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Effects Of Experiential Learning Strategy On Senior Secondary School Students' Interest And Achievement In Practical Agricultural Science In Some Selected School In Borno State, Nigeria

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This study investigates the effects of experiential learning strategies on senior secondary school students' interest and academic performance in practical agricultural science in Biu, Borno State, Nigeria. Anchored on Kolb's experiential learning theory, the study employs a quasi-experimental research design with a non-equivalent group pre-test/post-test approach. A population of 871 Senior Secondary School II (SS II) students offering agricultural science in five government secondary schools formed the basis of the study, from which a sample of 300 students (150 male and 150 female) was selected using simple random sampling. The experimental group was exposed to experiential learning strategies, including fieldwork, while the control group was taught using the conventional lecture method. Data were collected using the Agricultural Science Practical Test (ASPT) and the Students' Agricultural Science Interest Inventory (SASII). The findings revealed that the experiential learning strategy significantly improved students' interest, with a mean gain of 3.28 in the experimental group compared to 1.29 in the control group. Academic performance also improved notably, with the experimental group achieving a mean gain of 23.34 compared to 6.75 in the control group. Additionally, male students in the experimental group outperformed their female counterparts, with a mean difference of 4.2 in academic performance. The study concludes that experiential learning strategies enhance students' interest and academic performance in practical agricultural science, offering a more effective alternative to traditional lecture methods. It recommends the integration of experiential learning into agricultural science curricula and the provision of resources to support hands-on activities, ensuring gender inclusivity and equitable access for all students.

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Introduction

Agricultural science is a subject taught in both junior and secondary schools in Nigeria to equip the students with sound scientific knowledge to empirically understand the science of soil formation and management, crop and animal production in relation to food production and prepare them for further education in vital science-based courses like biotechnology, agricultural pathology, agriculture engineering, veterinary, food technology among others. According to Newton (2020) Agricultural Science is the science that encompasses everything from food and fiber production to soil and crop cultivation and animal processing.

The importance of Agricultural science knowledge and skills in promoting self-reliance through the production of staple foods for the populace and the provision of employment

opportunities together with raw materials for the agro-allied industries cannot be over-emphasized. This is because the knowledge of Agricultural science can help individuals understand the physical and chemical characteristics and effects of agriculture on soil fertility, factors of production like climate, weeds, fungi, erosion, leaching and pests, plant physiology, genetics, nutrition, satellite-based micro-management of inputs and the maximization of sustained yield as well as how to market farm products. Agricultural science education plays a crucial role in promoting self-reliance and economic development through food production. The Nigerian agricultural science curriculum aims to equip students with skills for self-reliance after graduation, though inadequate facilities hinder practical teaching (Ishaya & Bello, 2022). Agricultural education can improve food security, youth employment, and raw material provision, but faces challenges such as insufficient funding and a lack of qualified personnel (Innocent-Ene et al., 2022). Small-scale farming, which accounts for about 95% of Nigeria's agricultural output, requires support through innovative applications of agricultural science, including soil science and improved production techniques (Nworu, 2018).

Despite the importance of Agricultural science to food security, self-reliance and national development at large, youth engagement in agricultural activities like crop cultivation, and livestock rearing as well as taking agriculture as an occupation has not been encouraging. This lack of interest in agriculture has resulted in low performance in practical agriculture in external examinations (WAEC Chief Examiners' Reports, 2016-2023). The reports revealed that candidates continue to perform poorly in the practical examinations over the years. Based on the findings, the reports advised that schools offering the subject should have the following infrastructural facilities: a school farm/site to conduct students' practicals, poultry house, piggery pen, goats and sheep pen, rabbits, ducks, guinea fowls, pigeon pen; aqua-culture/fish pons (natural & artificial); animal specimens example snail, beehive and others. Students should be made to go on excursions to agricultural institutions to make the subject interesting and they will have the opportunity to familiarize themselves with practical exercises.

Practical agriculture is the fundamental principle of exposing students to the real production chain of agriculture, which helps to eradicate pseudo-teaching and readdress the students' wrong mindset towards the subject.

Otekunrin et al., (2019) Observe that one of the major causes of students' poor performance in Agricultural science is the poor teaching techniques, which are without appropriate instructional materials. Corroborating the assertions, Bash, (2021) the conventional lecture strategy is usually the dominant approach used by teachers in Nigeria and students are not actively involved in developing knowledge; they generally remain passive listeners throughout the lesson. Hence the strategy is mainly a teacher-centered approach to learning, which is not an effective method for teaching Agricultural science. From the foregoing, it becomes imperative for more research to discover better teaching methods that could enhance students' interest and achievement in the subject. Based on this, more effort ought to be accorded to experiential learning strategy since it has proven to be efficacious in the teaching of skill-based and practical-oriented subjects like Agricultural science. Experiential Learning (EL) is learning by doing or learning through experience.

Experiential learning is a type of learning in which students participate in some activities, reflect upon the activities and use their analytical skills to derive some useful insight from the experience and then incorporate their new understanding into their lives. In experiential learning, a person's experience is the central point for learning, which allows students to test the validity of the ideas that were created during the learning process. Experiential learning is like taking students to the zoo to observe or interact with the animals, instead of reading about them from books.

The studies of Bibi et al., (2022) show that through the use of experiential learning activities, students' interest can be enhanced as well as achievement. However, little research has been done in the area of experiential learning to enhance student's interest and performance in practical agricultural science. Hence, this study looks at the effects of experiential learning strategy on senior secondary school students' interest and achievement in practical agricultural science in Biu, Borno state Nigeria.

The study is limited to the effects of experiential learning strategy on students' interest and academic performance in practical Agricultural science in senior secondary schools in Biu, Borno State. Similarly, the study is restricted to only SS II students who offer agricultural science in senior secondary schools in Biu Borno State.

Statement of the Problem

Agricultural science is a vital component of the senior secondary school curriculum, designed to equip students with practical skills and knowledge for sustainable agricultural practices. Despite its significance, students often demonstrate low interest and poor academic performance in the subject, particularly in its practical aspects. Traditional teaching methods, such as the lecture method, which emphasizes theoretical knowledge over hands-on experiences, may contribute to this challenge. This situation raises concerns about the effectiveness of conventional instructional strategies in fostering students' engagement and academic success in practical agricultural science.

In response to these challenges, experiential learning, which emphasizes active participation and real-world application, has emerged as a potential strategy to enhance students' interest and academic performance. However, the extent to which experiential learning influences students' interest and academic outcomes, compared to the lecture method, remains unclear. Furthermore, it is uncertain whether the experiential learning strategy affects male and female students differently in terms of their academic performance.

This study seeks to address these gaps by examining the effects of the experiential learning strategy on students' interest and academic performance in practical agricultural science in senior secondary schools in Biu, Borno State. Specifically, the study aims to compare the outcomes of experiential learning with the lecture method, as well as investigate potential gender differences in students' academic performance following exposure to experiential learning.

Objectives of the study

The study aims to determine the effects of experiential learning strategy on students' interest and academic performance in practical agricultural science in Biu, Borno State, while the objectives are to:

i. Determine senior secondary school students' interest when taught practical

agricultural science using experiential learning strategy and when taught with lecture method;

ii. Determine the academic performance of students taught practical agricultural science using experiential learning strategy and that of their counterparts taught with the conventional lecture method;

iii. Find out the academic performances of male and female senior secondary school students in practical agricultural science after exposure to experiential learning strategy.

Research Questions

i. What is the pre-test and post-test interest mean score of senior secondary school students when taught practical agricultural science using experiential learning strategy and when taught with lecture method in the experimental and control groups?

ii. What are the pre-test and post-test academic performance mean scores of senior secondary school students taught practical agricultural science using experiential learning strategy and that of their counterparts taught with the conventional lecture method in the experimental and control groups?

iii. What are the academic performances of male and female senior secondary school students in practical agricultural science after exposure to experiential learning strategy?

Literature Review

Agricultural Science education in Nigeria plays a crucial role in promoting food security, economic development, and self-reliance. The subject is included in the secondary school curriculum to equip youth with essential knowledge and skills. However, several challenges hinder effective teaching and learning, including inadequate facilities, theoretical-focused instruction, and a lack of qualified teachers (Otekunrin et al., 2017). Despite these obstacles, the Nigerian agricultural science curriculum is considered appropriate for fostering self-reliance among students (Ishaya & Bello, 2022). Improving agricultural education can lead to enhanced food security, youth employment, and economic growth (Innocent-Ene et al., 2022). To address these issues, recommendations include increased funding for equipment and facilities, providing incentives for learners, and employing innovative teaching methods to sustain student interest and improve academic performance (Innocent-Ene et al., 2022; Otekunrin et al., 2017).

Research indicates that traditional lecture methods are less effective than alternative teaching strategies in agricultural science education. Multiple studies have found that demonstration, peer-tutoring, project-based learning, and role-play methods significantly improve student achievement and interest compared to lecture-based instruction (Nwachukwu et al., 2020). Demonstration method consistently ranked highest in enhancing student performance across studies (Nwachukwu et al., 2020). Role-play was found to be particularly effective in increasing student interest (Nwachukwu et al., 2020). These findings highlight the limitations of the lecture method in fostering student engagement and academic success in agricultural science. To address these shortcomings, researchers recommend providing teachers with training in alternative teaching strategies, particularly demonstration techniques (Nwachukwu et al., 2020). Implementing a variety of teaching methods can help overcome the limitations of lecture-based instruction and improve overall

student outcomes in agricultural science education.

Poor performance in agricultural science examinations has been attributed to several factors. Examination malpractice is identified as a significant determinant, reducing students' interest in agriculture (Oloidi, 2023). Chief examiners' reports highlight issues such as poor map work, inadequate preparation, and scanty explanations in geography, which may also apply to agricultural science (Eze, 2020). The lack of laboratory and farming facilities significantly impacts students' performance in agricultural science (Nsa et al., 2016). Additionally, practical performance in subjects like music has been reported as poor, suggesting a need for pragmatic measures from examination bodies, school administrators, and the government (Amuah et al., 2021). These issues collectively contribute to the declining performance in agricultural science examinations. Addressing these challenges requires a multifaceted approach, including improving teaching strategies, providing adequate resources, and enhancing practical skills development to better prepare students for external examinations.

Nigerian schools face significant infrastructural and resource challenges that hinder effective education delivery. Secondary schools lack adequate buildings, laboratories, and equipment for teaching science and practical subjects (Ojeje & Adodo, 2018; Uche Emma, 2013). There is a shortage of qualified teachers and laboratory technicians, particularly for science and technology subjects (Uche Emma, 2013). Electricity supply is unreliable, with only 30% of schools receiving power for up to 4 hours daily (Uche Emma, 2013). Tertiary institutions struggle with insufficient lecture rooms, furniture, library services, and laboratory installations (Usman, 2014). Additional challenges include inadequate funding, student indiscipline, examination malpractices, and an inappropriate curriculum (Matthew, 2013). To address these issues, recommendations include increased funding, improved school administration, teacher recruitment and training, curriculum review, and regular school inspections (Matthew, 2013). Providing functional buildings, laboratories, and equipment is crucial for enhancing the quality of education and achieving national development goals (Ojeje & Adodo, 2018; Uche Emma, 2013).

Experiential learning is an educational approach emphasizing active participation, reflection, and real-world application (Chae, 2024; Wooding, 2019). It involves "learning by doing" and constructing meaningful knowledge through reflection-in-action (Chae, 2024; Wooding, 2019). Key principles include the continuity of experience and interaction between experience and reflection (Chae, 2024). This approach engages students in phenomena they are studying, such as internships, service learning, and research projects. Experiential learning theory, based on the works of Dewey, Kolb, and Schön, posits that growth is education and education is a reconstruction of experience (Chae, 2024). It has been applied in various fields, including medical education, to prepare students for unpredictable futures and professional roles (Chae, 2024). The teacher's role is to create worthwhile educational experiences for students to reflect upon, fostering critical thinking and interpersonal skills development (Wooding, 2019).

This study is anchored on the theory of experiential learning propounded by David Kolb in 1984. Kolb conceptualized experiential learning as learning through experience, involving active interaction with the

environment. The theory consists of four stages of the learning cycle, popularly known as Kolb's cycle of experiential learning: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Jones-Roberts & Bechtold, 2024).

The application of situated learning theory and experiential learning to agricultural education has shown promising results. Situated learning can enhance students' achievement, interest, and ability to apply knowledge to real-life situations in practical arts education. However, challenges exist in integrating practical skills in agricultural education, including teaching methodologies and resource allocation. Teacher-related factors such as competencies, qualifications, and preferred teaching methods significantly influence the integration of practical skills in agriculture teaching (Shabani et al., 2023). Regular professional development for teachers and curriculum alignment with national agricultural policies are recommended to enhance practical agricultural science education.

Methodology

This study will adopt a quasi-experimental research design, specifically employing the non-equivalent group pre-test/post-test design. Intact classes within the study area were randomly assigned to experimental and control groups, as described by Awotunde and Ugodulunwa (2004). The design was chosen because random assignment of students to groups was not feasible due to the use of the normal schooling period for administering the treatment. A pre-test will be administered to both experimental and control groups to determine any existing differences between the two groups before treatment. Only the experimental group will receive the treatment (experiential learning), after which a post-test will be administered to both groups. Diagrammatically, the design is represented as follows:

O1 → X → O2 (Group 1: Experimental)
O3 → O4 (Group 2: Control).

In this design, the experimental group (Group 1) and the control group (Group 2) were both exposed to a pre-test, denoted as O1 and O3, respectively. Only the experimental group received the treatment (X), after which a post-test (O2 and O4) was administered to both groups. The absence of randomization of the samples to either group is indicated by the dotted line in the diagram.

The population of this study consists of all 871 Senior Secondary School II (SS II) students in five government secondary schools within the study area who are offering Agricultural Science. The population comprises 520 male and 351 female students. A sample of two secondary schools was randomly selected from the five government secondary schools using a simple random sampling technique. These two schools were then randomly assigned to experimental and control groups. The sampled schools had a combined population of 300 students, consisting of 150 males and 150 females. School A had 181 students, while School B had 119 students.

The sampling technique employed was the simple random sampling method using the lottery technique. This method ensured fairness in the selection process, allowing each of the five schools an equal chance of being included in the study. The two selected schools were randomly assigned to either the experimental or control group to facilitate the quasi-experimental design.

The instruments used for data collection in this study are the Agricultural Science Practical

Test (ASPT) and the Students' Agricultural Science Interest Inventory (SASII). These instruments were designed to measure students' practical skills in agricultural science and their interest in the subject, respectively. The ASPT focused on assessing hands-on skills, while the SASII evaluated the students' enthusiasm and engagement with agricultural science.

Results

Research Question One:

What is the pretest and posttest interest mean score of senior secondary school students when taught practical agricultural science using experiential learning strategy and when taught with lecture method in the experimental and control groups

Table 1

Mean Scores of Pretest and Posttest of Students Interest when Taught Practical Agricultural Science using Experiential Learning Strategy and when taught with Lecture Method in the Experimental and Control Groups

Groups	Pretest			Posttest		Mean	
	N	Mean	SD	Mean	SD	Gain/Loss	X diff.
Experimental	150	34.78	5.45	38.06	8.71	3.28	1.99
Control	150	34.62	7.79	35.91	9.33	1.29	

Table 1presents the mean scores of pretest and posttest interest of students taught Practical Agricultural Science using an experiential learning strategy (experimental group) compared to those taught with a lecture method (control group). The result showed that in the experimental group, students had a pretest mean score of 34.78 (SD = 5.45) and a posttest mean score of 38.06 (SD = 8.71), resulting in a mean gain of 3.28. The calculated difference in mean scores from pretest to posttest was 1.99. While in the control group, students achieved a pretest mean score of 34.62 (SD = 7.79) and a posttest mean score of 35.91 (SD = 9.33), indicating a smaller mean gain of 1.29. This suggests that the experiential learning strategy significantly improved students' interest compared to the traditional learning strategy used in the control group. Hence, the results indicate that while both groups showed improvement from pre-test to post-test, the experimental group, taught using experiential learning, exhibited a greater mean gain in scores compared to the control group taught with the lecture method.

Research Question Two: What is the pre-test and post-test academic performance mean scores of senior secondary school students taught practical agricultural science using experiential learning strategy and that of their counterparts taught with the conventional lecture method in the experimental and control groups?

Table 2

Mean Scores of Pre-tests and Post-test Academic Performance of Students Taught Practical Agricultural Science using Experiential Learning Strategy and that of their Counterparts Taught with the Conventional Lecture Method in the Experimental and Control Groups.

Test		Pretest		Posttest		Mean	$\underline{X}$
	N	Mean	SD	Mean	SD	Gain/Loss	diff.
Experimental	150	44.63	5.45	67.97	5.93	23.34	
							16.59
Control	150	42.79	7.29	49.54	5.93	6.75	

Table 3 reveals the mean scores of pre-tests and post-test academic performance for students taught Practical Agricultural Science using an experiential learning strategy (experimental group) and those taught with a conventional lecture method (control group). The result showed that students in the experimental group had a pre-test mean score of 44.63 (SD = 5.45) and a post-test mean score of 67.97 (SD = 5.93). This resulted in a gain of 23.34 points, indicating a significant improvement in academic performance following the experiential learning strategy. The calculated difference in mean scores from the pre-test to the post-test was 16.59. While in the control group, students recorded a pretest mean score of 42.79 (SD = 7.29) and a post-test mean score of 49.54 (SD = 5.93), reflecting a gain of only 6.75 points. This smaller increase suggests that the conventional lecture method was less effective in enhancing academic performance compared to the experiential learning strategy. Therefore, these findings indicate that the experiential learning strategy significantly improved students' academic performance in Practical Agricultural Science, as evidenced by the larger mean score gain compared to those taught with the conventional method.

Research Question Three: What are the academic performances of male and female senior secondary school students in practical agricultural science after exposure to experiential learning strategy?

Table 4

The Academic Performance Mean Scores of Male and Female Students in Practical Agricultural Science of the Experimental Group

Test		Posttest			
		N	Mean	SD	$\underline{X}$ diff.
Experimental	Male	150	67.71	7.70	
					4.2
	Female	150	59.22	11.90	

Table 4 reveals the academic performance mean scores of male and female students in the experimental group for Practical Agricultural Science. The result showed male students had a mean score of 67.71 (SD = 7.70), while female students had a mean score of 59.22 (SD = 11.90). The mean difference between male and female students was 4.2, indicating that male students outperformed their female counterparts in the academic assessment. These results suggest a notable difference in academic performance between genders within the experimental group, with males achieving higher scores on average compared to females.

Discussion of Findings

The study revealed that students taught using experiential learning strategies showed higher levels of interest compared to those taught through traditional lecture methods. This finding is consistent with (Nwachukwu et al., 2020), who emphasised that alternative teaching methods, such as role-play and project-based learning, significantly enhance student engagement. Experiential learning's focus on active participation and real-world application aligns with (Chae, 2024, Wooding, 2019), who underscored the role of interaction and reflection in fostering interest. These studies reinforce the importance of moving away from theoretical instruction to practical, hands-on learning experiences to sustain students' enthusiasm for Agricultural Science.

The findings showed that students taught using experiential learning strategies performed better academically than those taught with conventional lecture methods. This aligns with the observations of (Nwachukwu et al., 2020), who reported that the demonstration method consistently improves academic performance. Additionally, the experiential learning theory of Kolb (1984) supports this result by emphasizing the importance of active experimentation and reflective observation in the learning process. Studies by (Innocent-Ene et al., 2022; Otekunrin et al., 2017) further validate that innovative teaching methods enhance students' understanding and retention, leading to improved academic outcomes.

The study found no significant disparity in academic performance between male and female students exposed to experiential learning strategies. This aligns with the recommendations of (Shabani et al., 2023), who advocate for gender-inclusive teaching practices to ensure equitable access to quality education. However, challenges such as resource allocation and teacher competencies, as highlighted by (Uche Emma, 2013; Matthew, 2013), may affect the effectiveness of these strategies. Addressing these barriers through professional development and curriculum alignment with practical applications can help sustain the gains in academic performance for both genders.

The findings also underscore the infrastructural and resource challenges faced by Nigerian schools, such as inadequate facilities and teacher shortages (Ojeje & Adodo, 2018). These limitations hinder the effective implementation of experiential learning strategies. Addressing these challenges requires increased funding, improved teacher training, and resource provision to support practical agricultural education, as recommended by (Matthew, 2013; Innocent-Ene et al., 2022).

Conclusion

1. **Student Interest in Practical Agricultural Science:** The study found that senior secondary school students exhibited a significantly higher level of interest in practical Agricultural Science when taught using the experiential learning strategy compared to the traditional lecture method.

This suggests that experiential learning methods, which involve hands-on activities and real-world applications, are more engaging for students and promote a deeper interest in the subject.

2. **Academic Performance of Students:** The academic performance of students taught practical Agricultural Science using the experiential learning strategy was significantly higher than that of students taught using the conventional lecture method. This highlights the effectiveness of experiential learning in improving students' understanding and performance in practical subjects, providing evidence that active learning strategies are more beneficial for students' academic achievement.
3. **Gender Differences in Academic Performance:** The study revealed no significant gender differences in the academic performance of male and female students exposed to experiential learning strategies. Both male and female students showed comparable improvements in performance, indicating that experiential learning strategies can be equally effective for students of all genders in practical Agricultural Science education.

Recommendations

The following recommendations are made:

1. **Enhancing Students' Interest in Practical Agricultural Science:** Teachers should adopt experiential learning strategies, such as fieldwork, farm visits, and hands-on activities, to increase students' interest in practical agricultural science. These strategies provide interactive and real-life learning experiences that make the subject more engaging and relatable for students, as opposed to the conventional lecture method.
2. **Improving Academic Performance through Experiential Learning:** Experiential learning strategies should be implemented as the primary teaching approach for practical agricultural science. By offering students practical exposure and active participation in agricultural practices, their academic performance can be significantly improved compared to those taught with traditional lecture methods.
3. **Addressing Gender Differences in Academic Performance:** Schools and teachers should ensure that experiential learning strategies are designed to support both male and female students equally. Efforts should be made to eliminate gender-based disparities in access to resources and opportunities during practical agricultural science activities, ensuring that both male and female students can achieve optimal academic performance.

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