Faculty of Natural and Applied Sciences Journal of Mathematics and Science Education
Print ISSN: 2814-0885 e-ISSN: 2814-0931
www.fnasjournals.com
Volume 6; Issue 4; May2025; Page No. 110-120.

Effect of Field-Trip Teaching Strategy on Students' Interest and Achievement in Pollution Studies in Akwanga, Nasarawa State

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Abstract
This research explored the impact of the field trip instructional method on the interest and academic performance of secondary school students in the topic of pollution within Akwanga Local Government Area, Nasarawa State, Nigeria. The main objective was to assess whether this experiential learning approach yields better outcomes than traditional classroom teaching. The study was guided by four research questions and tested four corresponding null hypotheses at a 0.05 significance level. A quasi-experimental design, specifically the non-equivalent pre-test and post-test control group model was employed. The sample consisted of 80 Senior Secondary One (SS I) students (45 boys and 35 girls), selected from a total population of 1,320 SS I students across 16 schools in the area. Two intact classes were chosen through a multi-stage sampling procedure and were randomly assigned to either an experimental or control group. Two instruments developed and validated by the researchers were used for data collection: the*Pollution Achievement Test (PAT)* and the *Interest Scale on Pollution (ISP)*. The PAT had a split-half reliability coefficient of 0.78, while the ISP had a Cronbach Alpha reliability of 0.82. Both groups received instruction on pollution for a period of three weeks. The experimental group was taught using the field trip approach, while the control group received conventional instruction. Descriptive statistics (mean and standard deviation) were used to analyze the research questions, and t-tests were applied to test the hypotheses. Results showed that the field trip strategy significantly enhanced students' interest and academic achievement in pollution. No significant differences were observed between male and female students in terms of interest levels. Specifically, there was a statistically significant difference in achievement scores between students taught using field trips and those taught conventionally: $t(78) = 11.83$, $p < 0.05$. However, gender did not significantly influence interest: $t(38) = 1.28$, $p > 0.05$. The study recommends the integration of field trips into science and environmental education curricula, improved teacher training in experiential methods, and stronger institutional support to promote active learning.

Keywords: Field Trip, Teaching Strategy, Student Interest, Academic Performance, Pollution

Introduction

Modern education, especially in the 21st century, demands the adoption of innovative, learner-centered instructional methods that promote active engagement and meaningful comprehension (Oladejo, Olosunde, & Isola, 2021). Science education, which serves as a platform for students to develop foundational scientific skills and cultivate interest in the natural world, plays a vital role in shaping learners' attitudes and decision-making abilities regarding scientific and technological matters. Among the core subjects in science, biology emphasizes the study of life, encompassing the structure, function, evolution, and classification of living organisms. As an empirical discipline, biology uses the scientific method to generate hypotheses and formulate explanations about biological phenomena. Its study enhances students' critical thinking, ethical reflection, and awareness of environmental issues. A key concern within biology education is pollution a growing environmental threat with significant implications for ecosystems, public health, and socio-economic development. Understanding pollution through biological lenses enables students to identify its causes and propose effective interventions to

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mitigate its impact. Adesina, A., & Gabriel, E. (2023) noted that science education is crucial in addressing present-day challenges such as climate change, pandemics, and rapid technological developments. It provides learners with scientific knowledge, moral reasoning, and problem-solving competencies needed for informed, responsible citizenship. According to UNESCO (2020), science learning bridges the gap between theory and practice, especially in contexts grappling with socio-economic and environmental issues.

In teaching environmental topics like pollution, conventional instructional approaches often fall short in stimulating student interest and fostering deep understanding, primarily due to their abstract nature. Pollution, driven by anthropogenic activities such as industrial operations and deforestation, threatens biodiversity, human health, and ecological stability Ogunleye, 2022). Addressing this issue requires educational approaches that transcend theoretical discussions. Field trips offer a practical alternative by exposing students to real-life environmental problems and enabling them to analyze their causes, consequences, and possible solutions (Eze, 2020). Evidence suggests that learners who participate in field-based instruction develop superior analytical and investigative skills compared to those taught using traditional methods Akpan , Umanah, & Abasi (2025). For example, research by Audu, Ojo, Balogun, & Tanimu, (2023) found that students who engaged in supervised field visits to polluted environments showed stronger reasoning and problem-solving abilities. This supports the argument by Oladejo, *et al* (2021) that integrating field experiences into science curricula strengthens the application of classroom knowledge. In Nigeria, where pollution poses a significant challenge, field trips enhance students' awareness and foster experiential learning (Chinyere Nnaemeka C., & Edache O. ,2022). However, factors such as limited funding, transportation issues, and safety concerns often limit their use .

A field-trip teaching method involves organized visits to relevant sites outside the school environment where learners can interact with real-world contexts related to classroom content. This experiential approach supports deeper learning, increases motivation, and improves academic outcomes. James (2014) emphasizes that field trips serve as a bridge between theoretical learning and practical experience, especially in teaching environmental topics. Okolocha (2020) further explains that exposing students to polluted areas, recycling centers, and conservation zones enhances their understanding of environmental issues. According to Adegbite, O. (2020). students who engage in field activities exhibit higher levels of motivation and participation. The interactive and immersive nature of field trips promotes critical observation and fosters responsibility. Adesina, & Gabriel (2023) argue that such experiences are essential in developing students' awareness of pressing issues like pollution and climate change. For field-trip strategies to be fully effective, stakeholders must address the logistical challenges and institutional constraints that hinder their implementation.

Student interest is a key determinant of academic engagement and performance (Dada, 2021). When learners find a subject engaging, they are more likely to participate actively, seek deeper understanding, and retain information better. Sambo, Olayinka, and Sabo (2022) describe interest as a motivational process that energizes learning and shapes academic and career choices. Uwah (2025), assert that hands-on learning in students' immediate environment cultivates curiosity and scientific inquiry, leading to improved academic outcomes. Egbunu and Akinwale (2023) observed that students who take part in field trips retain environmental concepts more effectively than those taught solely through lectures. Despite these benefits, field trips are not widely implemented due to issues such as inadequate transportation, insufficient teacher training, and safety risks Ekpo, & Ehi, (2022). Additionally, teacher-centered methods like lectures often fail to inspire learners, especially in subjects requiring real-world understanding like environmental science. The interplay between interest and academic achievement is influenced by factors including teacher encouragement, conducive learning environments, and learner autonomy. Educators must adopt strategies that spark interest and involvement to foster meaningful learning experiences.

Academic achievement serves as a key measure of the effectiveness of teaching strategies, indicating students' comprehension, retention, and ability to apply knowledge. Numerous studies confirm that students exposed to field-based learning environments tend to score higher in assessments than their peers taught in conventional settings (Egwu, 2021). This may be attributed to the benefits of experiential learning, where students engage directly with natural phenomena. For example, observing polluted rivers, waste disposal sites, or deforested areas gives students concrete insight into environmental issues. Challenges such as inadequate educational funding and poor learning environments are often cited as reasons for the low adoption of recommended strategies like field trips. Among these challenges, the absence of multimedia and interactive methods including field excursions stands out as a major barrier to effective biology teaching.

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According to the West African Examinations Council (2022), students in biology continue to show weaknesses in spelling technical terms, interpreting graphs, applying statistical knowledge, and answering ecology-related questions. These challenges are linked to the overuse of abstract instructional methods. Nwachukwu (2018) reported that students exposed to a field-based environmental science curriculum outperformed their counterparts on post-tests, highlighting the advantages of direct exposure to real-world scenarios. Thus, this study investigates the influence of the field-trip teaching approach on students' academic achievement and interest in pollution in Akwanga Local Government Area of Nasarawa State. The goal is to provide evidence-based recommendations for enhancing environmental science instruction through experiential methods, with implications for educators, curriculum developers, and policymakers. Ultimately, the study aims to demonstrate how field-based instruction supports engagement, comprehension, and sustainable development.

Biology as a subject in senior secondary schools across Nigeria is fundamental to developing students' scientific interest, critical reasoning abilities, and problem-solving skills particularly in relation to environmental and personal challenges. Despite its importance, the continued use of traditional instructional methods, which prioritize rote learning and abstract instruction, often hinders students from effectively linking classroom knowledge to practical, real-life situations. This limitation is particularly evident in the teaching of ecological concepts, such as pollution, where learners struggle to grasp the real-world implications of what they are taught. The lack of hands-on, student-centered learning experiences restricts learners' potential for meaningful scientific exploration and reduces their ability to think critically about environmental challenges. Conversely, adopting strategies like field trips allows students to engage directly with their environment, fostering deeper interest and understanding. Through real-world observation, students are more likely to internalize biological concepts, leading to improved performance and greater enthusiasm for the subject. Many students find it difficult to apply their classroom understanding of pollution to everyday issues within their surroundings, thereby weakening their ability to offer practical solutions. This educational gap highlights the urgent need to incorporate more dynamic teaching strategies that connect scientific theory to practice. Employing approaches such as the field-trip method can enrich students' learning experiences, stimulate motivation, and enhance academic outcomes in science, particularly in environmentally focused topics like pollution.

Aim and Objectives of the Study

This study is designed to assess how the use of a field-trip instructional approach influences students' academic achievement and interest in the topic of pollution in Akwanga Local Government Area, Nasarawa State, Nigeria. The study sought to:

1. Examine the variation in the mean interest scores between students taught pollution through field trips and those taught using traditional classroom methods.
2. Investigate the extent to which the field-trip strategy affects the interest levels of male and female students differently.
3. Assess differences in the academic achievement scores between students exposed to field-trip instruction and those receiving conventional teaching.
4. Determine whether there is any variation in academic achievement between male and female students taught pollution using the field-trip strategy.

Research Questions

This study will be guided by the following research questions:

1. What is the difference in the mean interest scores between students taught pollution using field-trip strategy and those taught with traditional methods?
2. How do the mean interest scores of male and female students taught pollution using field trips compare?
3. What is the difference in the academic performance between students taught pollution using field trips and those taught through conventional methods?
4. How do the academic performance scores of male and female students taught with the field-trip strategy differ?

Hypotheses

The study will test the following null hypotheses:

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$H0_1$: There is no statistically significant difference in the mean interest scores between students taught pollution through field trips and those taught using conventional methods.

$H0_2$: There is no significant difference in the interest levels of male and female students taught pollution using the field-trip strategy.

$H0_3$: There is no statistically significant difference in the academic performance between students taught pollution using field trips and those taught using traditional methods.

$H0_4$: There is no significant difference in the academic performance of male and female students who were taught pollution using the field-trip strategy.

Material and Methods

This research utilized a **quasi-experimental design,** specifically the non-equivalent pre-test and post-test control group format. Intact classes were used for both the experimental and control groups to ensure minimal disruption to school activities and to maintain a natural classroom environment. Students in the experimental group participated in field-trip-based instruction, which included direct exposure to pollution-related contexts, such as visits to contaminated areas, environmental protection agencies, and nearby industries. Meanwhile, the control group was taught the same content through conventional lecture-based instruction in the classroom.

This design was deemed suitable for investigating causal relationships within an educational context where random assignment of participants is not feasible. Kerlinger (1973) also supports the use of this method for research conducted in real-life educational settings.The study population comprised all Senior Secondary One (SS I) Biology students in public secondary schools within Akwanga Local Government Area of Nasarawa State. From a total population of 1,320 students, a sample of 80 SS I students (45 males and 35 females) was selected. A preliminary survey helped identify eligible schools based on specific inclusion criteria:

i. Schools must be co-educational.
ii. Schools must have senior secondary classes.

A **multistage sampling technique** was applied to select participants who met the study requirements.

Two instruments were employed for data collection:

1. **Pollution Academic Achievement Test (PAT):** This is a structured test designed to evaluate students' knowledge and comprehension of pollution-related topics. It contains 30 multiple-choice questions (options A to D), adapted from past West African Senior School Certificate Examination (WASSCE) papers. The content covers key subtopics such as types, causes, effects, and control of pollution, as well as the responsibilities of individuals and government agencies.
2. **Interest Scale on Pollution (ISP):** This is a 20-item structured questionnaire developed to measure students' interest in learning about pollution. It uses a five-point Likert scale ranging from Strongly Agree (5) to Strongly Disagree (1), allowing students to express their level of interest and engagement with the topic.

Results

Research Question 1: What is the difference in mean interest scores between students taught pollution using the field-trip strategy and those taught using conventional instructional methods?

Table 1: Mean and Standard Deviation Scores for Experimental and Control Groups in Pre-Test and Post- Test

Group	No. of Students	Pre-Test Mean	SD	Post-Test Mean	SD	Mean Difference (MD)
Experimental	40	2.19	0.07	3.96	0.13	1.77
Control	40	2.24	0.06	2.19	0.09	0.05
MD		**0.05**		**1.77**		

Note: MD = Mean Difference; SD = Standard Deviation

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Table 1 shows the descriptive statistics of students' interest scores in both the experimental and control groups before and after the instructional intervention. Prior to the treatment, students in the experimental group had a mean interest score of 2.19, whereas the control group slightly outperformed them with a mean of 2.24. The marginal difference of 0.05 indicates that both groups started with nearly the same interest levels.
Following the instructional period, the post-test results revealed a notable increase in the interest scores of the experimental group, which reached a mean of 3.96 (SD = 0.13). Conversely, the control group's post-test mean remained almost the same at 2.19 (SD = 0.09). The improvement in the experimental group, reflected by a mean gain of 1.77, highlights a substantial positive shift in students' interest after exposure to the field-trip strategy. On the other hand, the control group exhibited negligible change, with only a 0.05 increase. This outcome suggests that the field-trip teaching method was significantly more effective in enhancing students' interest in the topic of pollution compared to conventional classroom instruction.

Hypothesis 1
There is no significant difference in the mean interest scores of students taught pollution using the field-trip teaching strategy and those taught using conventional methods.
Table 2: Independent Sample t-Test Summary for Hypothesis 1-

Group	No. of Students	Mean	SD	df	t_{cal}	t_{crit}	p-value	Decision
Experimental	40	3.96	0.13	78	70.19	1.99	2.98E-72	Significant
Control	40	2.19	0.09					

($p< 0.05$ = Statistically Significant)

The data in Table 2 reveals the result of an independent sample t-test comparing the interest levels of students exposed to the field-trip strategy versus those taught using conventional instructional methods. Students in the experimental group recorded a mean interest score of 3.96 (SD = 0.13), while those in the control group had a mean of 2.19 (SD = 0.09).
The calculated t-value (t_{cal} = 70.19) exceeds the critical value (t_{crit} = 1.99) at 78 degrees of freedom and a 0.05 significance level. Moreover, the p-value (2.98E-72) is far below the threshold of 0.05, providing strong evidence against the null hypothesis.
Based on these findings, the null hypothesis is rejected. The results indicate a statistically significant difference in interest levels between students taught pollution through the field-trip method and those taught through conventional classroom instruction. This supports the conclusion that the field-trip teaching strategy substantially increases student interest in environmental science topics like pollution. Hence, it serves as an effective pedagogical tool for engaging learners and enhancing motivation.

Research Question 2: What is the mean difference in interest scores between male and female students taught pollution using the field-trip teaching strategy?

Table 3: Post-Test Mean Scores and Standard Deviation for Male and Female Students (Experimental Group Only)

Gender	No. of Students	Mean	Std Dev.
Male	23	3.98	0.049
Female	17	3.93	0.192
Mean Difference		0.05	

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Table 3 shows the mean post-test interest scores of male and female students who were part of the experimental group exposed to the field-trip instructional strategy. Male students recorded a slightly higher average score of 3.98 compared to the 3.93 scored by female students. However, the difference between the two averages is minimal (MD = 0.05), suggesting a comparable level of interest in pollution-related topics across genders. The standard deviation for male students (0.049) was lower than that of female students (0.192), indicating that male students' scores were more consistent, whereas female students' scores were slightly more spread out.
Overall, the closeness of the mean values implies that both male and female students were similarly engaged and interested in the topic when taught using the field-trip strategy.

Hypothesis 2: There is no statistically significant difference in the mean interest scores between male and female students taught pollution through the field-trip instructional method.

Table 4: Summary of t-test Analysis for Hypothesis 2

Group	No. of Students	Mean	SD	Df	tcal	tcrit	p-value	Decision
Male	23	3.98	0.049	38	1.28	2.02	0.209	Not Significant
Female	17	3.93	0.192					

(P< 0.05 = Significant)

Table 4 presents the results of the t-test analysis comparing the mean interest scores of male and female students in the experimental group after being taught pollution using the field-trip teaching strategy. The mean score for male students was 3.98 with a reduced standard deviation of 0.040, while the mean score for female students was slightly lower at 3.93 with a standard deviation of 0.080. The computed t-value (tcal = 1.10) is less than the critical t-value (tcrit = 2.02) at a 0.05 level of significance and 38 degrees of freedom. Moreover, the p-value (p = 0.277) is greater than 0.05, indicating that the difference in mean interest scores between male and female students is not statistically significant.
Since the calculated t-value is less than the critical value and the p-value is greater than 0.05, the null hypothesis is retained, supporting the assertion that there is no significant difference in the mean interest scores of male and female students taught pollution using the field-trip teaching strategy. This outcome implies that the field-trip approach was similarly effective in enhancing interest in environmental topics like pollution among both male and female students.

Research Question 3: What are the mean academic achievement scores of students taught pollution using field-trips teaching strategy and those taught using conventional methods.

Table 5: Mean and Standard Deviation of Experimental and Control Groups in Pre-test and Post-test

Group	No. of Students	Pre-test		Post-test		MD
		Mean	SD	Mean	SD	
Experimental	40	23.40	4.80	46.33	12.68	22.93
Control	40	26.45	5.60	18.38	7.91	8.07
MD		**3.05**		**27.95**		

MD = Mean Difference, SD = Standard Deviation

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Table 5 presents the mean academic achievement scores of students in the experimental and control groups before and after the intervention. In the pre-test, students in both groups had comparable mean scores of 23.40 and 26.45 (MD = 3.05), with relatively low standard deviations of 4.80 and 5.60 respectively, indicating a modest spread in performance.

Following the intervention, the experimental group's mean post-test score rose significantly to 46.33, with a reduced standard deviation of 6.90, suggesting improved consistency in student performance. In contrast, the control group's post-test mean dropped to 18.38 with a standard deviation of 4.50, reflecting lower performance and tighter clustering of scores.

The improvement in the experimental group (MD = 22.93) emphasizes a strong academic gain due to the field-trip teaching strategy, whereas the control group experienced a decline (MD = 8.07). These results indicate that the field-trip method not only enhanced students' academic achievement but also reduced variability, leading to more uniform learning outcomes. This supports the value of interactive and experiential learning strategies in environmental science education.

Hypothesis 3: There is no significant difference in academic achievement scores of students taught pollution using field-trips teaching strategy and those taught using conventional methods.

Table 6: Summary of t-test Analysis for Hypothesis 3

Group	No. of Students	Mean	SD	Df	Tcal	Tcrit	p-value	Decision
Experimental	40	46.325	6.90	78	15.83	1.99	1.07E-25	Significant
Control	40	18.375	4.50					

(P< 0.05 = Significant)

Table 6 presents the t-test results comparing the academic achievement scores of students taught pollution using different instructional strategies. The experimental group, which was exposed to the field-trip strategy, achieved a mean score of 46.33 with a standard deviation of 6.90. In contrast, the control group, taught using conventional methods, had a lower mean score of 18.38 with a standard deviation of 4.50. The calculated t-value (tcal = 15.84) far exceeds the critical t-value (tcrit = 1.99) at the 0.05 significance level with 78 degrees of freedom. The corresponding p-value (1.07E-25) is extremely small, indicating that the observed difference in academic achievement is highly statistically significant. As a result, the null hypothesis is rejected.

This finding confirms that the field-trip teaching strategy significantly improved students' academic performance in pollution-related topics, while also promoting more consistent learning outcomes. The reduced variation among scores in the experimental group further suggests that this strategy benefits a broader range of students, making it an effective and inclusive approach in environmental education.

Research Question 4: What are the mean achievement scores of male and female students taught pollution using the field-trip teaching strategy?

Table 7: Mean and Standard Deviation of Male and Female Students in the Experimental Group

Gender	No of Students	Mean	Std Dev.
Male	23	44.35	14.09
Female	17	49.00	10.30
Mean Difference		**4.65**	

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From the data presented in Table 7, female students recorded a higher average achievement score (49.00) than their male peers (44.35), indicating that the female group performed better when pollution was taught through field trips. The score gap between the two groups is 4.65, showing a modest advantage in favor of the females. Moreover, the standard deviation values reveal that male students had more dispersed scores (14.09), whereas female students' results were more closely grouped (10.30). This indicates greater consistency in performance among the females. The wider variation in the scores of male students could be linked to individual differences such as their engagement level, interest, or prior understanding of the topic.

Hypothesis 4: There is no significant difference in the mean achievement scores of male and female students taught pollution using field-trips teaching strategy.

Table 8: Summary of t-test Analysis for Hypothesis 4

Group	No. of Students	Mean	SD	Df	Tcal	Tcrit	p-value	Decision
Male Students	23	44.35	14.09	38	-1.21	2.02	0.235	Not Significant
Female Students	17	49.00	10.30					

(P< 0.05 = Significant)

Table 8 shows the outcome of the t-test comparing the mean achievement scores of male and female students following instruction on pollution via field trips. The average score for male students was 44.35 (SD = 14.09), while female students had a slightly higher average of 49.00 (SD = 10.30). However, the calculated t-value (-1.21) did not exceed the critical value of 2.02 at a 0.05 significance level and 38 degrees of freedom. Since the p-value (0.235) is greater than 0.05, the difference between the two groups is not statistically meaningful. This means the null hypothesis is accepted, confirming that no significant difference exists between male and female students' achievement scores after using the field-trip strategy. Both male and female students appeared to benefit similarly from the field-trip instructional approach, suggesting that it supports equitable academic outcomes regardless of gender.

Discussion

This research examined the impact of using field-trip instructional strategies on students' interest and academic performance in pollution-related topics, while also exploring gender-based responses to the approach. The outcomes were compared with prior research to identify agreements or differences. Findings showed that students exposed to field-trip instruction exhibited a noticeable increase in interest compared to those taught through traditional classroom methods. The mean interest score of the experimental group rose from 2.19 (pre-test) to 3.96 (post-test), whereas the control group showed a slight decline from 2.24 to 2.19. This improvement (mean difference = 1.77) in the experimental group reflects the capacity of field trips to actively engage students through real-life experiences. These interactive excursions likely stimulated curiosity by placing learning within practical and relatable contexts. This result echoes the work of Uwah (2025), who reported higher student motivation through field-based learning. Similarly, Adesina*, et al* (2023) emphasized that field trips promote awareness of environmental issues while linking scientific instruction to practical societal concerns like pollution and waste management.In terms of academic performance, a considerable gain was recorded in the experimental group, with their mean score increasing from 23.40 to 46.33. Conversely, students in the control group showed a decrease from 26.45 to 18.38. The improvement of 22.93 points in the experimental group underscores the effectiveness of experiential learning in enhancing students' understanding and retention of content.

This aligns with findings by Egwu *et al*. (2021), who noted better academic outcomes among students taught through activity-based methods. The inclusion of direct observation and interaction with learning materials during the field trip may have played a crucial role in bridging theoretical concepts with real-world examples.A comparison of performance based on gender revealed that female students scored slightly higher (mean = 49.00)

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than males (mean = 44.35), resulting in a mean difference of 4.65. This modest edge may be attributed to factors such as higher attention to detail or better processing of experiential learning activities by the female students.

Four hypotheses were tested in this study. The first hypothesis, which suggested no significant difference in interest levels between the field-trip and conventional teaching groups, was rejected ($t_{cal} = 70.19$, $p < 0.05$). The finding confirms that field trips significantly enhance student interest. This may be due to the novelty, engagement, and practical relevance that accompany out-of-classroom learning.The second hypothesis, which stated there would be no significant gender difference in interest among students taught using field trips, was accepted ($p > 0.05$). This result indicates that both male and female students were equally engaged by the field-trip strategy. The finding supports Egwu et al. (2021), who observed balanced interest across genders in experiential learning contexts. However, this contrasts with Okolocha (2020), who reported greater male enthusiasm in outdoor learning. Such conflicting results may be influenced by differing learning environments, student maturity, or prior exposure. The third hypothesis, which posited no difference in academic achievement between students taught through field trips and those taught conventionally, was rejected ($p < 0.05$).

The significant improvement in the experimental group confirms the effectiveness of field-based instruction. This supports James (2014), who also found that hands-on learning significantly improves student performance by reinforcing theoretical ideas through direct application. The final hypothesis, which suggested no significant difference in achievement between male and female students taught using field trips, was accepted. Although female students had slightly higher scores, the difference was not statistically significant ($p > 0.05$). This suggests that both genders benefited similarly from the instructional strategy. This outcome is consistent with Egwu et al. (2021), who observed equal gains across genders in interactive learning settings. However, it contrasts with findings by Hassan and Dada (2018), who reported better performance among male students in science when exposed to field activities possibly due to factors such as assessment type or student interest. The findings provide strong evidence that field-trip teaching strategies enhance both student interest and academic achievement in pollution topics. The method was effective across genders, showing minimal performance differences. These results reinforce the need to incorporate more experiential learning approaches into science curricula to improve student engagement and academic success.

Conclusion

The findings of this study demonstrate that the use of field-trip instructional strategies significantly enhances students' interest and academic performance in the topic of pollution. Field trips provide meaningful, hands-on experiences that actively involve learners, helping to spark curiosity and improve understanding of scientific concepts. The improvement observed in students' results suggests that conventional classroom instruction, while important, may not be sufficient on its own to achieve optimal educational outcomes.By linking classroom knowledge to real-life contexts, field trips promote analytical thinking and problem-solving, making learning more relevant and impactful. The results of this study underscore the importance of incorporating experiential approaches into science teaching. For field trips to be effective, proper planning, curriculum alignment, and sufficient resources are essential. It is therefore crucial that educational stakeholders invest in structured excursion programs that make science education more engaging and meaningful.This study has implications for multiple groups in the education sector. Teachers are encouraged to use field trips as part of their teaching toolkit to improve students' engagement and learning outcomes. Curriculum designers should consider including experiential components within science syllabi. Policymakers are urged to provide funding and logistical support for experiential programs, and partnerships should be formed with relevant institutions to enhance student exposure. For students, field trips bring abstract lessons to life and foster important skills needed for lifelong learning. Additionally, further research is recommended to examine the long-term impact of field-based instruction across different subjects and educational settings.

Recommendations

Based on the conclusions drawn, the following recommendations were offered:

1. Integration of Field Trips into Instruction: Schools should include field-trip activities in the teaching of environmental topics like pollution to improve student engagement and achievement.
2. Capacity Building for Teachers: Teachers should be trained on how to plan and implement effective field-trip lessons that align with curricular goals.
3. Government and Institutional Support: Education ministries and relevant bodies should provide both financial and logistical support to make field trips feasible and effective.

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4. Parental Engagement: Parents should be encouraged to contribute to field-trip efforts by offering support and ensuring their children participate fully.
5. Diversified Funding Sources: Schools should explore funding options through grants, NGOs, and private sector partnerships to support and expand field-based learning initiatives.

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