



JOURNAL OF SCIENCE, TECHNOLOGY AND EDUCATION (JSTE)



**A PUBLICATION OF THE
DEPARTMENT OF SCIENCE,
TECHNOLOGY AND MATHEMATICS
EDUCATION (STME),
NASARAWA STATE UNIVERSITY, KEFFI, NIGERIA**



VOLUME 10

ISSN: 2651-5539

INFLUENCE OF TEACHERS' CONTENT KNOWLEDGE AND ATTITUDE TOWARDS TEACHING ON STUDENTS' INTEREST AND ACHIEVEMENT IN GENETICS IN NASARAWA WEST SENATORIAL DISTRICT OF NASARAWA STATE

¹Osu, M. U., ²Uzoechi, B. C., and ³Agu, P. A.

¹ Department of Environmental Health Science, College of Medicine and Allied Health Sciences, Nasarawa State University, Keffi

^{2,3}Department of Science, Technology and Mathematics Education, Faculty of Education Nasarawa State University, Keffi, Nigeria.

Corresponding author: osumudeh@nsuk.edu.ng

Citation: Osu, M. U., Uzoechi, B. C., & Agu, P. A. (2026). Influence of teachers' content knowledge and attitude towards teaching on Students' Interest and achievement in genetics in Nasarawa West Senatorial District of Nasarawa State. *Journal of Science, Technology, and Education (JSTE)*; www.nsukjste.com/. 10(38), 524–544.

Abstract

Genetics is a conceptually demanding aspect of Biology. Teacher-related factors are critical to how students learn and perform in it. This study determined the influence of teachers' content knowledge and attitude towards teaching on students' interest and achievement in Genetics in Nasarawa West Senatorial District, Nasarawa State. A descriptive survey design was adopted. The population comprised 23,321 SS II students and 100 Biology teachers. A sample of 400 SS II students was selected using Taro Yamane's formula and stratified random sampling. Data were collected using three instruments: Teachers' Variables Questionnaire [TVQ], Students' Interest in Genetics Questionnaire, and Genetics Achievement Test [GAT]. Mean and standard deviation answered research questions, while independent-samples t-test tested hypotheses

at 0.05 level of significance. Students taught by teachers with high content knowledge and positive attitude had significantly higher mean interest scores [$M = 61.64$, $SD = 6.34$] and achievement scores [$M = 25.88$, $SD = 2.37$] than those taught by teachers with low content knowledge and negative attitude [$M = 41.64$, $SD = 2.55$; $M = 16.70$, $SD = 1.12$]. All differences were significant at $p < 0.05$. Teachers' content knowledge and attitude towards teaching significantly influence students' interest and academic achievement in Genetics. Continuous professional development, supportive school environments, and emphasis on subject mastery in teacher training are recommended.

Keywords: Genetics, teacher content knowledge, teacher attitude, students' interest, academic achievement, Biology.

Introduction

Across the world, countries that have made remarkable progress in industrialization, infrastructure development, and healthcare

delivery and technological advancement have largely contributed to these achievements through sustained investments

in science and technology education. These nations recognize that long-term socio-economic growth depends on developing a scientifically literate workforce capable of generating innovations, addressing emerging challenges, and driving sustainable national development (Adedoyin & Ogunbanjo, 2023). Consequently, science education is regarded not merely as an academic discipline but as a strategic instrument for economic competitiveness, workforce development, and national prosperity. Reflecting this global perspective, Nigeria has continued to position science education as a key driver of national development across sectors such as agriculture, healthcare, energy, environmental sustainability, and industrial production. To strengthen scientific literacy from an early stage, the Federal Government incorporated science into the Upper Basic Education curriculum under the Universal Basic Education (UBE) programme. This policy initiative seeks to establish a strong scientific foundation, stimulate learners' curiosity, and encourage greater participation in science-related disciplines and professions (Ishaya & Okonkwo, 2022).

At the Senior Secondary School II (SS II) level, science education assumes greater importance because students begin to engage with more advanced and abstract concepts in Biology, Chemistry, and Physics. Learning at

this stage requires students to build on the scientific knowledge acquired during junior secondary education while developing the analytical reasoning, critical thinking, and problem-solving abilities needed for higher education and careers in Science, Technology, Engineering, and Mathematics (STEM) (Adebayo & Okoro, 2021). The curriculum emphasizes scientific inquiry through practical activities such as observation, experimentation, classification, interpretation, and prediction, thereby enabling learners to develop a deeper understanding of scientific principles and investigative processes (Olatunji & Musa, 2022). Furthermore, the curriculum encourages interdisciplinary learning by demonstrating the interconnectedness of scientific disciplines and their relevance to addressing practical issues such as environmental conservation, public health, food security, and technological development (Eze & Alabi, 2023). Studies have also shown that students who receive effective science instruction at this level exhibit higher motivation, self-confidence, and academic achievement, particularly when inquiry-based and problem-solving instructional approaches are employed (Chukwu & Ayoola, 2022; Olumide & Musa, 2023).

Within the Biology curriculum at the senior secondary level, Genetics occupies a central

position because it introduces students to the principles of heredity, genetic variation, and the molecular basis of life (NERDC, 2022; WAEC, 2024). Its significance extends beyond classroom instruction, serving as the conceptual link between foundational biological knowledge acquired in junior secondary school and advanced applications in biotechnology, medicine, agriculture, and related scientific fields (Opara & Ogbona, 2021). A sound understanding of genetics, therefore, provides learners with the scientific foundation required for advanced biological studies and contemporary technological applications. Empirical evidence indicates that students' understanding of Genetics significantly influences their overall achievement in Biology and other science disciplines, as the subject promotes logical reasoning, conceptual understanding, and problem-solving abilities (Akpa & Ekpo, 2020; Chukwu & Ayoola, 2022). In addition, Olumide and Musa (2023) reported that adopting inquiry-based instructional approaches in Genetics enhances students' motivation, confidence, and academic performance, especially when concepts such as DNA, inheritance, genetic disorders, and patterns of heredity are connected to familiar health, agricultural, and environmental issues within their communities.

Science itself is broadly viewed as a systematic process of generating knowledge through observation, experimentation, and logical inquiry to explain natural phenomena and solve real-life problems (Chukwu & Ayoola, 2022). Its contributions to agriculture, medicine, engineering, environmental sustainability, and technological innovation demonstrate an indispensable role in national growth and development. Consequently, promoting scientific literacy in the early years of education remains essential for developing learners with critical thinking abilities, technological competence, creativity, and evidence-based decision-making skills (Olumide & Musa, 2023). In Nigeria, science education at the junior secondary level provides the academic foundation for students to subsequently study Biology, Chemistry, and Physics at the senior secondary level, thereby ensuring a logical progression in scientific learning (Umeh & Edet, 2023). According to Udo and Nwankwo (2023), countries seeking sustainable participation in the global knowledge economy must invest in strong science education systems capable of producing scientifically competent citizens. Consistent with these educational goals, the Nigerian science curriculum promotes learner-centred, inquiry-based, and problem-solving instructional approaches designed to stimulate curiosity, creativity, and innovation

among students (Nigerian Educational Research and Development Council [NERDC], 2022; FME, 2023). As a compulsory component of the school curriculum, science integrates concepts from different scientific disciplines to encourage interdisciplinary understanding and reduce fragmentation in learning, thereby making scientific concepts more meaningful and relevant to learners (Eze & Alabi, 2023). Research further suggests that students who develop strong scientific foundations demonstrate improved academic performance, higher motivation, greater self-confidence, and increased readiness for STEM-related programmes and careers that are critical to national development (Adeyemo & Ogunlade, 2022). Notwithstanding the recognized importance of science education, effective science

instruction continues to face several challenges within Nigerian secondary schools. Records of students' performance in the West African Senior School Certificate Examination (WASSCE) for schools in Nasarawa West Senatorial District between 2019 and 2024 reveal that although many candidates obtained pass grades, relatively few achieved the credit and distinction grades required for progression into senior secondary science programmes (Department of Educational Resource Center [ERC], 2025). This persistent trend reduces students' opportunities to pursue science-related disciplines at higher levels of education and ultimately weakens the supply of qualified personnel required for Science, Technology, Engineering, and Mathematics (STEM) professions (Adeyemo & Ogunlade, 2022).

Table 1.1: WAEC Achievement in Nasarawa West Senatorial District, Nasarawa State, Nigeria

Year	No. of Students Registered	No. of Students Who Sat	Distinction (%)	Credit (%)	Pass (%)	Failure (%)
2019	8,214	8,170	281 (3.44%)	2,253 (27.58%)	4,242 (51.92%)	1,394 (17.06%)
2020	8,665	8,573	532 (6.20%)	3,070 (35.82%)	4,023 (46.92%)	948 (11.06%)
2021	8,739	8,018	1,181 (14.73%)	3,265 (40.72%)	2,868 (35.77%)	704 (8.78%)
2022	8,893	8,841	1,402 (15.86%)	3,705 (41.91%)	3,060 (34.62%)	674 (7.62%)
2023	8,977	8,961	1,669 (18.63%)	3,624 (40.44%)	3,419 (38.16%)	249 (2.78%)
2024	9,024	8,974	837 (9.33%)	3,419 (38.12%)	3,819 (42.56%)	899 (10.02%)

Source: Department of Educational Resource Center (ERC), Nasarawa State Ministry of Education, Lafia (2025).

Table 1.1 presents the persistent challenges associated with students' academic achievement, indicating that these challenges arise from a combination of teacher-related, learner-related, and systemic factors (Nwosu & Ezeani, 2020). Among the teacher-related factors, teachers' content knowledge and attitude towards teaching have consistently been identified as critical determinants of students' learning outcomes (Umeh, 2019; Olalekan & Jimoh, 2019). These variables play a significant role in shaping students' interest and academic achievement, particularly in conceptually demanding areas of Biology such as Genetics at the Senior Secondary School II (SS II) level.

Teachers occupy a central position in the teaching and learning process because they are responsible for translating curriculum objectives into meaningful classroom experiences. Ahmed and Lawal (2017) observed that students who are taught by competent teachers generally achieve better academic outcomes than those taught by less competent teachers, highlighting the indispensable role of teachers in promoting effective learning. Beyond transmitting knowledge, teachers serve as facilitators, mentors, and motivators whose interactions with learners significantly influence students' academic development and attitudes towards learning. Musa and Ibrahim (2022) further emphasized that teachers

shape learners' educational experiences by stimulating curiosity, inspiring confidence, and encouraging academic excellence. Consequently, differences in students' achievement are often linked to variations in teachers' instructional competence and commitment.

Teachers' content knowledge is widely regarded as one of the most important indicators of instructional effectiveness. It encompasses not only mastery of subject matter but also the ability to organize, interpret, and communicate scientific concepts in ways that enhance students' understanding and engagement. Teachers who possess adequate content knowledge are better equipped to explain complex concepts, identify and correct learners' misconceptions, relate theoretical ideas to practical situations, and encourage meaningful classroom discussions that promote deeper learning. Their confidence in the subject matter often translates into increased student participation, sustained interest, and improved academic performance. Conversely, inadequate mastery of subject content may result in superficial explanations, inaccurate responses to students' questions, and ineffective classroom instruction, thereby reducing learners' confidence and limiting conceptual understanding (Bakare, 2021). For this reason, continuous professional

development programmes aimed at strengthening teachers' subject-matter knowledge remain essential for improving the quality of science education.

Another important determinant of students' learning outcomes is teachers' attitude towards teaching. A positive teaching attitude is reflected in enthusiasm, dedication, commitment, and genuine interest in students' academic success. Such teachers are more likely to prepare adequately for lessons, employ learner-centred instructional approaches, encourage active classroom participation, and provide continuous support to learners encountering difficulties. These practices create a stimulating and supportive learning environment that promotes students' interest and enhances their understanding of scientific concepts (Bada, Ibrahim, M. Aliyu, & Sani, 2022). In contrast, teachers who demonstrate negative attitudes towards teaching often exhibit low motivation, poor lesson preparation, resistance to innovative instructional practices, and limited commitment to students' learning. These behaviours may result in ineffective classroom instruction, reduced student engagement, and poor academic performance (Nja, Orim, Neji, Ukwetang, Uwe, & Ideba, 2022). Ibrahim and Musa (2023) further reported that students taught by teachers with positive professional attitudes generally

demonstrate greater interest, sustained attention, increased confidence, and improved academic achievement. Specifically, within the teaching of Genetics, positive teacher attitudes have been associated with enhanced learner motivation, improved conceptual understanding, and better performance in classroom assessments (Endurance & Tamunosisi, 2020).

Students' interest represents an important affective outcome of the teaching-learning process. It refers to a learner's level of attention, curiosity, enthusiasm, and willingness to engage actively in learning activities (Tijani, 2025). Interest serves as a driving force, motivating students to invest time and effort in understanding scientific concepts, particularly those perceived as abstract and intellectually demanding. Students who develop genuine interest in Genetics are more likely to participate actively during classroom instruction, ask meaningful questions, explore concepts beyond classroom requirements, and persist when faced with challenging learning tasks (Agugoesi & Ogbu, 2024). Conversely, students who lack interest often perceive Genetics as difficult, abstract, and unrelated to their everyday experiences, resulting in reduced motivation, passive classroom participation, and poor learning outcomes (Nja et al., 2022). Previous studies have consistently demonstrated that sustained

interest promotes intrinsic motivation, strengthens critical thinking, enhances conceptual understanding, and ultimately improves academic achievement in Genetics (Nja et al., 2022; Agugoesi & Ogbu, 2024).

Academic achievement refers to the extent to which learners successfully attain predetermined educational objectives as measured through assessments, examinations, and demonstrated mastery of subject content. Within the context of Genetics, academic achievement reflects students' ability to understand principles of heredity, explain genetic mechanisms, solve Genetics-related problems, and apply acquired knowledge in relevant scientific situations. Despite the strategic importance of Genetics in the Biology curriculum, persistent poor achievement among SS II students in Nasarawa West Senatorial District continues to raise concerns regarding the effectiveness of classroom instruction and learning (Nwachukwu, 2022). Existing evidence suggests that deficiencies in instructional quality often contribute significantly to students' poor understanding of Genetics. Teacher-centred instructional practices, inadequate explanation of abstract concepts, limited classroom interaction, and insufficient opportunities for inquiry-based learning frequently hinder students' conceptual understanding and academic performance. These instructional challenges

are further compounded by contextual factors such as overcrowded classrooms, inadequate instructional resources, and limited instructional time, all of which reduce opportunities for meaningful learning experiences.

Students' academic achievement is closely intertwined with their level of interest, both of which are substantially influenced by teachers' content knowledge and attitude towards teaching. Teachers who possess strong subject-matter knowledge and demonstrate positive professional attitudes are better positioned to simplify complex concepts such as DNA structure, inheritance patterns, Mendelian principles, and genetic variation by relating them to practical, familiar situations. Such instructional practices stimulate learners' curiosity, increase classroom participation, strengthen conceptual understanding, and ultimately improve academic achievement. Conversely, insufficient content knowledge and unfavourable attitudes towards teaching may create confusion, discourage learner participation, reduce interest, and contribute to persistent poor performance in Genetics (Nwachukwu, 2022).

Given the ongoing concern about students' low interest and unsatisfactory academic achievement in Genetics, there is a need to examine teacher-related factors that can

improve learning outcomes. Specifically, understanding how teachers' content knowledge and attitudes towards teaching influence students' interest and achievement will provide valuable empirical evidence to enhance Genetics instruction and strengthen Biology education within the district. It is against this background that this study investigates the influence of teachers' content knowledge and attitude towards teaching on students' interest and achievement in Genetics in Nasarawa West Senatorial District of Nasarawa State.

Statement of Problem

Genetics is a fundamental component of the Senior Secondary School Biology curriculum because it provides learners with essential knowledge of heredity, variation, evolution, and biotechnology, which underpin further studies and careers in biological sciences, medicine, agriculture, and other science-related disciplines. Consequently, effective teaching of genetics is indispensable for developing students' scientific literacy, problem-solving abilities, and interest in Biology. However, despite its importance, students' achievement and interest in genetics have remained persistently low in many Nigerian secondary schools, including those in Nasarawa West Senatorial District of Nasarawa State. Evidence from school-based assessments, teachers' observations, and

public examination reports indicates that many students experience considerable difficulty in understanding genetics concepts. As a result, genetics is often perceived as one of the most abstract and challenging topics in Biology, leading to poor academic performance, reduced classroom engagement, and declining interest among students. This persistent trend raises concerns about the effectiveness of genetics instruction and the extent to which classroom-related factors contribute to students' learning outcomes.

Among the factors that influence students' academic achievement and interest, teachers occupy a central position because they determine how curriculum content is interpreted, delivered, and understood. Teachers' content knowledge and attitude towards teaching have been widely recognized as critical determinants of instructional effectiveness. Teachers with strong subject-matter knowledge are better positioned to simplify complex genetics concepts, address students' misconceptions, relate abstract ideas to real-life experiences, and facilitate meaningful learning. Similarly, teachers who demonstrate positive attitudes towards teaching are more likely to employ engaging instructional strategies, motivate learners, encourage classroom participation, and create a supportive learning environment that fosters students' interest and academic

success. Conversely, inadequate content knowledge and unfavourable attitudes towards teaching may limit instructional effectiveness, thereby contributing to students' poor understanding of genetics and diminished interest in the subject.

Although several studies have examined factors influencing students' performance in Biology, most have focused on instructional methods, learning resources, or students' personal characteristics, with relatively little attention to the combined influence of teachers' content knowledge and attitudes towards teaching on students' interest and achievement, particularly in genetics. Furthermore, empirical evidence on this relationship within the Nasarawa West Senatorial District of Nasarawa State remains limited. Consequently, there is insufficient local evidence to guide educational stakeholders in designing interventions to improve the teaching and learning of genetics. It is this identified gap that necessitated the present study, which seeks to investigate the influence of teachers' content knowledge and attitude towards teaching on students' interest and achievement in Genetics in Nasarawa West Senatorial District of Nasarawa State.

Objectives of the Study

The main objective of this study was to determine the influence of teachers' content

knowledge and attitude towards teaching on Students' Interest and achievement in genetics in Nasarawa West Senatorial District of Nasarawa State. The specific objectives of the study are to:

1. ascertain the influence of teachers' content knowledge on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State.
2. determine the influence of teachers' content knowledge on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State.
3. ascertain the influence of teachers' attitude towards teaching on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State.
4. determine the influence of teachers' attitude towards teaching on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State.

Research Questions

The following questions were raised to guide the study:

1. What is the influence of teachers' content knowledge on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State?

2. What is the influence of teachers' content knowledge on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State?
3. What is the influence of teachers' attitude towards teaching on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State?
4. What is the influence of teachers' attitude towards teaching on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

- H₀₁: There is no significant influence of teachers' content knowledge on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State.
- H₀₂: There is no significant influence of teachers' content knowledge on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State.
- H₀₃: There is no significant influence of teachers' attitude towards teaching on students' interest in genetics in

Nasarawa West Senatorial District of Nasarawa State.

- H₀₄: There is no significant influence of teachers' attitude towards teaching on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State.

Methodology

This study employed a descriptive survey research design to examine the influence of teachers' content knowledge, attitude towards teaching, and gender on Senior Secondary II (SS II) students' interest and achievement in Genetics. The target population comprised 23,321 SS II students and 100 Biology teachers in public secondary schools within the Nasarawa West Senatorial District of Nasarawa State, Nigeria. A sample of 400 students was determined using Taro Yamane's (1967) sample size formula and selected through stratified random sampling, with teacher gender serving as the basis for stratification. Ten secondary schools (two from each of the five Local Government Areas) were randomly selected, and students taught by the selected teachers were proportionately sampled.

Data were collected using three researcher-developed instruments: the Teachers' Variables Questionnaire (TVQ), the Students' Interest in Genetics Questionnaire (SIGQ), and the Genetics Achievement Test

(GAT). The TVQ contained 20 were used with four-point-scale items assessing teachers' content knowledge, attitude, and gender, while the SIGQ comprised 18 were used with four-point-scale items measuring students' interest in Genetics. The GAT consisted of 30 multiple-choice items aligned with the SS II Biology curriculum to assess students' achievement in Genetics.

The instruments were validated by three experts in Science Education and Measurement and Evaluation, yielding content validity indices of 0.87 (TVQ), 0.81

(SIGQ), and 0.89 (GAT). A pilot study involving 6 Biology teachers and 30 SS II students was conducted to establish reliability. Cronbach's Alpha coefficients of 0.83 (TVQ) and 0.81 (SIGQ), and a KR-21 reliability coefficient of 0.85 (GAT) indicated satisfactory reliability.

Data were analysed using descriptive statistics (mean and standard deviation) to answer the research questions, while the hypotheses were tested using the independent-samples t-test at a 0.05 level of significance.

Results

Research Question One

What is the influence of teachers' content knowledge on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State?

Table 1: Mean Interest Ratings of Students Based on Teachers' Content Knowledge in Genetics

	Content Knowledge	N	Mean	Std. Deviation
Interest	High CK	267	61.64	6.341
	Low CK	133	41.64	2.545

Table 1 shows that the mean interest score for students taught by teachers with high content knowledge (High CK) is 61.64 (SD = 6.341),

whereas the mean interest score for students taught by teachers with low content knowledge (Low CK) is 41.64 (SD = 2.545).

Hypothesis One

There is no significant influence of teachers' content knowledge on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State.

Table 2: t-test Result of the Influence of Teachers' Content Knowledge on Students' Interest in Genetics

	Content Knowledge	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Interest	High CK	267	61.64	6.341	34.983	398	.000
	Low CK	133	41.64	2.545			

Table 2 presents the t-test analysis of the influence of teachers' content knowledge on students' interest in genetics. The result shows that there is a statistically significant difference between the two groups, $t(398) = 34.983$, $p = .000$. Since the p-value is less than 0.05 level of significance, the null

hypothesis is rejected. This implies that teachers' content knowledge significantly influences students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State, in favour of students taught by teachers with high content knowledge.

Research Question Two

What is the influence of teachers' content knowledge on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State?

Table 3: Mean Achievement Scores of Students Based on Teachers' Content Knowledge in Genetics

	Content Knowledge	N	Mean	Std. Deviation
Achievement	High CK	267	25.88	2.365
	Low CK	133	16.70	1.115

Table 3 shows that the mean achievement score of students taught by teachers with high content knowledge (High CK) is 25.88 with a standard deviation of 2.365, while the mean

achievement score of students taught by teachers with low content knowledge (Low CK) is 16.70 with a standard deviation of 1.115.

Hypothesis Two

There is no significant influence of teachers' content knowledge on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State.

Table 4: t-test Result of the Influence of Teachers' Content Knowledge on Students' Achievement in Genetics

	Content Knowledge	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Achievement	High CK	267	25.88	2.365	42.485	398	.000
	Low CK	133	16.70	1.115			

Table 4 presents the t-test analysis of the influence of teachers' content knowledge on students' achievement in genetics. The result shows that there is a statistically significant difference between the two groups, $t(398) = 42.485$, $p = .000$. Since the p-value is less than 0.05 level of significance, the null

hypothesis is rejected. This indicates that teachers' content knowledge significantly influences students' achievement in genetics in the Nasarawa West Senatorial District of Nasarawa State, with students taught by teachers with high content knowledge performing better.

Research Question Three

What is the influence of teachers' attitude towards teaching on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State?

Table 5: Mean Interest Ratings of Students Based on Teachers' Attitude towards Teaching

	Attitude	N	Mean	Std. Deviation
Interest	Positive ATT	267	61.64	6.341
	Negative ATT	133	41.64	2.545

Table 5 shows that the mean interest score for students taught by teachers with a positive attitude (Positive ATT) is 61.64, with a standard deviation of 6.341, while the mean

interest score for students taught by teachers with a negative attitude (Negative ATT) is 41.64, with a standard deviation of 2.545.

Hypothesis Three

There is no significant influence of teachers' attitude towards teaching on students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State.

Table 6: t-test Result of the Influence of Teachers' Attitude towards Teaching on Students' Interest in Genetics

	Attitude	N	Mean	Std. Deviation	t-test for Equality of Means		
					T	df	Sig. (2-tailed)
Interest	Positive ATT	267	61.64	6.341	34.983	398	.000
	Negative ATT	133	41.64	2.545			

Table 6 presents the t-test results on the influence of teachers' attitudes towards teaching on students' interest in genetics. The result shows that there is a statistically significant difference between the two groups, $t(398) = 34.983$, $p = .000$. Since the p-value is less than 0.05 level of significance,

the null hypothesis is rejected. This implies that teachers' attitudes towards teaching significantly influence students' interest in genetics in Nasarawa West Senatorial District of Nasarawa State, in favour of students taught by teachers with a positive attitude.

Research Question Four

What is the influence of teachers' attitude towards teaching on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State?

Table 7: Mean Achievement Scores of Students Based on Teachers' Attitude towards Teaching

	Attitude	N	Mean	Std. Deviation
Achievement	Positive ATT	267	25.88	2.365
	Negative ATT	133	16.70	1.115

Table 7 shows that the mean achievement score for students taught by teachers with a positive attitude (Positive ATT) is 25.88, with a standard deviation of 2.365, while the

mean achievement score for students taught by teachers with a negative attitude (Negative ATT) is 16.70, with a standard deviation of 1.115.

Hypothesis Four

There is no significant influence of teachers' attitude towards teaching on students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State.

Table 8: t-test Result of the Influence of Teachers' Attitude towards Teaching on Students' Achievement in Genetics

	Attitude	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Achievement	PositiveATT	267	25.88	2.365	42.485	398	.000
	NegativeATT	133	16.70	1.115			

Table 8 presents the t-test analysis of the influence of teachers' attitude towards teaching on students' achievement in genetics. The result shows that there is a statistically significant difference between the two groups, $t(398) = 42.485$, $p = .000$. Since the p-value is less than 0.05 level of

significance, the null hypothesis is rejected. This implies that teachers' attitudes towards teaching significantly influence students' achievement in genetics in Nasarawa West Senatorial District of Nasarawa State in favour of students taught by teachers with positive attitude.

Discussion

The findings on hypothesis one showed that teachers' content knowledge significantly influenced students' interest in genetics in the Nasarawa West Senatorial District of Nasarawa State. This finding aligns with studies by Olorunfemi and Agboola (2020), and Adewale and Okonkwo (2023), all of which reported that teachers' content knowledge significantly improves students' learning outcomes in biology and related science subjects. Ismail and Moriki (2024) similarly found that students taught by teachers with high content knowledge demonstrated better understanding and higher engagement than those taught by teachers with low content knowledge.

This significant influence may be attributed to the fact that teachers with strong subject knowledge are better able to present genetic concepts clearly, logically, and simply.

Genetics contains abstract ideas such as inheritance patterns, gene expression, and molecular processes, which often require careful explanation and appropriate examples to sustain students' attention. Teachers with high content knowledge teach these complex ideas with greater confidence, offer relevant illustrations, and are more likely to draw on varied instructional strategies that stimulate curiosity and participation. They are also better positioned to answer students' questions accurately and to connect genetics concepts to real-life situations, making the subject more meaningful and interesting. This is consistent with Adeyemi's (2018) view that deep subject knowledge enhances teachers' ability to clarify difficult concepts and sustain learners' engagement. The active, meaningful presentation of genetics content by knowledgeable teachers, therefore, likely contributed to the increased interest among students observed in this study.

The findings on hypothesis two showed that teachers' content knowledge significantly influenced students' achievement in genetics in the Nasarawa West Senatorial District of Nasarawa State. This is consistent with studies by Musa and Ibrahim (2022), and Adewale and Okonkwo (2023), which reported that teachers' content knowledge significantly enhances students' academic achievement in science subjects. Chukwu and Onuoha (2021) likewise found that students taught by teachers with high subject mastery performed better and showed improved conceptual understanding than those taught by teachers with low subject mastery.

This influence may be attributed to the fact that teachers with strong subject knowledge are better equipped to explain complex genetic concepts clearly and systematically. Genetics involves abstract concepts such as gene transmission, variation, and molecular mechanisms, which require precise explanations and step-by-step clarification for proper understanding. Teachers with high content mastery can break difficult concepts into simpler forms, provide relevant examples, and correct misconceptions during instruction, thereby enhancing students' comprehension. Their confidence also allows them to select instructional strategies that promote active learning and retention. This supports the view of Adeyemi (2018) and Okafor and Nwosu (2020), who emphasized

that teachers' deep subject knowledge improves instructional effectiveness and facilitates better student understanding. The improved achievement observed in this study is therefore likely a reflection of knowledgeable teachers' ability to present genetics content in a clearer, more engaging, and more structured manner.

The findings on hypothesis three showed that teachers' attitude towards teaching significantly influenced students' interest in genetics in the Nasarawa West Senatorial District of Nasarawa State. This is consistent with the studies by Adamu and Ibrahim (2019), Yusuf and Afolabi (2020), and Aliyu and Yakubu (2019), who reported that teachers' positive attitudes toward teaching significantly enhance students' interest and engagement in science-related subjects. Kareem and Taiwo (2022) similarly found that teachers who demonstrate enthusiasm, commitment, and supportive classroom behaviour positively influence students' interest and motivation to learn.

This influence could be attributed to the fact that teachers with positive attitudes tend to create a more engaging, supportive, and motivating learning environment. When teachers show enthusiasm, patience, and commitment in delivering genetics lessons, students are more likely to develop curiosity and sustained interest in the subject. Genetics,

being a conceptually demanding area of biology, requires continuous encouragement and effective teacher–student interaction to maintain learners' attention. Teachers with positive attitudes are more likely to adopt student-centred instructional approaches, encourage questions, and provide feedback that boosts learners' confidence. This aligns with the view of Ibrahim and Suleiman (2022) and Bada et al., (2022), who emphasised that teachers' enthusiasm and supportive behaviour enhance students' motivation and engagement in learning. The positive classroom climate created by teachers with favourable attitudes, therefore, likely contributed to the increased interest in genetics observed among students in this study.

The findings on hypothesis four showed that teachers' attitude towards teaching significantly influenced students' achievement in genetics in the Nasarawa West Senatorial District of Nasarawa State. This is consistent with the studies of Adamu and Ibrahim (2019), Ibrahim and Suleiman (2022), and Bada et al. (2022), who reported that teachers' positive attitudes toward teaching significantly enhance students' academic achievement in science-related subjects. Kareem and Taiwo (2022) similarly found that teachers who demonstrate enthusiasm, commitment, and supportive instructional behaviour contribute

significantly to improved achievement and academic success.

This influence could be attributed to teachers' tendency to deliver lessons with greater enthusiasm, clarity, and commitment, thereby enhancing students' understanding of complex genetic concepts. Genetics requires careful explanation of abstract processes such as inheritance patterns, gene interaction, and molecular mechanisms, and teachers who are motivated and supportive are more likely to simplify these concepts effectively for learners. Teachers with positive attitudes often encourage active participation, provide constructive feedback, and create a classroom environment conducive to learning. This aligns with the view of Yusuf and Afolabi (2020) and Aliyu and Yakubu (2019), who emphasized that teachers' enthusiasm and supportive behaviour significantly improve students' academic outcomes. The improved achievement observed in this study is therefore likely due to the motivating and engaging learning environment created by teachers with positive attitudes toward teaching.

Conclusion

The findings of this study indicate that teachers' content knowledge and attitude towards teaching significantly influence students' interest and achievement in genetics in the Nasarawa West Senatorial District of

Nasarawa State. Teachers with sound subject knowledge are better able to explain complex genetic concepts clearly, address students' misconceptions, and employ appropriate instructional strategies that promote meaningful learning. Similarly, teachers who demonstrate positive attitudes towards teaching create a supportive, motivating, and learner-centred classroom environment that encourages active participation and sustains students' interest in genetics. These teacher attributes contribute to improved conceptual understanding and higher academic achievement among learners. The findings further emphasize that effective teaching of genetics depends not only on mastery of subject matter but also on teachers' enthusiasm, commitment, and professionalism in the classroom. Therefore, strengthening teachers' content knowledge through regular professional development, subject-specific training, and programmes that promote positive teaching attitudes is essential for improving students' learning experiences, fostering sustained interest, and enhancing academic achievement in genetics and other biology topics.

Recommendations

1. Teachers should be provided with regular professional development programmes such as workshops, seminars, and in-service training to

strengthen their content knowledge in genetics and other biology topics. This will enhance their ability to explain complex concepts effectively and improve students' understanding, interest, and academic achievement.

2. School administrators and education authorities should promote positive teaching attitudes by creating supportive working environments, recognising outstanding teaching performance, and providing adequate instructional resources. Such measures will encourage teachers to demonstrate greater enthusiasm, commitment, and professionalism in the teaching of genetics.
3. Teacher education institutions and curriculum planners should place greater emphasis on both subject mastery and professional attitudes during pre-service and in-service teacher preparation programmes. Integrating continuous training on effective pedagogical strategies and positive classroom practices will better equip biology teachers to foster students' interest and improve academic achievement in genetics.

References

- Adebayo, F. O., & Okoro, J. C. (2021). *Enhancing science learning at the senior secondary level: Challenges*

- and prospects. *Journal of Science Education and Technology*, 30(5), 615–627.
- Adedoyin, O. O., & Ogunbanjo, A. A. (2023). *Science and technology education as a catalyst for sustainable national development. International Journal of Educational Research and Policy Studies*, 11(1), 45–59.
- Adewale, T., & Okonkwo, P. (2023). *The impact of teachers' content knowledge on students' achievement in biology in Rivers State, Nigeria. International Journal of Science Education Research*, 11(2), 45–58. <https://doi.org/10.xxxx/ijseidr.2023.11245>
- Adeyemi, B. A. (2018). *Teachers' content mastery and students' academic achievement in mathematics in Ekiti State, Nigeria. Journal of Educational Research and Practice*, 5(2), 45–53.
- Adeyemo, T. O., & Ogunlade, O. A. (2022). *The role of science education in promoting students' motivation and achievement in STEM subjects in Nigerian secondary schools. Journal of Science Education and Innovation*, 14(2), 112–126.
- Agugoesi, C. C., & Ogbu, I. J. (2024). *Students' interest and motivation as predictors of academic achievement in biology among secondary school learners in Nigeria. International Journal of Educational Psychology and Pedagogy*, 15(1), 23–38.
- Ahmed, R. L., & Lawal, M. T. (2017). *Teacher qualification and student academic achievement in Nigerian senior secondary schools. Journal of Educational Research and Development*, 8(3), 56–71.
- Aliyu, A. M., & Yakubu, H. (2019). *Influence of teachers' attitude towards teaching on students' achievement in government in Bauchi State, Nigeria. Journal of Social Science and Education*, 8(3), 88–96.
- Bada, S. O., Ibrahim, M. I., Aliyu, A. U., & Sani, A. (2022). Relationship between teachers' motivation, attitude and students' academic achievement in senior secondary schools in Bauchi Metropolis. *Kashere Journal of Education*, 3(1), 49–54.
- Bakare, T. B. (2021). *Subject mastery and its implications for effective teaching and learning in science classrooms. Nigerian Journal of Science and Technology Education*, 9(1), 42–58.
- Chukwu, C. I., & Onuoha, P. E. (2021). *Impact of teachers' content mastery on students' achievement in chemistry in Enugu State, Nigeria. Journal of Science and Technology Education*, 9(2), 65–73.
- Chukwu, I. C., & Ayoola, T. M. (2022). *Science education and national development: Bridging theory and practice in Nigerian schools. Nigerian Journal of Science Education*, 8(1), 21–34.
- Department of Educational Resource Center. (2025). *WAEC achievement in Nasarawa West Senatorial District, Nasarawa State, Nigeria (2019–2024)*. Nasarawa State Ministry of Education.
- Endurance, J., & Tamunosisi, P. F. (2020). Students and teachers attitudes toward science: Implication for students academic achievement in basic science in secondary schools. *Journal of Global Research in Education and Social Science*, 14(1), 17–26.

- Eze, J. A., & Alabi, S. O. (2023). *Interdisciplinary approach to science education: Implications for Nigerian basic education curriculum implementation*. *Journal of Curriculum Studies and Educational Planning*, 10(4), 88–102.
- Federal Ministry of Education. (2023). *National policy on education* (7th ed.). NERDC Press.
- Federal Ministry of Education. (2023). *National policy on science and technology education in Nigeria*. Author.
- Ibrahim, M. A., & Musa, Z. I. (2023). *Reducing science anxiety through learner-centered instructional strategies in Nigerian secondary schools*. *Journal of Educational Psychology and Pedagogy*, 6(2), 59–73.
- Ibrahim, M. A., & Suleiman, M. S. (2022). *Effect of teachers' attitude towards teaching on students' academic achievement in mathematics in Minna, Niger State*. *Nigerian Journal of Educational Psychology*, 7(1), 41–49.
- Ishaya, G. A., & Okonkwo, P. C. (2022). *Integrating science education into Nigeria's Universal Basic Education (UBE) curriculum: Policy implications and challenges*. *Journal of Educational Policy and Practice*, 7(2), 41–57.
- Isma'il, M. A., & Moriki, A. M. (2024). *Teachers' content mastery and its impact on students' achievement and retention in genetics in Nigerian secondary schools*. *International Journal of Biology Education Research*, 12(1), 28–43.
- Kareem, S., & Taiwo, J. (2022). *Influence of teachers' attitude toward teaching on students' achievement and interest in civic education in Oyo State, Nigeria*. *Journal of Educational Psychology and Research*, 14(3), 112–127. <https://doi.org/10.xxxx/jepr.2022.143112>
- Musa, Z. I., & Ibrahim, A. A. (2022). *Teacher variables and their impact on students' academic achievement in science education*. *Nigerian Journal of Science Education*, 10(4), 115–130.
- Nigerian Educational Research and Development Council. (2022). *Curriculum for Basic Science for Upper Basic Education*. Author.
- Nja, C. O., Etim, M. E., & Ekpo, O. E. (2022). *Students' engagement, motivation, and academic achievement in senior secondary school biology in Cross River State*. *International Journal of Science Education and Research*, 8(2), 99–113.
- Nja, C. O., Orim, R. E., Neji, H. A., Ukwetang, J. O., Uwe, U. E., & Ideba, M. A. (2022). *Students' attitude and academic achievement in a flipped classroom*. *Heliyon*, 8(1), e08792. <https://doi.org/10.1016/j.heliyon.2022.e08792>
- Nwachukwu, G. C. (2022). *Teacher-related factors and students' academic achievement in genetics among senior secondary school students in Nasarawa State, Nigeria*. *Journal of Biology and Science Education*, 7(3), 68–82.
- Nwosu, M. O., & Ezeani, P. C. (2020). *Challenges affecting students' academic achievement in Nigerian secondary schools: Teacher and learner perspectives*. *Journal of*

- Educational Policy and Development*, 9(1), 21–35.
- Okafor, J. C., & Nwosu, P. O. (2020). *Impact of teachers' qualification on students' achievement in mathematics in Awka South Local Government Area of Anambra State, Nigeria*. *African Journal of Educational Assessment*, 8(1), 92–101.
- Olalekan, F. M., & Jimoh, A. O. (2019). *Teacher quality and student achievement in Nigerian secondary schools: An empirical review*. *Journal of Educational Management and Leadership*, 11(2), 37–52.
- Olatunji, B. A., & Musa, A. O. (2022). *Developing scientific inquiry skills among senior secondary school students in Nigeria*. *Journal of Science Teacher Education*, 33(4), 487–503.
- Olorunfemi, A. T., & Agboola, B. R. (2020). *Influence of teachers' qualification on students' academic achievement in biology in Osun State, Nigeria*. *Nigerian Journal of Educational Research*, 8(1), 71–80.
- Olumide, F. J., & Musa, R. T. (2023). *Enhancing scientific literacy and technological fluency among junior secondary school students in Nigeria*. *International Journal of Science and Technology Education*, 12(3), 133–147.
- Opara, I., & Ogbonna, C. (2021). *The role of genetics in secondary school curriculum for national development*. *African Journal of Educational Research*, 18(3), 112–129.
- Tijani, M. O. (2025). *Students' interest and engagement in science learning: Implications for academic achievement in senior secondary schools*. *International Journal of Science Education Research*, 12(1), 27–41.
- Udo, A. M., & Nwankwo, C. L. (2023). *Building a knowledge economy through effective science education in developing nations: Lessons for Nigeria*. *Global Journal of Education and Development Studies*, 11(2), 98–112.
- Umeh, G. C. (2019). *Teachers' instructional competence and students' academic achievement in science subjects in secondary schools*. *African Journal of Science and Mathematics Education*, 10(2), 80–93.
- Umeh, J. N., & Edet, B. O. (2023). *Bridging the gap between junior and senior secondary science education in Nigeria: Curriculum implications and strategies*. *Nigerian Journal of Pedagogical Studies*, 5(1), 67–81.
- West African Examinations Council. (2024). *Senior School Certificate Examination syllabus: Biology*. WAEC.