

Effects of Guided Biological Garden Field Trips on Secondary School Students Conservation Knowledge and Attitudes in Zaria, Nigeria

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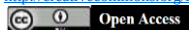
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ABSTRACT

Experiential learning approaches are increasingly recognized as essential for bridging the gap between theoretical biological concepts and practical environmental stewardship. This study evaluated the effects of guided biological garden field trips on conservation knowledge and attitudes among senior secondary school students in Zaria Local Government Area, Kaduna State, Nigeria. Employing a quasi-experimental pre-test, post-test non-equivalent control group design, a sample of 92 Senior Secondary II (SS II) biology students was assigned to either an experimental group (n = 46, receiving guided field trip instruction) or a control group (n = 46, receiving conventional classroom instruction). Data were collected using the Biology Conservation Achievement Test (BCAT) (KR-20 $\geq$ 0.70) and the Environmental Attitude Scale (EAS) (Cronbach's $\alpha \geq$ 0.70). One-way Analysis of Covariance (ANCOVA) was used to analyze post-test scores, controlling for pre-test baseline levels at a 0.05 level of significance. Results indicated that students exposed to guided field trips achieved significantly higher post-test conservation knowledge scores ($F(1, 89) = 43.271, p < .001$) and exhibited significantly more positive attitudes toward environmental conservation ($F(1, 89) = 22.514, p < .001$) than those in the conventional group. These findings demonstrate that structured outdoor experiential learning significantly enhances cognitive comprehension and affective domain outcomes in ecological science. Integrating guided environmental excursions into the secondary school biology curriculum is recommended to foster actionable environmental literacy.

Introduction

There is a shift in education from teaching-centred to learning-centred education. Field trips are an integral part of teaching and learning in biology because they make the concepts taught in the classroom relevant to the ecological realities. Students' direct experiences of natural ecosystems, such as the vegetation around Zaria, enhances their internalization of the interactions of an ecosystem. Outdoor experiential education is more effective in enhancing students' academic performance than conventional teaching, and can give students a chance to observe biological phenomena directly. Deeper thinking is stimulated through outdoor learning. Guided interactions help students make connections between abstract and real events in the curriculum, such as nutrient cycling and habitat degradation, with actual environmental events. Experiential activities provide students with the needed concrete foundation necessary for understanding ecological sustainability. Conservation knowledge helps students to grasp the human factors which are contributing to environmental degradation and the scientific basis of ecosystem management.

EE not only affects students' cognitive domain, but also their affective domain. Environmental attitudes are self-assessments from neutral to high levels of conservation concern. A frequent issue of didactic teaching methods is that they do not translate into changes of students' attitudes to nature.

Guided field trips on the other hand can inspire an ecological empathy, moving from neutral to emotional, and as well engender an emotional and cognitive reaction.

1.2 Problem statement.

The subject of conservation is covered in the Biology curriculum of senior secondary schools in Nigeria, but teaching of it in the schools has not received adequate attention in Zaria Local Government Area (LGA). Teacher-centred lecture models ("talk and chalk") are the main method for secondary institutions, resulting in less students' interactions and interest in ecological science. This pedagogical constraint is the reason why students' cognitive achievements are not good and there is no awareness of the environment among the students.

Further, environmental problems cited (waste disposal, deforestation etc.) show that there is a gap between teaching and practice. Some studies had been carried out on general academic attainment in Biology but empirical study on the concurrent effect of guided Biological field trips on conservation knowledge and attitude of students at secondary school in Zaria LGA is scanty. This study is one that addresses this gap by looking at how structured biological garden field trips affect conservation knowledge and attitudes of secondary school students.

This study aimed to:

The overall aim of this study was to evaluate the effect of guided biological garden Field trips on conservation knowledge and attitude of secondary school students in Zaria LGA. The study was aimed at achieving the following:

1. Examine whether there are statistically significant differences between the conservation knowledge scores of students that were exposed to guided biological garden field trips and students that were exposed to traditional teaching.
2. Compare the conservation attitude scores of students that received guided biological garden field trips with those that received traditional instruction.

1.3 Research Questions

- i. Is there any difference in the mean conservation knowledge scores between students who were exposed to the guided biological garden field trips and students who were exposed to the conventional way of instruction?
- ii. What is the difference between the mean conservation attitude scores for students who are exposed to field trips in the biological garden and the mean conservation attitude scores for students who are not exposed to field trips in the biological garden?

1.4 Research Hypotheses

The following null-hypotheses were tested at the 0.05 level of significance:

- a. The average scores obtained in the post tests for the conservation knowledge do not differ significantly between the students' field trips to the biological garden and the students' conventional instruction.
- b. Mean post test attitude scores in the conservation for the two groups (guided biological garden field trip and conventional instruction) were not found to be significantly different from each other.

2.2 Theoretical Framework

The idea behind Kolb's Experiential Learning Theory (ELT).

Kolb (1984) has proposed the following four stage model of learning: Concrete Experience, Reflective Observation, Abstract Conceptualization and Active Experimentation. Concrete Experience: firsthand sensory experience of local plants and ecosystems. Reflective Observation: Guided questioning which helps students observe and reflect on biological processes.

Student relates to ecologic concepts discussed in their book. Active Experimentation: Students use their knowledge in a meaningful way for environmental conservation in their local area.

The Theory of Planned Behavior (TPB) proposed by Ajzen is the theory that is developed. The theory that is developed is called the Theory of Planned Behavior (TPB) by Ajzen.

The Theory of Planned Behavior (TPB), developed by Ajzen (1991), suggests that behavioral intention towards a specific behavior depends on the attitude, the subjective norm and the perceived behavioral control. Experiential field instruction is concerned with the affective domain that focuses on positive attitude towards nature. Collaborative activities in the field reinforce social norms that promote conservation, and promotes students' perceptions of their own control over conservation.

Conceptual Framework

Guided biology field trips are a significant change in pedagogy from the "sage-on-the-stage" lecture to an "experiential learning, guide-on-the-side" approach. This includes organised visits to the local ecosystems like the Ahmadu Bello University (ABU) Dam or forest reserves where students are able to watch the biological processes in their environment. The guided walk, unlike an ordinary walk, guarantees the structure of the walk with learning objectives as per the Nigerian curriculum. According to Segun (2024), the purpose of these trips is to link up abstract theoretical concepts learnt in class to the real world and enable students to experience the "real-world application" of the knowledge they have learnt on nature. The trips are an overt attack on the "talk and chalk" approach to the acquisition of scientific knowledge that is the hallmarks of the Nigerian school history. The students learn a certain habitat through the physical senses, which makes a more effective learning retention, reduces the boredom of rote learning and promotes an effective learning. In the northern part of Nigeria, Danjuma & Andrew (2024) recommend that field trips are particularly effective due to the natural laboratory environment provided by the savannah habitat in which to study seasonal changes and biodiversity. In this future oriented position, the environment is considered as a teacher and the role of the biology teacher is to establish a "dialogue" between the student and the environment, and to ensure that the learning process is culturally relevant and scientifically valid. These trips are not "picnics", but are "guided" by that. Requires careful planning: Students require a pre-trip orientation, careful observation during the trip, and debriefing sessions at the end of the trip for participants to synthesize their observations. There needs to be a planned interaction to develop thinking skills as pupils are encouraged to ask 'why' and 'how' questions about the organisms they observe. Ndukwe (2023) points out that if students are trained to see particular biological encounters, like symbiosis or competition, they take a more complex "scientific gaze. This approach respects the importance of first-hand experience and takes advantage of contemporary pedagogical principles to ensure that students are engaged and learning the most they can.

The "guided field trips" will also help the students to get away from the "digital fatigue" of modern life, and reconnect with the real world. The "vibe" of the outdoor experience creates something that's outside the realm of digital simulations that brings a depth of mental clarity and curiosity, which is something that's just being outside provides. The "anchor points" of memory are what Suarlin (2023) determined to be soil, leaf patterns, and insect activity when using the sense of touch. These experiences are the foundation for more complex learning in biology and do not just get students to memorize an exam list of facts, but are the building blocks of a general knowledge of the life sciences that will be useful long after they have left the secondary school system.

The key to a successful guided field trip is to make the student the protagonist in his/her learning experience. Students are no longer just passive recipients of information, rather they are investigators, collectors and analysts. The roles of the agencies should be shifted to develop a true interest in Biology. The recent study by Bohm and Oljans (2025) indicates that outdoor learning can help to lower science anxiety and build students' confidence about doing science. Teachers can be trained and supported to

guide and navigate the learning process in the local environment, making it a free and high quality learning resource, in Zaria LGA where resources for education may be limited.

2.2. Conservation Knowledge

Everything environmental action is a result of the knowledge of conservation. It contains the understanding of biodiversity, interconnectedness of ecosystems and human activities that are leading to resource depletion. For the Nigerian context, such knowledge is often restricted to the definitions found in textbooks and is not sufficient to equip the students for the challenges of the 21st Century environmental problems. Velepini (2025) points out that "true" conservation knowledge is transformative; it must help students to recognize the systemic nature of environmental problems and the importance that SD plays in mitigating climate change. If students don't have this understanding, then they are essentially playing easy mode, and the world is playing hard mode.

Scientific approaches can be used in conjunction with this knowledge gained in the field. For instance, in Zaria, students can also be educated on the native trees of the area and the traditional applications of these trees while simultaneously being taught about their function in carbon sequestration. The blend of old and new enriches the knowledge base with a vitality and strength. As students see the tangible impacts of erosion or deforestation in their community, so the "receipts" of environmental degradation are undeniable, argues Gupta et al. (2024). This direct evidence asks for cognitive frames that change and make the abstract vision of "conservation" a local, personal vision for communities instead of an international vision.

In addition, knowledge of conservation is fundamental in planning for the "future" of the youngsters of Zaria. With the advent of a green economy, an ecological point of view is one of the flexibilities that opens up the way to careers in fields of environmental science, policy and sustainable agriculture. This is an understanding that is not just on the surface, and should include an understanding of the "trade-offs" of development and conservation. Identifying a practical conservation approach as a way to enhance the retention of ecological concepts by students, Segun (2024) found that students were more likely to retain ecological concepts when performing a practical conservation activity rather than reading about it. This means that the 'hands-on' experience of field visits is integral to the realisation of high order cognitive outcomes that must be met as stipulated in the Biology syllabus and cannot be compromised.

The understanding aspect is missing in most traditional education systems due to the lack of knowing aspect. The ability to assess and analyse environmental policies and decisions should be incorporated into the conservation of knowledge. An example of this is knowing about the nitrogen cycle, but knowing how a local farm's fertilizer run off impacts a local stream. The field trips bring the "missing link", in which students have the opportunity to experience these cycles (Danjuma and Andrew, 2024). The depth of understanding needed to create citizens who are able to participate in thoughtful discussions and debate local land use and resource management and ensure that Zaria's natural heritage is preserved over time.

In brief, conservation knowledge is 're-branding' the environment from the background to life support system. Students' learning is motivated when they are able to understand that their own health/economic wellbeing is related to the wellbeing of the local ecosystem. The literature in the past two years suggests that learning in the context in which it occurs is best practiced, as in Velepini's (2025) "situated learning". Conservation knowledge is being transmitted via familiar and familiar landscapes of Zaria - a landscape that allows students to not just "learn" Biology but "live" it, meaning that there is no risk of "brain rot" due to superficial learning.

2.3 Attitudes toward Conservation

Attitude is the inner "energy" of a student that determines his/her attitude towards the world. It is a psychological construct, and has a cognitive, affective and behavioral component, i.e., what a student thinks, feels, what a student wants to do, in relation to the environment. In many secondary schools the attitude towards the conservation is very shallow, whether it is a lack of interest or a superficial interest in this subject; it is not an imperative to conserve but merely a set of rules. According to Bohm and Oljans (2025) field trips are a "game-changer" in attitude formation as it invokes the emotions of students in relation to nature. The "affective" dimension of the attitude of the student is triggered when he/she enters the forest, or when he/she passes by the river, and a relationship is formed which a text cannot produce.

Long-term sustainability hinges on positive attitudes towards conservation, which can only be achieved by people. When nature is seen as a source of fear or as a thing to be exploited, no one will promote its protection. However, with guided field trips this can be "reframed" when the beauty, complexity, and usefulness of the flora and fauna of the area are presented. Natural environment contributes to the appreciation of the intrinsic value of organisms as it reduces the environmental "blindness" of the students, Suarlin (2023) said. It's a shift from anthropocentric (human centered) to biocentric (life centered) thinking that is sorely needed by the generation which will face a crisis of the planet. This is a cultural and ecological project that is situated in Zaria, where urban development often invades peri-urban spaces.

For changing negative or fearful attitudes towards the outdoors, the "guided" aspect of these trips is crucial. Some students may be more apprehensive about the bush or some animals and this may prevent them from enjoying biology. These fears can be changed to respect and curiosity with the support of a teacher. Ndukwe (2023) emphasizes that students' attitude towards nature is balanced and positive if mediated experiences are given which allow students to process their emotions. Rather than just scientific knowledge, it is the development of 'emotional intelligence' that would allow students to understand the environment and to be concerned with the 'well-being' of the environment on an individual basis.

Further, attitudes are highly social. A peer group will begin a "positive feedback loop" if they are shown to be "awestruck" and/or interested by a field trip, which may alter the attitude of the entire class. It's a "social proof" that speaks powerfully to the "generation of collectives and common values" that is Gen Z. Gupta et al. (2024) argue that the cooperative field-learning activities foster a "community of care" and students' motivation to take care of the environment. This is the aggregate of the energies which are more difficult to induce in a sterile classroom setting. Conservation can be cool and fun, it's an effective way to change the student population's mindset to pro-conservation that extends beyond the school walls.

It's impossible to have good behavior without having a positive attitude first. Without valuing the results people won't do it sustainably. The "root cause" of environmental neglect is the attitude and this is what we're targeting with field trips. According to Segun (2024) knowledge is the 'map' and attitude is the 'fuel' for the conservation efforts. For FUE Zaria, the formation of attitude is so important that if we want to produce citizens who are all-rounded, then this is important so that they have the 'head' (knowledge) and the 'heart' (attitude) to lead. A true "glow up" in Biology education - a dull requirement to a lifelong love of the natural world.

Many recent studies have examined student attitudes and the change from apathy to concern is a key area of focus. Olayinka et al. (2026), in their very recent Analytical study, investigated students' attitudes towards problems, attitudes, and actions concerning environmental conservation in the Science students. They concluded that there was a "normative awareness" of environmental issues among many

students but their "emotional involvement" was "Low. This study is a big "reality check" and shows that much as we know about a problem it does not necessarily mean that we care about the problem. The researchers found that if students are not provided with immersive experiences such as guided field trips that foster an emotional response to nature, students will remain "stuck" in a clinical indifferent.

In the specific context of Zaria, Ibrahim and Passi (2025) looked into the relationship between the social factors and the attitude of the students towards Biology. They conducted a survey on 120 students of Zaria LGA and found out that there was a positive correlation between the experiences of the teachers and the 'favorable attitude' of the students. This means that in Zaria, the teachers can teach students to look love in their surround and let them experience their surround in a "high energy" manner so as to deepen their appreciation of their surroundings. The findings of this study agree with the teacher as the "final influencer" in the learning environment so that the teacher's influence on students' perceptions of the conservation subject is "boring" or "part of identity".

Anyachebelu and Achoru (2022) studied the impact of education on the awareness and attitudes towards the environment of the Nigeria populace. The findings from this study revealed a significant change in positive environmental values in the group of students that were taken on the "outdoor awareness programs" when compared to the group of students that were not taken on the programs, the researchers wrote; this study provides the "lore" of our study as it revealed that the "attitude glow up" achieved as a result of the field trips was more lasting and enduring than expected in the textbook.

The study conducted by Ayandele (2022) in Ibadan found that the attitudes of students with high preference for natural environment were much stronger in the pro-conservation attitudes, with a focus on the role of 'connectedness to nature' (CN). The research paper emphasizes the guided field trip as the most salient instrument that can promote this "connectedness" in that way, students can experience nature "raw" and learn to care for it in a natural and organic way. The emphasis of this is that the environment is the "best healer" of the harmful attitudes that trigger ecological neglect.

Based on the review by Bileya and Achor (2021), there are various methods of instruction, each of which has its own benefits, but trips to the field are special in that they can enhance "affective outcomes" (in this case, how much students care). The research they did indicated that there was a "social energy" that was created by the field trip, and that this "social energy" led to a positive bridging between field trip and environment beyond the field trip itself. So, this is the "secret sauce" for Zaria secondary schools whereby the entire school population can transition to a "green mindset" that values both the existing values and future sustainability agenda.

2.4. Experiential Learning Theory (ELT) of Kolb was used.

The final "blueprint" for students' learning to become personal, deep, and lasting knowledge is provided by Kolb's Experiential Learning Theory. The theory assumes learning is the process of making a change to the experience. It has four components: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE). The "concrete experience" for our Zaria study is the guided field trip where the students have a chance to "touch grass" (in reality). This is also a crucial step as it provides students with sensory information that would not be present in the traditional classroom and helps to ensure they have the "receipts" necessary before they are required to analyze them, states Suarlin (2023).

The "vibe check" takes place in the second stage, Reflective Observation. Upon returning from the field trip, the students have to reflect on what they have seen. This involves the teacher in a guided setting with probing questions about the biodiversity he/she sees in Zaria savannah. It is time to ponder and make sense of it at this point. If it is not a part of the process then it is merely a "cool day out" according to Danjuma and Andrew (2024). It's a "big stick" to helping Gen Z students consider

biological processes and conservation from a more traditional, thought-provoking perspective, a forced pause for reflection that is common to this generation.

Active Experimentation is the "practical flex" in Kolb's cycle and is the final phase in the cycle. Learners apply the ideas that they have learned to new scenarios or problems. For instance, upon attending a tour of the ABU Dam, a student may try some water conservation methods in their own home or school garden. To achieve real Pro-Environmental Behavior (PEB), this is the stage that is emphasized by Velempini (2025). It moves the student from "knowing" to "doing" and helps him or her get from theory to practice. This is an important stage to ensure that education in Zaria schools does not only prepare students for exams, but for "glitches" in the environment in their own local community.

The Kolb's theory is being used for this study as a framework to use when evaluating the "success" of a field trip. It suggests that this cycle can be changed and rote learning can be avoided if it is followed. We are delivering a 'whole education', recognising the tradition of 'learning through doing', and at the same time fulfilling the new pedagogical needs, because we are making the guided field trip a 'whole-school' experience and cover all four stages. Consistent with Gupta et al. (2024), experiential learning is the "main character" of 21st century science education and is the most effective method for students to internalize and have a lasting commitment to ecological concepts.

2.4. Ajzen's Theory of Planned Behavior (TPB)

The understanding of how a student's mindset translates into actual conservation action is carried out using the logic gate that is known as the Theory of Planned Behavior (TPB) by Ajzen. The three components: Attitude toward the behavior, Subjective Norms, and Perceived Behavioral Control are hypothesized as being components of a person's "Intention" to engage in a behavior. This theory is "no cap" in terms of predicting the behavior of pro- or anti-environmental students in Zaria. One's attitude, subjective norm and perceived behavioral control are crucial for a student to protect the environment, as explained by Ndukwe (2023).

It is the emotional "energy" of the guided field trip that is represented in the Attitude component of TPB. When the field trip is interesting and enlightening a positive evaluation of conservation is created in the student's mind. They are now not thinking of conservation as a chore, it's a "vibe" worth protecting. According to the Bohm and Oljans' (2025) suggestion, the attitude is a "fuel" of environmental intention. It is imperative in the Zaria setting where among other problems, desertification is a real threat to instil the sense of "this matters" in students, not "I don't care", so that they become generation of change makers as their forefathers were concerned about their natural heritage.

Subjective Norms model the "social proof" component of behaviour. The collective energy of the peer group is a strong influence on Gen Z. When the two of them have the same experience through guided field trip, a new "normal" is set and environment protection is "cool" and socially desirable. If the teacher or students, the "main character" of the class want to save, so will the others. Field trips offer a chance to the students to escape from the confines of the classroom and soak in social learning, as mentioned by Gupta et al. (2024). This 'peer-pressure-for-good' is a powerful tool for introducing a pro-environmental behaviour as the 'standard' 'standard' in Zaria secondary schools.

The "skill-check" of the TPB model is Perceived Behavioral Control. If it is not in their ability to plant a tree, or to recycle, then they will not. This "agency" is achieved by the guided field trip, during which the students are given the opportunity to learn the skills they use in a real world context. If students can see a species being seen or a conservation technique being put into practice and are convinced they can make a difference, the confidence in making a difference will be huge. It's the feeling of control that's required to replace the "existential dread" that many people feel about climate change with a "can do" state of mind that will motivate them to do something about it.

Methodology

The design used in the study was quasi experimental with pre-test, post-test, non-equivalent control group. The study involved the Senior Secondary II (SS II) Biology students in the public secondary schools in Zaria LGA of Kaduna State. A multi-stage sampling process was carried out. The two public secondary schools were co-educational and one intact class SS II was selected from each of the schools. There were 46 students in the experimental group and 46 in the control group for a total $N = 92$. Data were gathered with two primary instruments: Biology Conservation Achievement Test (BCAT): This aims to assess cognitive achievement in several important conservation topics. The internal consistency of the instruments was determined using the Kuder-Richardson Formula 20 ($KR-20 \geq 0.70$) and Environmental Attitude Scale (EAS): A Likert scale instrument that assesses students' affective evaluations of conservation. Cronbach's alpha was used to validate the internal consistency of the instrument ($\alpha \geq 0.70$). Three subject matter experts from the Federal University of Education, Zaria were asked to assess the content and face validity of the instrument. The pre-test was given to both groups before the intervention. The experimental group was given a structured biological garden field trip and the control group were given the conventional classroom lecture for the same amount of instruction. Post-tests were conducted after the intervention. Descriptive statistics (frequencies and percentages) and inferential statistics were used in analyzing the data. The one-way Analysis of Covariance (ANCOVA) used to test the null hypotheses at the 0.05 level of significance controlled baseline pre-test scores.

Results

A total of 100 instruments were administered, and 92 completed sets were retrieved (92.0% response rate).

Variable	Classification	Frequency	Percentage (%)
Gender	Male	48	52.2
	Female	44	47.8
Age Group	10-12 years	8	8.7
	13-15 years	47	51.1
	16-18 years	34	37.0
	≥ 19 years	3	3.3
Instructional Group	Guided Field Trip (Experimental)	46	50.0
	Conventional instruction (Control)	46	50.0

Hypotheses Testing

The two null hypotheses were tested at the 0.05 level of significance.

Test of Hypothesis One

HO1: There is no significant difference in the mean conservation knowledge scores of students taught using guided field trips and those taught using the conventional method.

Table 1. ANCOVA Result of Post-Test Conservation Knowledge Scores by Instructional Group

Source	Type III Sum of Squares	df	Mean Square	F	P value(Sig.)
Pre-test Knowledge	8.421	1	8.421	14.763	.000
Instructional Group	24.683	1	24.683	43.271	.000
Error	50.793	89	0.571		
Corrected Total	83.897	91			

Source: Field Survey, 2026

As shown in Table 1, the effect of the instructional group on post-test conservation knowledge scores was statistically significant after controlling for pre-test scores, $F(1, 89) = 43.271$, $p < .001$.

Consequently, H_{O1} is rejected. Students in the guided field trip group achieved significantly higher conservation knowledge scores than those in the conventional instruction group.

2 Test of Hypothesis Two

HO2: There is no significant difference in the mean attitude scores toward conservation between students in the experimental and control groups.

Table 2. ANCOVA Result for Post-Test Conservation Attitude Scores by Instructional Group

Source	Type III Sum of Squares	df	Mean Square	F	p-value(Sig.)
Pre-test Attitude	1.284	1	1.284	6.117	.015
Instructional Group	4.726	1	4.726	22.514	.000
Error	18.683	89	0.210		
Corrected Total	24.693	91			

Source: Field Survey, 2026

As shown in Table 2, the post-test conservation attitude scores differed significantly between instructional groups after adjusting for pre-test scores, $F(1, 89) = 22.514$, $p < .001$. Therefore, H_{O2} is rejected. Students participating in the guided field trip displayed significantly more positive attitudes toward environmental conservation compared to those receiving conventional instruction.

Discussion

The empirical results show that the secondary school students' conservation knowledge has significant effects following the interventions of guided biological garden field trips. When pre-test baseline was controlled, students who had structured field activities had significantly higher cognitive achievement than students using traditional lectures ($F = 43.271$, $p < .001$) individually. The results are consistent with Kolb's ELT theory which states that abstract thinking requires concrete sensory experiences. Students will better understand more complex biological topics when they are able to see the interactions among the different organisms.

Moreover, the students' affective aspects were also positively affected by the intervention. The attitude scores obtained in the post test are significantly different ($F = 22.514$, $p < .001$), which indicates that outdoor education experiences generate more positive attitudes to conservation. The findings are in line with the Ajzen's Theory of Planned Behavior arguing that experiential learning can enhance positive attitudes and result in positive effects on environmental stewardship. Students are pushed to reflect on the impacts of humans on their environment when they get in touch with the local ecosystem.

Conclusion

Guided biological garden field trips is an effective method of teaching that helps to improve biological garden knowledge and attitude of secondary school biology students of Zaria LGA. The experimental intervention had a significant effect in comparison with the conventional classroom instruction regarding its cognitive and affective outcomes. Advantages of experiential learning in the outdoors include the greater concepts of environmental literacy, a concept that makes the biological concepts more tangible.

Recommendations

Structured field trips to biological and botanical gardens should be introduced in the schools as part of the regular curriculum in the units of ecology in secondary schools.

School admin, educational authorities to step in to help the school with logistics, safety, learning materials, etc.

Secondary schools should establish relationship with the university departments, botanical reserves and conservation organizations in the locality that can provide school facilities.

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