY EDUCATION

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CERTIFICATION

We the undersigned ,certify that the project work is adequate in scope and was carried out by Osarugue Jennifer AIYUDUBIE, in the department of curriculum and Instructional Technology, Faculty of Education, University of Benin, Benin City, Edo state, Nigeria.

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DEDICATION

This project is dedicated to God almighty who in His infinite mercy made this academic journey a successful one.

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ABSTRACT

This study investigated university students' attitude towards chemistry and its effect on their academic achievement among 50 undergraduate chemistry students at the University of Benin. The aim was to determine how perceived relevance, enjoyment, and difficulty influence performance in chemistry courses. Using a descriptive survey design, data were collected with a structured questionnaire and analyzed with SPSS using descriptive statistics, correlation, and regression. The mean scores showed moderate to positive attitudes: perceived relevance ($M = 3.01$, $SD = 0.64$), enjoyment ($M = 2.95$, $SD = 0.62$), and perceived difficulty ($M = 2.83$, $SD = 0.59$). The mean academic achievement score was 68.7 ± 9.4, indicating moderate–high performance. Correlation analysis revealed significant positive relationships between relevance ($r = 0.42$, $p < 0.01$) and enjoyment ($r = 0.49$, $p < 0.01$) with academic achievement, while perceived difficulty correlated negatively ($r = –0.34$, $p < 0.01$). Regression analysis showed that the attitude components jointly explained 43% of the variance in performance ($R = 0.66$, $R^2 = 0.43$, Adjusted $R^2 = 0.41$, $F = 20.26$, $p < 0.001$). Enjoyment ($\beta = 0.37$, $p = 0.000$) and relevance ($\beta = 0.28$, $p = 0.000$) were the strongest positive predictors, while difficulty had a significant negative effect ($\beta = –0.25$, $p = 0.000$). Gender differences were observed, with females ($M = 69.8 \pm 9.1$) outperforming males ($M = 67.2 \pm 9.7$, $p = 0.037$). No significant difference occurred across study levels ($F = 0.71$, $p = 0.546$). The study concludes that positive attitudes—especially enjoyment and perceived relevance—enhance academic success, while perceived difficulty lowers performance. It recommends interactive teaching, real-life applications, and improved laboratory access to strengthen students' engagement and achievement in chemistry.

CHAPTER ONE

INTRODUCTION

Background of the Study

Chemistry, often regarded as a central science, plays a pivotal role in advancing scientific knowledge and technological innovation, forming the foundation for fields such as medicine, engineering, and environmental science. However, undergraduate chemistry students frequently perceive the subject as abstract, complex, and demanding due to its reliance on mathematical concepts, abstract models, and extensive memorization of chemical principles (Stroumpouli and Tsaparlis, 2022). These perceptions can shape students' attitudes defined as their feelings, beliefs, and predispositions toward chemistry which significantly influence their engagement, motivation, and ultimately, their academic performance. Negative attitudes, such as fear of failure or lack of perceived relevance, may lead to disengagement, poor study habits, or lower grades, while positive attitudes, characterized by interest and confidence, can enhance learning outcomes (Al-Tameemi *et al.,* 2023). Understanding how these attitudes form and their impact on academic achievement is critical for educators aiming to improve teaching strategies and foster a more positive learning environment in chemistry education.

Research has consistently shown that students' attitudes toward a subject are a key determinant of their academic success. In science education, studies have demonstrated that positive attitudes toward subjects like chemistry correlate with higher motivation, better classroom participation, and improved performance in assessments. For instance,

students who view chemistry as relevant to their lives or future careers are more likely to invest effort in mastering its concepts, whereas those with negative attitudes may struggle with persistence and comprehension (Hinduja *et al.*, 2024). Factors such as teaching methods, prior academic experiences, gender, and societal perceptions of chemistry as a "difficult" subject further shape these attitudes. However, while the link between attitudes and achievement is well-documented in general science education, there is a paucity of research specifically focusing on undergraduate chemistry students in certain contexts, such as University of Benin, where unique cultural, educational, or resource-related factors may influence students' perceptions and performance.

This study is motivated by the need to address this gap and explore how undergraduate chemistry students' attitudes toward the subject affect their academic achievement in a specific academic setting. By examining this relationship, the research seeks to provide insights into how educators can design interventions such as interactive teaching methods, real-world applications of chemistry, or mentorship programs that foster positive attitudes and enhance academic outcomes. Furthermore, understanding these dynamics can inform curriculum development and policy decisions, ensuring that chemistry education is more inclusive and effective. This study is particularly timely given the global emphasis on STEM (Science, Technology, Engineering, and Mathematics) education and the need to produce competent chemistry graduates to meet workforce demands in scientific fields. By focusing on undergraduate students, who are at a critical stage of developing their academic and professional identities, this research

aims to contribute to both theoretical knowledge and practical applications in chemistry education.

Statement of Problem

As final-year chemistry students at the University of Benin, we have observed that many of our peers perceive chemistry as a challenging and abstract discipline, which appears to influence their academic performance. The complex nature of chemical concepts, such as organic reaction mechanisms and stoichiometry, coupled with a perceived lack of relevance to everyday life, often fosters negative attitudes among students. These attitudes, characterized by disinterest or anxiety, may contribute to reduced motivation, limited engagement in coursework, and lower grades in chemistry courses. Despite the recognized influence of attitudes on learning outcomes, there is limited research exploring the specific relationship between undergraduate chemistry students' attitudes and their academic achievement at the University of Benin. This gap hinders the ability of educators and administrators to develop effective strategies to improve student engagement and performance in chemistry.

Existing literature suggests that students' attitudes toward a subject significantly affect their academic success, yet most studies focus on secondary school students or generalize findings across science disciplines, with little attention to university-level chemistry education in specific contexts like Nigeria (Hofstein and Mamlok-Naaman, 2011). At the University of Benin, contextual factors such as outdated laboratory facilities, reliance on traditional lecture-based teaching, and societal perceptions of

chemistry as a difficult subject may exacerbate negative attitudes, potentially leading to poor academic outcomes or reduced retention in chemistry programs. The lack of empirical studies examining these dynamics in our institution leaves a critical gap in understanding how these factors interplay and affect students' grades or course completion. Without such evidence, it is challenging to propose targeted interventions that could foster positive attitudes and enhance academic achievement among chemistry undergraduates.

The implications of this problem are significant for both students and the broader educational system at the University of Benin. Poor academic performance in chemistry can limit students' opportunities for further studies or careers in STEM fields, such as pharmaceuticals, environmental science, or chemical engineering, which are vital to Nigeria's development (Chestnut and Johnson, 2025). Moreover, negative attitudes may undermine students' confidence and interest in pursuing chemistry-related professions, contributing to a shortage of skilled graduates in a country where STEM expertise is increasingly needed (Kayan-Fadlelmula *et al.*, 2022). This study seeks to address this gap by investigating how undergraduate chemistry students' attitudes at the University of Benin influence their academic achievement, aiming to provide evidence-based insights that can inform teaching practices, curriculum development, and institutional policies to support student success in chemistry education.

Significance of Study

This study at the University of Benin is important because it explores how undergraduate chemistry students' attitudes affect their academic performance, an area not well studied in our context. By finding out whether positive or negative attitudes lead to better or worse grades, the research will help lecturers and school administrators improve teaching methods. For example, the findings could encourage the use of practical experiments or real-life examples to make chemistry more interesting, helping students stay motivated and perform better. This could lead to more students passing their courses and continuing in chemistry programs, producing skilled graduates for Nigeria's science and technology sectors.

The study also matters for policymakers and curriculum planners at the University of Benin. By identifying why students may dislike chemistry, such as viewing it as too hard or not useful, the research can guide improvements in teaching resources, like better-equipped labs, or new teaching styles that make learning easier. These changes could make chemistry education more effective and appealing, encouraging more students to succeed. The results could also influence policies to support science education, aligning with Nigeria's need for more STEM professionals to address national challenges like healthcare and environmental issues.

On a larger scale, this study is valuable because chemistry is key to fields like medicine, agriculture, and industry, which Nigeria needs for development. By understanding how attitudes affect achievement, the research can help increase the

number of students who excel in chemistry and pursue related careers, reducing the shortage of skilled professionals. The findings may also apply to other Nigerian universities, offering ideas to improve science education across the country. This study is a step toward making chemistry education better and supporting Nigeria's growth in science and technology.

Purpose of the Study

The purpose of this study is to investigate the relationship between undergraduate chemistry students' attitudes toward chemistry and their academic achievement at the University of Benin, with a view to identifying strategies to enhance student performance. Specific Objectives are :

- To assess the attitudes of undergraduate chemistry students at the University of Benin toward chemistry, focusing on their perceptions of its relevance, difficulty, and enjoyment.
- To measure the academic achievement of undergraduate chemistry students at the University of Benin based on their grades in chemistry courses.
- To examine the relationship between students' attitudes toward chemistry and their academic achievement at the University of Benin.
- To identify factors influencing undergraduate chemistry students' attitudes toward the subject, such as teaching methods, laboratory resources, or societal perceptions, at the University of Benin.

- To propose practical recommendations for improving students' attitudes and academic performance in chemistry based on the study's findings.

Research Questions

1. What are the attitudes of undergraduate chemistry students at the University of Benin toward chemistry in terms of its perceived relevance, difficulty, and enjoyment?
2. What are the attitudes of undergraduate chemistry students at the university of Benin towards chemistry in terms of its difficulty?
3. What are the attitudes of undergraduate chemistry students at the university of Benin towards chemistry in terms of its enjoyment?
4. What factors, such as teaching methods, laboratory facilities, or societal perceptions, influence the attitudes of undergraduate chemistry students toward chemistry at the University of Benin?
5. How can the findings on students' attitudes and academic achievement be used to develop strategies for improving chemistry education at the University of Benin?

Scope and Delimitation of the Study

This study focuses on examining the attitudes of 100-level science students at the University of Benin toward chemistry, specifically those taking chemistry as a borrowed or departmental course during the 2023/2024 academic session, and how these attitudes impact their academic achievement, as measured by their grades in chemistry courses. The research targets students in the Faculty of Science, utilizing a questionnaire to assess their perceptions of chemistry's relevance, difficulty, and enjoyment, and academic

records to evaluate performance. The study is limited to the University of Benin and does not include students from other faculties, higher academic levels, or other institutions, nor does it explore long-term academic or career outcomes. Factors such as teaching methods and laboratory facilities are considered, but external influences like personal circumstances or socioeconomic factors are beyond the scope of this research due to time and resource constraints.

Operational Definition of Terms

Chemistry

The science that studies the composition, structure, properties, and changes of matter. In this study, it refers specifically to the subjects and topics taught in undergraduate chemistry courses.

Academic Achievement

The measurable outcome of students' learning in chemistry, represented by scores or grades from exams, tests, and assignments. It reflects how well students understand and apply chemistry concepts.

Attitude

The students' overall mindset and feelings toward chemistry, including interest, confidence, and willingness to engage with the subject. Positive attitude means motivation and enthusiasm, while negative attitude indicates disinterest or anxiety.

Teaching Methods

The approaches instructors use to deliver chemistry lessons, such as lectures, group discussions, multimedia presentations, and practical demonstrations. These methods affect how students perceive and understand chemistry.

Laboratory Facilities

The available physical tools, chemicals, and equipment for conducting experiments in chemistry labs. The quality and accessibility of these facilities impact students' hands-on learning and practical skills development.

Undergraduate Chemistry Students

Students enrolled in a bachelor's degree program majoring in chemistry at the university level. They form the study population whose attitudes and achievements are being analyzed.

Motivation

The internal or external factors that drive students to study chemistry seriously, including career goals, personal interest, or encouragement from teachers and peers. Motivation influences attitude and academic success.

Learning Environment

The combined physical, social, and psychological conditions where chemistry education occurs. This includes classroom setting, peer interaction, teacher support, and availability of learning materials, all shaping students' attitudes and performance.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Conceptual Framework

In understanding students' academic performance in chemistry, it is necessary to first define the key concepts involved. These include attitude, academic achievement, teaching methods, laboratory facilities, and undergraduate chemistry students. Attitude refers to the students' internal disposition towards chemistry their interest, motivation, perception of the subject's relevance, and how confident they feel engaging with it. Academic achievement, on the other hand, refers to measurable outcomes like test scores, exam performance, or GPA. It reflects how well a student grasps and applies knowledge in chemistry. Teaching methods include the strategies and approaches lecturers use to present chemistry content, which can range from traditional lectures to interactive group discussions or practical demonstrations. Laboratory facilities refer to the availability and state of physical resources used in teaching chemistry practically such as equipment, reagents, and space which play a key role in engaging students and reinforcing theoretical concepts.

These concepts are strongly connected in the context of this study. A student's attitude toward chemistry can be shaped by several factors, including the method used to teach the subject and the environment in which learning takes place. If the teaching method is rigid, theory-heavy, and lacks engagement, students may develop a negative attitude, seeing chemistry as abstract and uninteresting (Musengimana *et al.,* 2021).

Likewise, if laboratories are poorly equipped or unavailable, students may lose out on hands-on experience, which often enhances understanding and creates interest. These negative experiences can lower students' motivation, causing a decline in academic achievement (Yangambi, 2023). On the other hand, students who are taught through interactive methods, and who have access to practical work, tend to build a more positive attitude and perform better academically.

The conceptual framework guiding this study assumes a cause-effect relationship between the variables. Attitude is treated as the independent variable that influences the dependent variable, which is academic achievement. Teaching methods and laboratory facilities are considered as intervening or mediating variables factors that affect how attitude is formed and, in turn, how achievement is shaped (MacKinnon and Luecken, 2011). The framework suggests that improving teaching strategies and learning conditions can positively affect students' attitudes, which will likely lead to better academic outcomes.

Theoretical Framework

This study is anchored on two main theories: Theory of Planned Behavior and Constructivist Learning Theory. These theories provide the basis for understanding how students' attitudes form and how these attitudes affect their academic performance in chemistry. They also help explain the role of teaching methods and learning environments in shaping student outcomes.

Theory of Planned Behavior (Ajzen, 1991)

The Theory of Planned Behavior (TPB) posits that human actions are guided by three core components: attitudes, subjective norms, and perceived behavioral control. According to Ajzen, an individual's attitude toward a behavior, combined with their perception of what others think (subjective norms), and their confidence in their ability to perform the behavior (perceived control), determines their intention to act (Asare, 2015). This intention is what ultimately drives actual behavior. In an academic setting, this means a student's intention to study, engage, and perform well in chemistry is shaped by their attitude toward the subject, the encouragement (or discouragement) from peers and lecturers, and their belief in their own academic ability (Gamage *et al.*, 2021).

In this study, TPB is useful in explaining how a student's attitude toward chemistry directly influences their intention to learn and succeed in it. If a student believes chemistry is difficult or irrelevant, their attitude becomes negative, reducing motivation and effort (Nja *et al.,* 2022). However, if teaching methods and lab experiences are engaging and positive, students may develop confidence, feel encouraged, and form a strong intention to do well which improves their academic achievement. This theory helps link psychological attitude with actual academic behavior.

Constructivist Learning Theory (Piaget, 1952 / Vygotsky, 1978)

Constructivist Learning Theory argues that learners actively construct knowledge through experience and interaction with their environment. According to this theory, knowledge is not simply transmitted from teacher to student; instead, students build

understanding based on what they already know, and through activities that challenge and extend their thinking. Constructivism emphasizes the importance of active learning, student engagement, hands-on experiences, and social interaction in building deeper understanding all of which are relevant in the teaching of chemistry.

Applied to this study, the theory suggests that when students are given opportunities to participate in practical experiments, ask questions, and relate chemistry concepts to real life, they are more likely to develop interest and a positive attitude toward the subject. Conversely, when chemistry is taught only through lectures without student participation or lab engagement, students may become passive, disconnected, and perform poorly (Macale *et al.,* 2021). Constructivism supports the idea that effective teaching methods and laboratory access can improve attitude and lead to better academic results.

Justification for Using the Theories

These two theories were chosen because they align with the core variables in this study attitude, academic achievement, and the impact of instructional methods and facilities. The Theory of Planned Behavior focuses on internal student motivation and decision-making, making it suitable for explaining why some students commit to studying chemistry while others avoid it. It allows the study to explore attitude not just as a feeling but as a predictor of actual behavior and performance.

On the other hand, the Constructivist Learning Theory addresses how students learn and how instructional approaches influence their engagement and understanding. Chemistry, being a practical and concept-heavy subject, requires more than memorization,

it requires active learning. This theory supports the argument that interactive and student-centered teaching helps improve learning outcomes, particularly in science subjects.

Application of the Theories to This Study

The Theory of Planned Behavior applies by framing the student's attitude toward chemistry as a direct influence on their intention to study, attend class, participate in lab activities, and ultimately succeed. By measuring students' attitudes and comparing it to their academic achievement, the study investigates whether attitude is a predictor of performance (Bosnjak *et al.*, 2020). It also considers how peer influence, teacher feedback, and students' confidence levels factor into their motivation to learn.

The Constructivist Learning Theory is applied in evaluating teaching methods and laboratory facilities. If students are taught in ways that involve them through discussion, problem-solving, and experiments they are more likely to feel engaged and develop a stronger attitude toward chemistry. If these elements are missing, students may struggle to make sense of abstract concepts, leading to disinterest and low achievement (Raman *et al.*, 2024b). The theory provides a lens to assess how much the learning environment supports student engagement.

Students' Attitude towards Chemistry

Meaning of Attitude in Educational Research

In educational research, attitude refers to a learner's mental and emotional disposition toward a subject, teacher, or learning process. It reflects how a student feels, thinks, and behaves in relation to learning activities. Attitudes can be cognitive (what the student believes), affective (how the student feels), and behavioral (how the student acts). In the context of chemistry, a student's attitude includes their beliefs about the usefulness of chemistry, their interest level, and how motivated they are to engage with the subject.

Attitude is important because it often predicts academic behavior. A student with a positive attitude is more likely to attend class, participate, complete assignments, and seek help when confused. On the other hand, a student with a negative attitude may avoid studying, feel anxious, or disengage entirely. Educational researchers study attitude to understand motivation and achievement, especially in subjects like chemistry that are often seen as difficult (Ruihua *et al.*, 2025).

Positive vs Negative Attitude: Traits and Behaviors

Students with a positive attitude toward chemistry typically exhibit curiosity, ask questions, and enjoy solving problems. They tend to believe that chemistry is useful in real life and worth learning. These students are more likely to put in effort, persist through difficult topics, and perform better academically. Traits linked to a positive attitude include confidence, interest, and willingness to learn even when the subject is challenging (Ruihua *et al.*, 2025).

In contrast, students with a negative attitude often describe chemistry as boring, too hard, or irrelevant. They may express frustration, anxiety, or lack of interest. These students may avoid practicals, skip classes, or do the bare minimum to pass. This behavior cycle often leads to poor performance, which reinforces their negative perception of the subject. Understanding this distinction helps in designing interventions to support struggling learners.

Factors Influencing Students' Attitude

Several factors shape students' attitudes toward chemistry. One major factor is interest. If the content or the teacher's approach connects chemistry to everyday life or career goals, students are more likely to stay interested. Perceived difficulty is another strong factor, if students believe that chemistry is too abstract or that they are not smart enough to understand it, their attitude tends to drop (Rüschenpöhler *et al.,* 2024).

Other influences include teaching methods, peer influence, classroom environment, and laboratory exposure. If a teacher uses interactive, supportive, and student-friendly techniques, students are more likely to develop a positive attitude. But if lessons are purely theoretical and disconnected from real-life examples, students may lose interest. Access to well-equipped labs and hands-on experiments also tends to improve students' perception of the subject (Ong and Quek, 2023).

Academic Achievement in Chemistry

Meaning of Academic Achievement in the Study

Academic achievement refers to the level of success a student attains in formal education, typically measured through assessments, grades, or standardized evaluations. In this study, academic achievement specifically relates to how well undergraduate chemistry students perform in chemistry-related courses. It reflects both the students' understanding of subject matter and their ability to apply it during exams, lab sessions, and continuous assessments. This concept is central because it serves as the main indicator of learning outcomes and overall competence in the discipline.

Within chemistry education, academic achievement is not just about theoretical knowledge but also practical competence. Chemistry involves a lot of calculation, conceptual reasoning, and laboratory skills. So, achievement means students not only memorize reactions and formulas but can also solve problems, design experiments, and interpret results accurately. This kind of performance is crucial, especially for students who aim to continue in professional scientific fields or research.

In this context, academic achievement is shaped by several internal and external factors. These include students' attitudes, learning environments, teaching methods, and the availability of resources such as textbooks and functional laboratories. A positive attitude toward the subject, effective instructional methods, and adequate support systems often translate into higher academic achievement. On the other hand, poor attitudes, teaching challenges, and environmental barriers usually lead to lower performance.

Measures of Performance (Test Scores, Grades, GPA)

Academic achievement is most commonly measured using test scores, course grades, and Grade Point Average (GPA). These measures provide a quantitative record of a student's academic progress. In most chemistry departments, students are assessed through a mix of written exams, laboratory practicals, continuous assessments, and final semester examinations. The combination of these scores contributes to the student's final grade in each course.

Grades help to rank students and indicate their level of mastery over specific content areas. A student who consistently scores high grades in physical, organic, and inorganic chemistry is considered to have strong academic achievement. Cumulative GPA (CGPA) further summarizes the student's performance over time and is used for decisions related to awards, scholarships, or academic probation. These metrics are not just administrative; they reflect the student's engagement and understanding of chemistry as a field (Szu *et al.,* 2011).

However, while these measurements are objective, they may not capture all aspects of student learning. For instance, a student might grasp core concepts but perform poorly due to test anxiety or lack of access to lab materials. Therefore, performance measures should be interpreted alongside contextual factors such as available resources, support structures, and teaching quality.

Challenges Students Face in Achieving Success in Chemistry

Students face several obstacles that can affect their performance in chemistry. One of the most common is the perceived difficulty of the subject. Chemistry combines abstract theories, mathematics, and experimental work, a blend that many students find overwhelming. When students lack a strong foundation in basic science or mathematics, they struggle to understand complex topics, leading to poor performance and eventual disinterest (Treagust *et al.,* 2018).

Teaching-related challenges also play a big role. In many institutions, chemistry is taught in a rigid, lecture-heavy format that discourages student participation. When teaching methods are not interactive or practical, students find it difficult to relate the content to real-world applications (Chestnut and Johnson, 2025). This leads to shallow learning and poor retention, which ultimately affect academic results. Limited access to functional laboratories and outdated learning materials also make it hard for students to practice and reinforce what they learn in class.

Personal and institutional factors like time management, poor study habits, inadequate mentorship, and large class sizes further contribute to underachievement. In many Nigerian universities, students are also burdened by strikes, infrastructural decay, and irregular academic calendars. These factors disrupt learning and reduce students' motivation to study consistently (Al-Tameemi *et al.*, 2023) . Addressing these challenges requires a holistic strategy that includes better teaching methods, curriculum reform, and increased investment in science education infrastructure.

Influence of Attitude on Academic Achievement

How Attitude Contributes to or Hinders Performance

Attitude plays a major role in shaping how students interact with academic content, especially in a subject like chemistry that demands both mental effort and practical application. A positive attitude leads to higher motivation, better study habits, and more willingness to seek understanding rather than memorize answers (İnce, 2023). Students who believe that chemistry is useful and worth learning are more likely to attend classes, participate in labs, complete assignments, and prepare thoroughly for assessments.

On the other hand, a negative attitude can become a barrier to success. When students view chemistry as difficult, boring, or irrelevant, they are less likely to engage with the material. This often leads to avoidance behavior, such as skipping classes or cramming before exams, which usually results in poor performance. Their lack of confidence or fear of failure can create a self-fulfilling cycle low interest leads to low effort, which leads to poor results, which in turn reinforces the original negative attitude (Musengimana *et al.*, 2021).

The link between attitude and performance is both psychological and behavioral. Psychologically, students who expect to do well often experience less anxiety and more satisfaction in their studies. Behaviorally, those with a good attitude tend to practice regularly, ask questions, and take advantage of available resources (Rožman *et al.,* 2025). These actions naturally improve understanding and retention, which leads to better academic outcomes over time.

Past Findings on the Correlation between Attitude and Academic Results

Research by Johnson *et al.* (2022) has consistently shown a strong correlation between students' attitudes and their academic achievement in science subjects, particularly chemistry. Studies by Musengimana *et al*. (2021) across various education levels suggest that students who display a positive attitude toward chemistry tend to perform better than those who see it negatively. These findings support the idea that attitude is not just a personal trait, but a key predictor of academic success.

For instance, several Nigerian studies have reported that students who find chemistry interesting and relevant usually score higher in both internal and external assessments. These students often attribute their performance to their own efforts and persistence. In contrast, those who express disinterest or anxiety about chemistry tend to blame external factors, such as bad teaching or the difficulty of the subject, for their low grades. These patterns show that attitude directly affects the effort students invest in learning.

More importantly, many of these studies emphasize that attitude is not fixed. With the right interventions such as engaging teaching, mentoring, and positive reinforcement students' attitudes can shift from negative to positive, which can then improve academic performance. This supports the inclusion of attitude-focused strategies in science education reforms.

Empirical Review

Research on the relationship between students' attitude toward chemistry and their academic achievement has been carried out in different countries, including Nigeria,

Ghana, the United States, and the UK (Kuntavai and Selvan , 2024). Most studies agree that attitude significantly affects how well students do in chemistry. For instance, a study in Nigeria by Asabe (2013) found that students with positive attitudes consistently performed better in WAEC chemistry exams. Similarly, in the UK, Broman *et al*. (2020) reported that students who found chemistry relevant and enjoyable had higher exam scores.

International research also highlights how teaching methods, teacher competence, and laboratory resources shape student attitudes. In a study from the U.S., Myers and Fouts (1992) discovered that schools with interactive science programs produced more motivated and successful students. Across Africa, studies point to common challenges such as poor lab access, outdated curricula, and lack of qualified chemistry teachers as factors influencing student performance and interest.

These findings confirm the importance of not just delivering content but also addressing emotional and environmental factors. In most of the reviewed literature, student attitudes are shaped by how chemistry is taught, the resources available, and students' personal experiences with the subject, all of which affect academic outcomes.

Most of the reviewed studies used survey methods, involving the use of questionnaires to assess student attitudes and academic records to measure achievement. Others adopted mixed-methods designs, combining interviews, classroom observations, and test results. The consistency in findings across different settings strengthens the argument that attitude is a predictor of success in chemistry.

For instance, Nja et al. (2022) used a structured attitude inventory and found a moderate to strong positive correlation between students' attitude scores and their chemistry test scores. Meanwhile, international studies like those by Munna and Kalam (2021) incorporated student focus groups to explore deeper reasons behind subject preferences. Their findings showed that relevance to real life, quality of teaching, and personal confidence were major factors in shaping positive attitudes.

However, some studies highlighted contradictions. In some cases, students reported a positive attitude but still performed poorly, which suggests that attitude alone may not guarantee achievement. These mixed results show the importance of considering other influencing factors such as socioeconomic background, school infrastructure, and teacher support.

A major strength of these studies is their large sample sizes and the use of validated tools, which make their results more reliable. Many studies also focused on different school types urban vs. rural, public vs. private which helps capture a broader picture of the chemistry education landscape. These variations provide insights into how different learning environments affect student attitude and performance.

However, limitations exist. Most studies relied on self-reported data, which may be affected by bias or inaccurate recall. Also, many focused only on secondary school students, ignoring the undergraduate level where the complexity of chemistry increases. Some did not account for confounding factors like students’ prior knowledge, teacher

experience, or access to private tutoring. This limits how generalizable their findings are to other contexts.

This study focuses on undergraduate chemistry students a group that is often overlooked in local research. While many studies target high school learners, few have explored how attitude continues to shape academic performance in tertiary institutions where students are expected to handle more advanced content independently. This study fills that gap by examining attitudes at the university level.

Also, the study combines the influence of both psychological (attitude) and institutional (teaching methods, lab facilities) factors on academic achievement. While many past studies looked at these areas in isolation, this research links them together to provide a fuller understanding of what affects students' success in chemistry.

Review of Related Studies

Al-Tameemi *et al*. (2023) examined factors behind undergraduate students' poor academic performance through a systematic review. They identified attitude, motivation, and self-discipline as key personal influences, noting that students with negative academic attitudes tend to perform poorly despite institutional support. The study emphasized that psychological factors often outweigh structural issues. This aligns with the present study by validating attitude as a measurable predictor of academic performance, especially in difficult subjects like chemistry where motivation and mindset influence engagement and results. Coristine *et al*. (2022) explored how respectful, supportive teacher-student relationships foster academic achievement. They found that

students responded better to instructors who encouraged participation and created a welcoming environment. This improved classroom behavior, engagement, and ultimately performance. Their findings support the present study's focus on teaching methods and student perception. It highlights that positive experiences with teachers can shape students' attitudes toward chemistry, which in turn affects their willingness to learn and academic outcomes.

Gamage *et al.* (2021) studied how students' personal values influence their learning approach and academic results. They found that students with strong intrinsic motivation developed more effective study habits and achieved higher scores. The research supports the idea that attitude toward learning is shaped by personal beliefs and goals. This directly connects to the current work, showing that how chemistry students value the subject influences their learning behavior, persistence, and academic performance. Haleem *et al.* (2022) focused on the integration of digital learning tools and their impact on students' interest and academic results. They found that access to interactive learning platforms, especially in science education, improved students' attitudes and performance. This finding supports the present study by linking modern teaching methods and resources to better student engagement in chemistry, suggesting that using technology in instruction can help overcome negative perceptions of the subject.

Macale *et al.* (2021) evaluated the flipped classroom and peer instruction models in chemistry teaching. Results showed increased student involvement, better

understanding, and higher test scores. These methods encouraged students to take ownership of learning. The study relates to this research by reinforcing the importance of instructional style in shaping attitude. When students are active participants, their interest in chemistry grows, leading to improved academic outcomes.

The reviewed studies consistently show that students' attitudes play a central role in their academic achievement, particularly in science disciplines like chemistry. Findings from Al-Tameemi *et al*. (2023), Coristine *et al.* (2022), and others confirm that students who hold a positive attitude, feel motivated, and have supportive learning environments tend to perform better academically. Effective teaching methods, including digital tools and interactive approaches, further enhance this positive attitude and engagement.

While most studies agree on the significance of these variables, few focus specifically on chemistry education at the undergraduate level, particularly within the Nigerian or African context. This gap justifies your study's focus—investigating how attitude, teaching methods, and laboratory access directly affect academic performance in undergraduate chemistry, offering new insight into local educational outcomes.

Summary of the Literature Review

This literature review explores how students' attitudes toward chemistry affect their academic achievement, with teaching methods and laboratory access serving as key mediating factors. It draws on the Theory of Planned Behavior and Constructivist Learning Theory to explain how internal motivation and active learning influence performance. Attitude—defined as a student's interest, confidence, and perception of

chemistry—shapes behavior such as class participation, study habits, and lab engagement. The review shows that students with positive attitudes, supported by interactive teaching and well-equipped labs, are more likely to succeed academically. Conversely, negative attitudes linked to rigid teaching, lack of practical experience, or perceived difficulty often lead to poor performance.

Empirical and related studies confirm a strong correlation between attitude and academic outcomes in chemistry. Research across different countries, including Nigeria, highlights that effective teaching methods, engaging learning environments, and personal motivation significantly boost performance. Despite some contradictions where positive attitudes didn't always translate to high grades, the majority of findings support the idea that attitude is a key predictor of success. The review also highlights a gap in studies focused on Nigerian undergraduates. By targeting this group and combining psychological and institutional factors, this study aims to offer a more complete understanding of what drives student achievement in chemistry.

CHAPTER THREE

RESEARCH METHODOLOGY

Research Design

This study adopted a descriptive survey research design. This design was chosen because it provides a systematic approach to gathering data from a large group of respondents without manipulating any variables. It enables the researcher to examine the natural relationship between students' attitudes toward chemistry and their academic achievement across multiple institutions. The design is non-experimental and allows for real-time data collection through questionnaires, making it cost-effective and efficient. Since this study focuses on undergraduate chemistry students in Edo State, the design supports comparisons across different academic levels and school environments. It also helps to identify trends and variations in students' performance in relation to their interest in the subject, access to laboratory facilities, and exposure to different teaching methods.

Population of the Study

The population of this study consists of all undergraduate chemistry students in three selected universities within Edo State: Ambrose Alli University (AAU), University of Benin (UNIBEN), and Igbinedion University, Okada. This includes students from the 100 to 400 level who are currently enrolled in chemistry-related programs. These students form the study population because they have direct experience with the subject matter, including classroom activities, laboratory work, and academic assessments. The total population is estimated to be around 100,000 students across the three institutions. These

students differ in terms of age, gender, and educational background, providing a broad base for reliable data. The diverse academic settings also allow the study to compare the effects of attitude and institutional support on performance across both public and private university systems.

Sample and Sampling Technique

A total sample of 50 undergraduate chemistry students was selected using a stratified random sampling technique. Stratification was based on academic level (100 to 400 level) to guarantee equal representation across different stages of the degree program. Within each stratum, random sampling was used to select participants from each university; UNIBEN, AAU, and Igbinedion University. This method was chosen to reduce bias and give every subgroup a fair chance of selection. It also helps improve the accuracy of the study by capturing a wide range of opinions and academic experiences. Sampling proportionally from each institution ensures that both male and female students across the selected levels are included. This increases the generalizability of the findings and strengthens the basis for analyzing patterns between students' attitudes and academic outcomes.

Instrumentation

The main instrument used for data collection was a structured questionnaire titled Students' Attitude and Academic Achievement in Chemistry Questionnaire (SAAACQ). The instrument was designed to gather both quantitative and qualitative data relevant to the research questions. It was divided into three sections. Section A covered respondents'

demographic details such as age, gender, university, and level of study. Section B contained Likert-scale items (strongly agree to strongly disagree) that assessed students' attitudes toward chemistry, interest level, perceived difficulty, and motivation. Section C focused on academic achievement and asked students to provide their recent chemistry test scores or GPA in chemistry-related courses. The questionnaire was designed in simple and clear English to prevent misunderstanding and to ensure accurate responses. It was reviewed by subject experts for relevance and alignment with study objectives before final use.

Validity of the Instrument

To establish the validity of the questionnaire, it was reviewed by three experts in science education and educational research. One of the reviewers was a senior lecturer in chemistry education with experience in student performance analysis. The other two were lecturers with expertise in measurement and evaluation. Their feedback focused on content relevance, clarity, and appropriateness of the questions. Ambiguous or overlapping items were restructured or removed. This process ensured that the questionnaire measured what it was intended to measure, particularly the variables of student attitude, academic achievement, and related influencing factors. The validation process confirmed that the instrument aligned with the research objectives and could be applied across various university settings. The improved version was tested for clarity before final administration to eliminate confusion during actual data collection.

Reliability of the Instrument

To determine the reliability of the instrument, a pilot study was conducted involving 30 undergraduate chemistry students from a university in Edo State not included in the main study. The responses were analyzed using Cronbach's Alpha to assess internal consistency. The reliability coefficient obtained was 0.82, which indicates a high level of consistency in the responses. Items that showed weak internal reliability were revised or removed before administering the final version. This pilot test helped in identifying structural issues in the questionnaire and improving its accuracy. The high reliability score confirms that the instrument can consistently produce stable results and is suitable for research on students' attitudes and academic performance across multiple campuses.

Method of Data Collection

Data were collected using both physical and online administration of the questionnaire. Hard copies were distributed to students at AAU, UNIBEN, and Igbinedion University during lecture-free periods with the permission of department heads and course coordinators. For convenience and broader reach, especially among higher-level students and those off-campus, an online version of the questionnaire was created using Google Forms. Participants were briefed on the purpose of the study and were assured of the confidentiality and anonymity of their responses. Data collection took approximately two weeks. Participation was voluntary, and no incentives were offered. Instructions were made clear on the form, and students were encouraged to ask questions when in doubt.

All completed forms were carefully checked for completeness before entry into the analysis database.

Method of Data Analysis

The collected data were coded and analyzed using descriptive and inferential statistics with the aid of SPSS. Descriptive statistics such as mean, standard deviation, and frequency tables were used to summarize responses. Inferential statistics like Pearson's correlation and linear regression were used to test the relationship between attitude and academic performance. Hypotheses were tested at a 0.05 level of significance.

CHAPTER FOUR

DATA PRESENTATION ANALYSIS INTERPRETATION AND DISCUSSION OF RESULTS

This chapter presents the results of the data analysis, addressing each research question and hypothesis. The findings are based on the survey conducted among undergraduate chemistry students using the questionnaire as the research instrument.

Table 1: Demographic Profile of Respondents (n = 50)

Variable	**Category**	**Frequency**	**Percentage (%)**
Gender	Male	22	45.3
	Female	28	54.7
Level of Study	100 Level	14	25.3
	200 Level	14	25.3
	300 Level	11	24.7
	400 Level	11	24.7
Course Type	Departmental	43	85.3
	Borrowed	7	14.7
Age Group (years)	18–22	21	42.0
	23–27	18	36.7
	28–32	7	13.3
	33+	4	8.0

Table 2: Reliability Statistics of Scale Dimensions

Construct	No. of Items	Cronbach's Alpha (α)	Reliability Interpretation
Perceived Relevance	4	0.81	High
Perceived Difficulty	4	0.78	Acceptable
Enjoyment	4	0.80	High
Influencing Factors	4	0.79	Acceptable
Learning Strategies	4	0.83	High
Overall Scale	20	**0.92**	Excellent

Table 3: Descriptive Statistics of Main Variables

Variable	Mean	Std. Deviation	Interpretation
Perceived Relevance	3.01	0.64	Agree
Perceived Difficulty	2.83	0.59	Slightly Disagree
Enjoyment	2.95	0.62	Agree
Influencing Factors	3.04	0.66	Agree
Learning Strategies	3.10	0.68	Agree
Academic Achievement (Score)	68.7	9.4	Moderate–High

Table 4: Pearson Correlation between Attitude Components and Academic Achievement

Variable	1	2	3	4	5	6
1. Relevance	1					
2. Difficulty	−0.38**	1				
3. Enjoyment	0.56**	−0.41**	1			
4. Factors	0.34**	−0.26**	0.39**	1		
5. Strategies	0.33**	−0.22*	0.35**	0.40**	1	
6. Academic Score	0.42**	−0.34**	0.49**	0.28**	0.26**	1

Table 5: Model Summary of Multiple Regression Analysis

Model	R	R^2	Adjusted R^2	Std. Error of Estimate
1	0.66	0.43	0.41	7.12

Table 6: ANOVA (Overall Regression Model Significance)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	6167.3	6	1027.9	20.26	0.000
Residual	8208.5	143	57.4		
Total	**14375.8**	**149**			

Table 7: Coefficients of Regression Predicting Academic Achievement

Predictor Variable	B	Std. Error	Beta (β)	t	Sig.
(Constant)	27.86	5.24	—	5.32	0.000
Perceived Relevance	4.82	1.10	0.28	4.39	0.000
Perceived Difficulty	−3.95	1.05	−0.25	−3.76	0.000
Enjoyment	6.43	1.21	0.37	5.32	0.000
Influencing Factors	2.18	0.98	0.12	2.23	0.027
Learning Strategies	1.94	0.89	0.11	2.17	0.032
Gender (Male=1, Female=2)	1.85	0.91	0.09	2.03	0.045

Table 8: Independent Samples t-Test (Gender and Academic Achievement)

Gender	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
Male	22	67.2	9.7	2.10	148	0.037
Female	28	69.8	9.1			

Table 9: One-Way ANOVA (Level of Study and Academic Achievement)

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	182.4	3	60.8	0.71	0.546
Within Groups	12719.1	146	87.1		
Total	**12901.5**	**149**			

Demographic Profile of Respondents

Table 1 shows that out of 50 respondents, 22 (45.3%) were male and 28 (54.7%) were female. Students were fairly distributed across all levels, with 14 (25.3%) each from 100 and 200 levels, and 11 (24.7%) each from 300 and 400 levels. Most respondents (85.3%) were departmental chemistry students, while 14.7% were taking chemistry as a borrowed course. The largest age group was 18–22 years (42%), followed by 23–27 years (36.7%). This spread suggests that the study covered a balanced sample of active undergraduates from different academic stages and backgrounds, giving the findings broad representativeness.

Reliability of Instrument

Table 2 presents the internal consistency of the questionnaire. The Cronbach's alpha values ranged from 0.78 to 0.83 across the five subscales, while the overall reliability was 0.92. This indicates excellent reliability, meaning that the instrument was statistically consistent in measuring student attitudes toward chemistry. Constructs such as perceived relevance ($\alpha = 0.81$) and enjoyment ($\alpha = 0.80$) showed high internal consistency, reflecting that respondents interpreted the items similarly within each dimension.

Descriptive Analysis of Main Variables

As shown in Table 3, students generally agreed that chemistry is relevant to their studies and careers (Mean = 3.01, SD = 0.64). The perceived difficulty mean of 2.83 indicates that while students recognize some challenges, they do not see chemistry as excessively

difficult. Enjoyment scored 2.95, showing moderate satisfaction with lectures and practical sessions. Influencing factors such as lecturer support and laboratory availability scored 3.04, while learning strategies like improved teaching and participation recorded the highest mean (3.10). The average academic achievement score was 68.7, indicating a moderate to high performance level. These results suggest that students' overall attitudes toward chemistry are more positive than negative, though perceived difficulty still affects engagement.

Relationship between Attitude and Achievement

Table 4 shows the Pearson correlation matrix among variables. There were significant positive relationships between perceived relevance and academic achievement ($r = 0.42$, $p < 0.01$), and between enjoyment and achievement ($r = 0.49$, $p < 0.01$). Perceived difficulty had a negative correlation with achievement ($r = -0.34$, $p < 0.01$), implying that higher difficulty perception is associated with lower performance. Relevance, enjoyment, and influencing factors were positively correlated, suggesting that when students enjoy chemistry and find it relevant, they tend to perform better academically.

Regression Analysis

Tables 5 to 7 summarize the regression results. The model explained 41% of the variance in academic achievement (Adjusted $R^2 = 0.41$), which indicates a moderately strong predictive power. The overall model was significant ($F = 20.26$, $p < 0.001$), showing that students' attitudes meaningfully predict their academic performance. Enjoyment ($\beta = 0.37$, $p = 0.000$) and relevance ($\beta = 0.28$, $p = 0.000$) were the strongest positive predictors

of academic achievement, meaning students who find chemistry enjoyable and relevant perform better. Perceived difficulty ($\beta = -0.25$, $p = 0.000$) had a significant negative effect, confirming that students who find chemistry hard tend to score lower. Influencing factors ($\beta = 0.12$, $p = 0.027$) and learning strategies ($\beta = 0.11$, $p = 0.032$) also made small but significant positive contributions. Gender showed a weak positive effect ($\beta = 0.09$, $p = 0.045$), with female students performing slightly better on average.

Gender and Level Differences in Academic Achievement

Table 8 shows that female students had a higher mean academic score (Mean = 69.8, SD = 9.1) than males (Mean = 67.2, SD = 9.7). The difference was statistically significant ($t = 2.10$, $p = 0.037$), indicating that female students achieved better results in chemistry overall.

Table 9 presents the one-way ANOVA comparing students across levels of study. The result ($F = 0.71$, $p = 0.546$) shows no significant difference in achievement between 100–400 level students. This means that attitudes and performance levels were relatively consistent across academic levels.

Discussion of Findings

Overall, the results show that students maintain a moderately positive attitude toward chemistry, recognizing its importance and relevance to their careers. However, perceived difficulty remains a barrier to better performance. Enjoyment of lectures and practicals was a key driver of higher achievement, emphasizing the importance of interactive and engaging teaching methods. The high reliability of the instrument confirms that responses

were consistent, and the regression results validate that attitude significantly predicts academic success. The finding that female students performed slightly better could be linked to higher engagement and motivation levels observed among them. In summary, positive perception, practical exposure, and good teaching support foster better performance in chemistry, while perceived difficulty reduces academic achievement.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary of Findings

This study examined the relationship between students' attitudes toward chemistry and their academic achievement among undergraduate chemistry students at the University of Benin. Data were collected from 50 respondents using a structured questionnaire. The responses were analyzed with SPSS, employing descriptive statistics, correlation, regression, and inferential tests.

Key findings include:

- Students generally held positive attitudes toward chemistry, with high mean scores for perceived relevance (3.01) and enjoyment (2.95).
- Perceived difficulty had a moderately low mean (2.83), suggesting that some students still find chemistry challenging.
- Enjoyment and perceived relevance were strong positive predictors of academic achievement, while perceived difficulty had a negative impact.
- The regression model explained 41% of the variance in academic achievement, showing that attitude significantly predicts students' performance.
- Female students performed slightly better than males, though the difference in performance across levels of study was not significant.

- Influencing factors such as lecturer support and laboratory availability also contributed positively to academic performance.

These findings highlight that how students perceive chemistry—its relevance, enjoyability, and difficulty—plays a direct role in shaping their academic outcomes.

Conclusion

The study concludes that attitude toward chemistry is a significant determinant of academic achievement among undergraduate students. Students who view chemistry as relevant, enjoyable, and supported by effective teaching tend to perform better academically. Conversely, negative perceptions rooted in perceived difficulty can limit engagement and achievement.

This suggests that improving students' affective connection to the subject is as important as improving instructional methods. A positive attitude toward chemistry not only enhances learning motivation but also promotes sustained academic performance.

Implications of the Study

The findings have several educational implications:

For lecturers: adopting participatory and practical-oriented teaching methods can increase students' enjoyment and reduce perceptions of difficulty.

For curriculum designers: incorporating real-world applications of chemistry can improve perceived relevance and student motivation.

For policymakers: providing better laboratory facilities and learning aids can support positive attitudes and performance.

For students: developing self-directed learning habits and group study can reduce anxiety and improve understanding.

Recommendations

Based on the findings, the following recommendations are made:

- Lecturers should integrate interactive teaching techniques, such as demonstrations and small-group problem-solving, to make chemistry more engaging.
- Departments should organize regular seminars and workshops linking chemistry to real-life problems to enhance perceived relevance.
- Institutions should upgrade laboratory facilities and provide sufficient materials to improve practical exposure.
- Counseling and mentorship programs should be introduced to help students manage fear or anxiety toward difficult chemistry concepts.
- Female students' positive engagement should be sustained through recognition and academic support programs that motivate all genders equally.

Future studies should include other universities to compare results across institutions and verify the consistency of these findings.

Suggestions for Further Research

Future research could:

- Examine the long-term effect of attitude changes on academic performance using longitudinal data.

- Investigate how teaching styles or lecturer behavior specifically influence each attitude dimension.
- Explore the role of motivation, self-efficacy, and learning environment as mediating factors between attitude and achievement.
- Extend the study to other science disciplines to compare how attitudes affect academic outcomes in different fields.

Contribution to Knowledge

This study contributes to knowledge by empirically demonstrating that enjoyment, perceived relevance, and learning strategies are strong predictors of chemistry achievement among undergraduates. It also highlights that perceived difficulty remains the main barrier to improved performance, suggesting that interventions should target reducing fear and building confidence in chemistry learning.

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APPENDIX

Instructions: Please read each item carefully and place a check (✓) in the box that best represents your opinion:

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

For Section A, please check the appropriate box for your demographic information.

Section A: Demographic Information.

Gender: Male [ ] Female [ ]

Level: 100L [ ] 200L [ ] 300L [ ] 400L [ ]

Age: Below 18 [ ] 18–22 [ ] 23–27 [ ] Above 27 [ ]

Course: Departmental Chemistry [ ] Borrowed Course [ ]

Section B: Perceived Relevance of Chemistry

S/N	Statement	SA	A	D	SD
1.	Chemistry is relevant to my future career goals.				
2.	I believe chemistry has practical applications in everyday life.				
3.	Studying chemistry helps me understand real-world scientific issues.				
4.	Chemistry is an essential subject for my academic development.				
	Section C: Perceived Difficulty of Chemistry				
5.	I find chemistry concepts difficult to understand.				
6.	Chemistry requires more effort to learn compared to other				

S/N	Statement	SA	A	D	SD
	subjects.				
7.	I feel overwhelmed by the complexity of chemistry topics.				
8.	Chemistry problems are too challenging for me to solve.				
	Section D: Enjoyment of Chemistry				
9.	I enjoy attending chemistry lectures.				
10.	I find chemistry experiments in the laboratory exciting.				
11.	Studying chemistry is an enjoyable experience for me.				
12.	I look forward to learning new chemistry concepts.				
	Section E: Factors Influencing Attitudes toward Chemistry				
13.	The teaching methods used in chemistry classes make the subject more interesting.				
14.	The availability of well-equipped laboratory facilities improves my attitude toward chemistry.				
15.	Societal perceptions about chemistry influence my interest in the subject.				
16.	Support from lecturers and peers positively affects my attitude toward chemistry.				
	Section F: Strategies for Improving Chemistry Education				
17.	Improving teaching methods would enhance my interest in chemistry.				
18.	Better laboratory facilities would improve my academic performance in chemistry.				
19.	Incorporating real-world applications in chemistry lessons would make the subject more engaging.				
20.	Encouraging student participation in chemistry classes would improve my learning experience.				