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EFFECT OF OUTDOOR LEARNING ACTIVITIES ON STUDENTS' ACHIEVEMENT IN ECOSYSTEM AMONG JUNIOR SECONDARY SCHOOL IN KEFFI EDUCATION ZONE, NASARAWA STATE, NIGERIA

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Abstract

This study determined the effect of outdoor and indoor learning activities on students' achievement in basic science and technology among junior secondary school students in Keffi Education Zone. Eight research questions guided this study, and eight hypotheses were tested at a 0.05 level of significance. A quasi-experimental research design involving a non-randomized pretest-posttest control group was adopted. The population of the study comprised 2,879 JSS II students. A simple random sampling technique was used to select 93 students as the sample for the study. Ecosystem Achievement Test (EAT) was used for data collection. The instrument was validated by three (3) experts, yielding a validation index of 0.82. The instrument was trial-tested, and a reliability coefficient of 0.75 was obtained using the Kuder-Richardson 21 (KR-21) formula. Research questions were answered using mean and standard deviation, while the

null hypotheses were tested at a 0.05 level of significance using Analysis of Covariance (ANCOVA). The findings of the study revealed that there was a significant difference in the mean achievement scores of students taught ecosystem concepts using outdoor learning activities and those taught using conventional methods. Furthermore, there was no interaction effect of method and gender on students' achievement in ecosystem concepts. Based on these findings, the study recommends, among others, that schools and educational policymakers should incorporate outdoor learning activities as a regular part of the science curriculum, particularly for teaching complex and abstract concepts. Teachers should be trained through workshops, seminars, and professional development programs on how to effectively utilize outdoor learning strategies.

Keywords: Outdoor learning, Indoor learning, Students' achievement, Basic Science and Technology, Gender.

Introduction

Science education in Nigeria has long been recognized as a vital component of national development, tracing its roots to the pre-independence era. The primary aim of science education is to equip individuals with an understanding of their environment and the ability to apply scientific knowledge to improve personal and societal well-being. As noted by Anegebe and Adeoye (2016), the Nigerian education system introduces children to science from the early years of primary school to foster curiosity, develop practical skills, and inspire contributions toward the country's scientific and technological growth. The foundation for science learning is established through the Universal Basic Education (UBE) programme, which provides free and compulsory education from primary one to junior secondary three (Adomeh, Arhedo, & Omoike, 2017). The UBE programme, structured into lower basic (Primary 1–3), middle basic (Primary 4–6), and upper basic (JSS 1–3) levels, was designed to enhance access to quality education and strengthen the implementation of the National Policy on Education. To support this goal, the Nigerian Educational Research and Development Council (NERDC) restructured the 9-year basic education curriculum, introducing 19 subject curricula, including Basic Science and

Technology as a core subject at all levels (Obioma, 2015).

At the upper basic level, the subject is divided into Basic Science and Basic Technology to provide focused instruction and promote entrepreneurship and technological innovation (Obioma et al., 2014). Basic Science, formerly known as Integrated Science, combines fundamental concepts from Physics, Chemistry, and Biology. It plays a critical role in preparing students for further studies in science-related disciplines such as medicine, engineering, and pharmacy. According to NERDC (2007), the objectives of the Basic Science curriculum are to:

1. Develop students' interest in science;
2. Equip learners with basic scientific knowledge and skills;
3. Enable the application of science to address societal needs;
4. Expose learners to science-based career opportunities; and
5. Prepare them for advanced scientific studies.

Despite these well-defined objectives, students' performance in Basic Science—particularly at the Basic Education Certificate Examination (BECE)—remains discouragingly low. Studies (Hamza & Mohammed, 2016; Dajal & Rinmark, 2015;

Danjuma, 2019) attribute this trend to teacher-centered instructional methods that fail to engage students meaningfully. Similarly, Nwagbo and Uzoma (2015) observed that inadequate use of practical and activity-based learning has diminished students’

achievement. This persistent underperformance underscores the urgent need for more interactive, experiential teaching strategies that can foster curiosity, sustain motivation, and improve academic achievement in Basic Science.

Table 1. Basic Education Certificate Examination (BECE) Result in Basic Science in Keffi, from 2018-2024

Year	Number of candidates registered	Total pass at credit level A1-C6	% passes at grade A1-C6	Total pass D7-F9	% failure D7-F9
2018	6624	2861	43.19%	3763	56.81%
2019	8015	3901	48.67%	4114	51.33%
2020	8518	3507	41.17%	5011	58.83%
2021	7534	3110	41.28%	4424	58.72%
2022	8760	3674	41.94%	5086	58.06%
2023	8998	3628	40.32%	5370	59.68%
2024	9387	3723	39.32%	5664	60.68%

Source: Department of Educational Resource Center (ERC), Nasarawa State Ministry of Education Lafia (2024).

Table 1.1 shows poor achievement in BECE which could be partly as a result of poor teaching method, lack of interest from the side of the students, inadequate or lack of instructional facilities, excess work load, among others in Nigerian secondary schools (Ukpai & Ezeaghashi 2017; Nwachukwu & Nwosu 2016). Similarly, Samir and Fawzi (2015), stated that other variables could influence students’ achievement; such variables include learning, interest in the

learning material and the procedures, learner’s environment as well as poor instructional approach (traditional method of teaching) which could have both psychological and sociological influence on the learner’s ability to understand concepts taught.

Traditional educational approaches have long focused on assessing students’ learning outcomes through methods such as problem-based and inquiry-based learning,

emphasizing the extent to which students develop deeper understanding and critical thinking skills. Researchers have increasingly shifted attention toward how learning involves the active construction of knowledge rather than passive reception (Ambrus, 2014; Ambrus & Barcsi-Veres, 2016). This paradigm shift reflects a broader educational reform aimed at fostering learners' ability to think critically and reflect on their learning processes. As noted by Lazarides and Ittel (2012), the constructivist instructional approach encourages learners to build their own understanding, leading to more meaningful and lasting learning experiences. Constructivism, therefore, views learning as an active, student-centered process, where new knowledge is formed based on prior experiences and cognitive frameworks (Odoh, 2013; Vighnarajah, Su Luan Wong, & Kamariah Abubakar, 2014). This shift has inspired the adoption of various instructional models in science education, including simulations, multimedia learning, and hands-on activities that emphasize active participation. Among these approaches, outdoor learning activities have emerged as particularly effective for promoting experiential learning and deep conceptual understanding. These activities engage students beyond the classroom environment, enabling them to explore, observe, and interact directly with their surroundings. Empirical studies (Ajayi & Olanrewaju, 2021;

Okonkwo & Ibe, 2023) highlight that outdoor learning enhances students' engagement, motivation, and achievement by providing authentic learning contexts.

According to Eze and Chukwuma (2022) and Okpala and Nwokolo (2020), outdoor experiences such as field trips, nature walks, and environmental projects—bridge the gap between theoretical instruction and real-world application. Such experiential learning opportunities are especially relevant for subjects like biology, geography, and environmental science, where understanding natural systems requires observation and inquiry (Adams & Thompson, 2019). In the Nigerian context, outdoor learning activities may include visits to botanical gardens, national parks, and ecological sites, offering students tangible experiences that reinforce classroom instruction and stimulate scientific curiosity (Ajayi & Olanrewaju, 2021). Ultimately, outdoor learning has become an integral aspect of Nigeria's educational framework, providing a structured yet dynamic platform for effective teaching and learning of Basic Science concepts such as ecology and ecosystem. As emphasized by Alabi and Bello (2022), such experiences not only improve students' achievement but also sustain their interest in science through active, hands-on engagement with the natural world.

Academic achievement is widely recognized as a key indicator of educational success,

reflecting the extent to which students, teachers, or institutions attain set learning objectives. It represents the measurable outcomes of learning efforts, typically expressed through test scores, grades, or other performance indicators (Mishra & Yadav, 2016; Bitrus, 2014). According to Okeke (2016), achievement denotes the successful completion of a task through one's effort and skill, while Saudi and Sukeiman (2014) emphasize that academic achievement encompasses students' performance in school, often gauged by their ability to attain high or average marks. Research further suggests that such outcomes can be enhanced through innovative instructional strategies that actively engage learners. Achor, Ogbeba, and Amadu (2014), for instance, found that interactive and inquiry-based strategies such as group inquiry and cooperative learning—can improve students' understanding of scientific concepts, including ecology, irrespective of gender differences.

The issue of gender has long attracted the attention of researchers and educators due to its influence on learning experiences and outcomes. Historically, educational access and opportunities were shaped by cultural and social norms that favored boys over girls, leading to enduring gender disparities in education. Although progress has been made, gender remains a significant variable in science and technology education,

influencing students' participation, interest, and achievement (Popoola & Ajani, 2017). As Ifeanchio (2018) observed, science education has often been delivered from a masculine perspective, inadvertently marginalizing female learners. This imbalance necessitates continuous investigation into how gender dynamics affect academic achievement, particularly in scientific disciplines such as ecology.

Empirical findings on gender differences in science achievement remain inconclusive. Some studies (Omiko, 2016; Nweze, 2014; Nweke, 2015) report significant differences in science process skills between male and female students, while others (Usman, 2010; Adekunle, 2015; Fatokun, Egya, & Uzoechi, 2016) found no significant disparities. Etukudo (2014) contends that these variations may be more closely linked to the instructional strategies employed than to gender itself. It is against this background, the present study investigated the effect of outdoor learning activities on students' interest and achievement in Ecosystem among Junior Secondary School students in Keffi Education Zone, Nasarawa State. By emphasizing experiential, hands-on engagement, the study aimed to determine whether outdoor learning could serve as an effective instructional strategy for enhancing both male and female students' understanding and achievement in Basic Science.

Statement of the Problem

Low academic achievement in Basic Science among Junior Secondary School students has continued to pose a serious challenge within the Nigerian education system. Despite various educational reforms and interventions, many students still perform poorly in the Basic Education Certificate Examination (BECE), particularly in topics such as the Ecosystem. This persistent underachievement limits their foundational understanding of scientific concepts and reduces their likelihood of pursuing science-related disciplines in higher levels of education. One major factor contributing to this trend is the continued reliance on traditional, teacher-centered instructional approaches that emphasize rote learning and theoretical explanations over practical engagement. The frequent use of chalk-and-board techniques, with little or no incorporation of interactive or experiential learning activities, often fails to sustain students' interest or promote meaningful understanding of scientific phenomena. To address this concern, it is essential to adopt learner-centered strategies that connect classroom instruction with real-world experiences. Outdoor learning activities provide students with opportunities to explore their natural environment, observe living and non-living components of ecosystems firsthand, and develop deeper conceptual understanding through active participation.

This study therefore determined the effect of outdoor learning activities on students' achievement in Ecosystem among Junior Secondary School students in the Keffi Education Zone, Nasarawa State. It also determined whether gender differences influence the effectiveness of these activities, with the goal of identifying innovative pedagogical approaches capable of enhancing students' achievement and interest in Basic Science.

Research Objectives

The aim of this research was to determine the effect of outdoor learning activities on students' achievement in ecosystem among junior secondary school in Keffi education zone, Nasarawa State. Specifically, the objectives were to:

1. determine the effect of outdoor learning activities on students' achievement in ecosystem concepts in Keffi Education Zone.
2. determine the effect of gender on students' achievement when taught ecosystem concepts using outdoor activities in Keffi Education Zone.
3. find out the mean interaction effect of methods and gender on students' achievement in ecosystem concepts in Keffi Education Zone.

Research Question

The following questions were raised to guide the study:

1. What are the mean achievement scores of students taught ecosystem concepts using outdoor learning activities, and those taught using conventional methods in Keffi Education Zone?
2. What are the mean achievement scores of males and female students' taught ecosystem concepts using outdoor learning activities in Keffi Education Zone?
3. What is the interaction effect of method and gender on students' achievement in ecosystem concepts in Keffi Education Zone?

Research hypothesis

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

- H₀₄: There is no significant difference in the mean achievement scores of students taught ecosystem concepts using outdoor learning activities, and those taught using conventional methods in Keffi Education Zone
- H₀₅: There is no significant difference in the mean achievement scores of males and female students taught ecosystem

concepts using outdoor learning activities in Keffi Education Zone

- H₀₆: There is no significant difference in the interaction effect of method and gender on students' achievement in ecosystem concepts in Keffi Education Zone

Methodology

The research design that was employed for this study is quasi experimental design of the nonrandomized control group, pretest and posttest type. This design is chosen because randomization of students was not possible because it can disrupt the school's arrangement which was not allowed by school authority. The population of this study comprised 2,879 JSS II Science students from 65 junior secondary schools in Keffi local government area of Nasarawa State, for 2022/2023 academic session.

The sample for this study comprised 93 JSS II Science selected using Simple random sampling technique. Simple random sampling technique of 'lucky dip' with replacement was employed to select three schools that make up the sample for the study. To do this, all the names of government owned secondary schools were written on cards and placed in a box; after shaking the box, a name of a secondary school was

picked, written down on a clear sheet of paper and replaced. The process of shaking and picking of schools with replacement was repeated three times, two secondary school were randomly selected. From the two schools selected, one of the schools was assigned to experimental group while one was assigned to control group.

Ecosystem Achievement Test (EAT) was used for data collection. Ecosystem Achievement Test (EAT) consists of 45 multiple choice questions adopted from past BECE questions from the year 2018-2023, each question consists of four options A-D, based on the content of BECE curriculum on ecosystem as stated in the senior secondary Basic science curriculum out of which only one is correct and the questions cover the three levels of bloom's taxonomy. The

instrument was used as the pretest and posttest to obtain data on students' achievement in ecosystem concepts taught. Details in Appendix B. A total unit of 45 mark was set for the items. The research instruments; Ecosystem Achievement Test (EAT) was subjected to face and content validity by three lecturers. The average validation index obtained was 0.73. The instruments were subjected to trial testing by administering it on twenty (20) JSS II Basic Science students which are not part of the sample size, but has similar characteristics with the population of the study. The validity index of 0.75 was obtained using and Kuder-Richardson (K-R)₂₁. The The research questions were answered using mean and standard deviations while the null hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA).

Results

Research Question One: What are the mean achievement scores of students taught ecosystem concepts using outdoor learning activities, and those taught using conventional methods in Keffi Education Zone?

Table 2: Mean Achievement Scores of Students Taught Ecosystem Concepts Using Outdoor Learning Activities, and those Taught Using Conventional Methods in Keffi Education Zone

Group		Pretest	Posttest
Experimental	Mean	22.14	43.35
	N	45	45
	Std. Deviation	4.098	7.061
Control	N	21.88	37.67
	Std. Deviation	48	48
		6.497	8.511

Table 2 shows mean achievement scores of students taught ecosystem concepts using outdoor learning activities, and those taught using conventional methods in Keffi education zone, students taught using the experimental teaching method (outdoor learning activities) had a pretest score 22.14

with a standard deviation of 4.098 while the post test score is 43.35 with standard deviation of 7.061 while the control group (lecture method) had a pretest score of 21.88 with standard deviation of 6.497 and a post test score of 37.76 with a standard deviation of 8.511

Hypothesis One

There is no significant difference in the mean achievement scores of students taught ecosystem concepts using outdoor learning activities, and those taught using conventional methods in Keffi Education Zone

Table 3: ANCOVA Result of the Mean Achievement Scores of Students Taught Ecosystem Concepts Using Outdoor Learning Activities, and those Taught Using Conventional Methods in Keffi Education Zone

Source	Type III Sum of	df	Mean Square	F	Sig.	Partial Eta
Corrected	2614.187 ^a	2	1307.093	34.900	0.000	0.463
Intercept	1901.257	1	1901.257	50.765	0.000	0.385
Pretest	1957.705	1	1957.705	52.272	0.000	0.392
Group	601.777	1	601.777	16.068	0.000	0.166
Error	3033.623	89	37.452			
Total	118288.000	93				
Corrected Total	5647.810	91				

a. R Squared = .463 (Adjusted R Squared = .450)

F(1,81) = 16.068; P = 0.000 < α = 0.05, Reject Ho2

Table 3 shows the ANCOVA result of the mean achievement scores of students taught ecosystem concepts using outdoor learning activities, and those taught using conventional methods in Keffi education zone. The F=16.068; and P=0.000, < α = 0.05, thus the hypothesis was rejected, implying that there

was significant difference in the mean scores of students' achievement score of students taught ecosystem using outdoor learning activities and those taught using lecture methods in favour of the student taught using outdoor learning activities.

Research Question Two: What are the mean achievement scores of males and female students' ecosystem concepts using outdoor learning activities in Keffi Education Zone?

Table 4: Mean Achievement Scores of Males and Female Students' Ecosystem Concepts Using Outdoor Learning Activities in Keffi Education Zone

Gender		Pretest	Posttest
Male	Mean N	21.14	39.57
	Std. Deviation	18	18
	N	4.130	8.083
	Std. Deviation	19.66	34.24
Female		27	27
		4.064	6.664

Table 4 shows the mean achievement scores of males and female students' ecosystem concepts using outdoor learning activities in Keffi Education Zone, the male students had a pretest score of 21.14 with a standard deviation of 4.130 and a post test score of 39.57 with a standard deviation of 8.083 while the female student had a pretest score of 19.66 and post test score of 39.24 with standard deviation of 6.664 respectively.

Hypothesis Two: There is no significant difference in the mean achievement scores of males and female students taught ecosystem concepts using outdoor learning activities in Keffi Education Zone

Table 5: ANCOVA Result of the Mean Achievement Scores of Males and Female Students Taught Ecosystem Concepts Using Outdoor Learning Activities in Keffi Education Zone

Source	Type III Sum of	df	Mean Square	F	Sig.	Partial Eta
Corrected	416.624 ^a	2	208.312	4.968	0.012	0.199
Intercept	870.879	1	870.879	20.771	0.000	0.342
Pretest	415.596	1	415.596	9.912	0.003	0.199
Gender	6.302	1	6.302	0.150	0.700	0.004
Error	1677.143	42	41.929			
Total	68672.000	45				
Corrected Total	2093.767	44				

a. R Squared = .199 (Adjusted R Squared = .159)

Table 5 shows ANCOVA result of the mean achievement scores of males and female students taught ecosystem concepts using outdoor learning activities in Keffi education zone. The $F = 0.150$; and $P = 0.700 > \alpha = 0.05$. The null hypothesis was not rejected since the

P-Value is greater than the alpha value 0.05. This implies that there is no significant differences between the male and female students taught ecosystem concept with

outdoor learning activities, therefore gender has no influence on student achievement of student taught ecosystem outdoor learning activities.

Research Question Three: What is the mean interaction effect of method and gender on students' achievement scores in ecosystem concepts in Keffi Education Zone?

Table 6: Mean Interaction Effect of Method and Gender on Students' Achievement Scores in Ecosystem Concepts in Keffi Education Zone

Group	Gender		PreInterest	PostInterest
Experimental	Male	Mean	41.14	51.43
		N	18	18
		Std. Deviation	11.773	4.988
	Female	Mean	39.07	51.38
		N	27	27
		Std. Deviation	9.369	6.161
Control	Male	Mean	41.28	43.44
		N	20	20
		Std. Deviation	6.351	6.224
	Female	Mean	36.22	43.30
		N	28	28
		Std. Deviation	7.994	6.957

Table 6 shows the mean interaction effect of method and gender on students' achievement scores in ecosystem concepts in Keffi education zone. The pretest and posttest mean of male students taught using outdoor learning activities are 41.14 and 51.53, with

standard deviations of 11.773 and 4.4.998 respectively while the mean of the pretest and posttest mean of the female students taught with outdoor learning activities are 39.07 and 51.3, with the standard deviations of 9.369 and 6.161 respectively.

Hypothesis Three: There is no significant difference in the mean interaction effect of method and gender on students' achievement scores in ecosystem concepts in Keffi Education Zone

Table 7: ANCOVA Result of the Mean Interaction Effect of Method and Gender on Students' Achievement Scores in Ecosystem Concepts in Keffi Education Zone

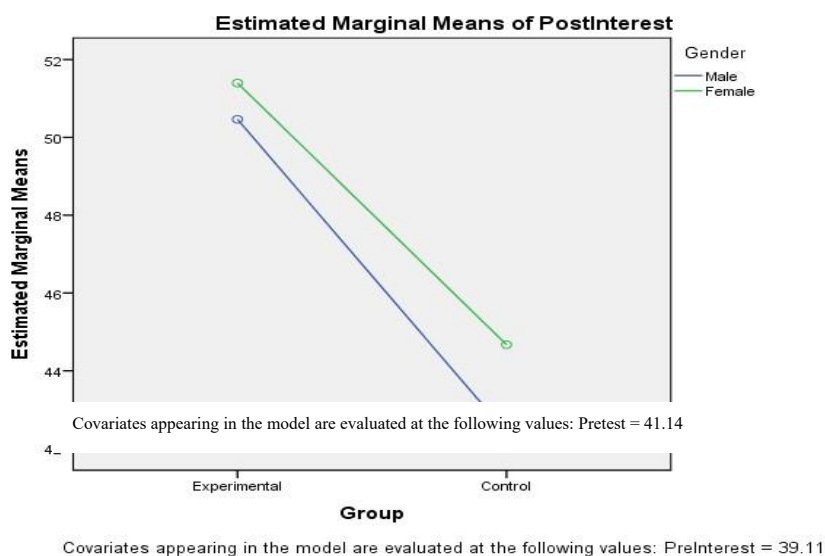
Source	Type III Sum of	df	Mean Square	F	Sig.	Partial Eta
Corrected Model	2779.581 ^a	4	694.895	32.611	0.000	0.623
Intercept	3199.270	1	3199.270	150.141	0.000	0.655
PreInterest	1426.199	1	1426.199	66.931	0.000	0.459
Group	1058.692	1	1058.692	49.684	0.000	0.386
Gender	47.827	1	47.827	2.244	0.138	0.028
Group *	8.500	1	8.500	0.399	0.529	0.005
Error	1683.371	88	21.308			
Total	193798.000	93				
Corrected Total	4462.952	92				

a. R Squared = .623 (Adjusted R Squared = .604)

Table 7 shows ANCOVA result of the mean interaction effect of method and gender on students' achievement scores in ecosystem concepts in Keffi education zone. $F(1,79) = 0.399$; $P=0.529 > \alpha=0.05$, implying that there is no interaction effect between method and

gender based on the mean scores of students taught ecosystem using outdoor learning activities because P-Value is greater than alpha level 0.05 thus the null hypothesis is not rejected

Profile Plots



Discussion

Hypothesis one showed that there that there was significant difference in the mean scores

of students' achievement score of students taught ecosystem using outdoor learning

activities and those taught using lecture methods. This finding is in agreement with that of Gor, Jaji, and Ngezack, (2023); Awodun and Boris (2020); Nwosu and Ndanwu (2020) and that of Oladiran and Oyawole (2018) who both found out that there was significant difference in the mean achievement scores of students taught concepts using outdoor learning activities. It could be that outdoor learning activities often foster greater engagement and motivation among students. Unlike traditional lecture methods, which can be passive and monotonous, outdoor learning encourages active participation, collaboration, and discovery. This dynamic and interactive environment captures students' interest and keeps them more invested in the learning process, which can lead to better academic outcomes. Also, outdoor learning provides a hands-on, experiential approach that allows students to directly interact with the natural environment. This practical engagement helps make abstract concepts more concrete and relatable, enhancing students' understanding and retention of the material. By observing and exploring ecosystems firsthand, students can connect theoretical knowledge to real-world applications, which deepens their learning and improves academic performance.

Furthermore, hypothesis two showed that there is no significant differences between the

male and female students taught ecosystem concept with outdoor learning activities. This finding agrees with the findings of Oladiran and Oyawole (2018) who carried out an investigation on the effect outdoor classroom instructional strategy and gender as determinants of students' achievement in biology and found out that Outdoor Classroom Instructional strategy improved students' achievements in biology for both student genders. Since outdoor learning creates an inclusive and engaging environment that benefits all students, regardless of gender. By emphasizing hands-on experiences, collaboration, and exploration, outdoor activities provide equal opportunities for both male and female students to actively participate and succeed. This approach minimizes the influence of gender stereotypes and ensures that learning is accessible and effective for everyone.

Hypothesis three showed that there is no interaction effect between method and gender based on the mean achievement scores of students taught ecosystem using outdoor

learning activities. This finding is in agreement with the findings of Obodo and Ani (2023) and Nwosu and Ndanwu (2020) who in their respective study found out that there is no significant interaction effect of teaching method and gender was found on the mean achievement scores of students'. This finding reflects broader educational trends that prioritize gender equality in teaching and learning. Modern pedagogical practices aim to create equitable opportunities for all students, ensuring that teaching methods are effective across genders. Outdoor learning, with its emphasis on collaboration, exploration, and real-world applications, naturally aligns with these goals by providing a neutral and engaging platform for all students to succeed.

Conclusion

The findings of this study highlight the significant benefits of using outdoor learning activities to teach ecosystem concepts to junior secondary school students in Keffi Education Zone, Nasarawa State. The findings collectively demonstrate that outdoor learning activities are an effective and inclusive teaching strategy for enhancing

achievement in ecosystem concepts among junior secondary school students in Keffi Education Zone, Nasarawa State. The approach benefits all students equally, regardless of gender, and outperforms conventional teaching methods in fostering engagement and academic success. These results align with previous research and highlight the importance of incorporating outdoor learning into science education to create more dynamic and equitable learning experiences.

Recommendations

- i. Schools and educational policymakers should incorporate outdoor learning activities as a regular part of the science curriculum, particularly for teaching difficult and abstract concepts
- ii. Teachers should be trained through workshops, seminars, and trainings on how to use outdoor learning activities.
- iii. School administrators and teachers should ensure that both male and female students are equally encouraged to participate in outdoor activities, and teachers should avoid gender stereotypes that may limit students' achievement

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