

Effects of Practical Teaching Strategies on Secondary School Students' Performance in Agricultural Science in Imo State, Nigeria

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Publication Date: 2026/10/05

Abstract: This study investigated the effects of practical teaching strategies on the academic performance of secondary school students in Agricultural Science in Imo State, Nigeria. The study was motivated by concerns about students' poor performance in Agricultural Science and the continued reliance on theoretical teaching methods in many secondary schools. A quasi-experimental research design involving pre-test, post-test, and control group arrangements was adopted. The study was conducted in Owerri Education Zones I and II, with a sample of 120 students comprising 60 males and 60 females drawn from four coeducational secondary schools. The experimental groups were exposed to practical teaching strategies, with particular emphasis on interactive practical learning and practical demonstrations using farming tools, while the control group was taught using the traditional theoretical classroom method. Data were collected using the Agricultural Science Achievement Test (ASAT), consisting of 25 multiple-choice questions based on the senior secondary school Agricultural Science curriculum. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at the 0.05 level of significance. The findings indicated that students exposed to interactive practical learning achieved higher mean post-test scores than those taught using the traditional theoretical method, with the difference being statistically significant. The findings also showed that both male and female students benefited from practical demonstrations with farming tools, with no statistically significant difference in their achievement scores. The study concluded that practical teaching strategies, particularly interactive practical learning and practical demonstrations, are more effective than traditional theoretical teaching in improving students' academic performance in Agricultural Science. It was recommended that Agricultural Science teachers should integrate practical-oriented instructional approaches into classroom teaching and that schools should provide adequate facilities, farming tools, and opportunities for practical learning.

Keywords: Agricultural Science, Practical Teaching Strategies, Interactive Learning, Academic Performance, Secondary Schools, Imo State.

How to Cite: U. U. Nkulo; J. I. Ukagwu; V. N. Acholonu; J. I. Offor (2026) Effects of Practical Teaching Strategies on Secondary School Students' Performance in Agricultural Science in Imo State, Nigeria. *International Journal of Innovative Science and Research Technology*, 11(8), 4221-4228. <https://doi.org/10.38124/ijisrt/26aug1568>

I. INTRODUCTION

Agriculture remains one of the most important sectors of human existence because it provides food, employment, raw materials, and economic sustainability for nations around the world. In developing countries such as Nigeria, agriculture contributes significantly to national development and serves as a major source of livelihood for millions of people. Consequently, the teaching of Agricultural Science in secondary schools is considered essential for preparing students with practical knowledge and skills required for food production, self-reliance, and national development.

Agricultural Science as a school subject was introduced into the Nigerian secondary school curriculum to equip learners with the principles and practices of farming, crop production, livestock management, and sustainable agricultural practices. The Federal Republic of Nigeria (2009) emphasized that Agricultural Science education should stimulate students' interest in agriculture, develop practical skills, and prepare learners for future agricultural careers. Despite these objectives, students' academic performance in Agricultural Science has remained unsatisfactory in many secondary schools.

One major factor responsible for the poor performance of students in Agricultural Science is the continued emphasis on theoretical teaching methods rather than practical and experiential learning approaches. In many schools, Agricultural Science is taught predominantly through lectures and textbook explanations without adequate opportunities for students to engage in hands-on activities. This disconnect between theory and practice reduces students' understanding, motivation, and interest in agriculture.

Practical teaching strategies involve learner-centered approaches that actively engage students in the learning process through demonstrations, farm experiments, project-based learning, field trips, and interactive activities. These strategies promote experiential learning by allowing students to apply theoretical knowledge to real-life agricultural situations. According to Kolb's Experiential Learning Theory, students learn more effectively when they actively participate in practical experiences and reflect on those experiences.

Studies have shown that practical teaching strategies improve students' retention, critical thinking, problem-solving abilities, and academic achievement. Practical exposure equally develops psychomotor skills and prepares students for future employment opportunities in agriculture and related industries. In contrast, traditional theoretical methods often encourage rote memorization without meaningful understanding.

Gender and school location are additional factors that may influence students' performance in Agricultural Science. Some societal beliefs portray agriculture as a male-dominated field, thereby affecting female students' participation and confidence. Similarly, urban and rural school locations may differ in terms of access to agricultural facilities, farmland, and instructional resources.

Given the importance of Agricultural Science in promoting food security and national development, there is a need to adopt instructional approaches that improve students' academic performance and practical competence. This study therefore examined the effects of practical teaching strategies on secondary school students' performance in Agricultural Science in Imo State, Nigeria.

Practical teaching strategies in Agricultural Science emphasize active student participation and experiential learning. According to Audu, Egunsola, and Yaro (2024), practical agriculture encourages students to develop skills through direct engagement in agricultural activities. These activities include farm demonstrations, use of farming tools, livestock management, crop cultivation, and project-based assignments.

Experiential learning theory developed by Kolb (1984) provides a strong foundation for practical teaching strategies. The theory proposes that learning occurs through concrete experiences, reflection, conceptualization, and experimentation. Students learn effectively when they

engage directly with learning activities rather than merely listening to lectures.

Similarly, Piaget's Constructivist Learning Theory emphasizes that learners actively construct knowledge through interaction with their environment. Practical agricultural activities therefore provide students with opportunities to explore, discover, and apply concepts in meaningful ways.

Several empirical studies have highlighted the benefits of practical teaching strategies in agriculture education. Fetsch and Grenwelle (2023) found that practical agricultural training improved farming skills and entrepreneurial competence among participants. Li (2016) also reported that practical teaching activities enhanced students' performance and practical competence in agricultural colleges. Shabani, Shiundu, and Mutsotso (2023) revealed that teacher proficiency in practical agricultural instruction significantly influenced students' learning outcomes in secondary schools in Kenya. Ouma et al. (2021) further emphasized the importance of competency-based practical learning in improving agricultural education.

In contrast, theoretical teaching methods have been criticized for limiting students' active participation and practical exposure. Lloyd (2023) noted that while theoretical teaching helps students understand scientific principles, it may not adequately develop practical agricultural skills required for real-world applications. The reviewed literature therefore indicates that practical teaching strategies are more effective in enhancing students' academic performance, practical competence, and interest in Agricultural Science. Despite the inclusion of Agricultural Science in the secondary school curriculum, many students graduate with limited practical skills and inadequate understanding of agricultural concepts. The teaching of agriculture in many schools remains largely theoretical due to inadequate facilities, lack of trained personnel, and poor implementation of practical lessons. Consequently, students often perform poorly in Agricultural Science examinations and develop little interest in agriculture as a career. The observable decline in students' performance in Agricultural Science has generated concern among educators, policymakers, and stakeholders in the educational sector. If this trend continues, the objectives of Agricultural Science education in promoting food production, self-reliance, and agricultural development may not be achieved. Therefore, there is a need to investigate whether practical teaching strategies can improve students' academic performance in Agricultural Science. The main purpose of this study was to investigate the effects of practical teaching strategies on the academic performance of secondary school students in Agricultural Science in Imo State, Nigeria.

Specifically, the study sought to:

- Determine the effect of interactive practical learning on students' academic performance in Agricultural Science compared with traditional theoretical teaching.

- Examine the difference in the academic performance of male and female students exposed to practical demonstrations with farming tools.

➤ Research Questions

The following research questions guided the study:

- What are the effects of interactive practical learning on students' academic performance in Agricultural Science compared with traditional theoretical teaching?
- What are the differences in the academic performance of male and female students exposed to practical demonstrations with farming tools?

➤ Hypotheses

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

- There is no significant difference between the mean performance scores of students exposed to interactive practical learning and those taught using traditional theoretical methods.
- There is no significant difference between the mean performance scores of male and female students exposed to practical demonstrations with farming tools.

II. METHODOLOGY

➤ Research Design

The study adopted a quasi-experimental research design involving pre-test, post-test, and control group arrangements. The design was considered appropriate because intact classes were used without random assignment of participants. The design enabled the researchers to compare the academic performance of students exposed to practical teaching strategies with that of students taught using the traditional theoretical method. The study was conducted in Owerri Education Zones I and II of Imo State, Nigeria. The population of the study consisted of all secondary school students offering Agricultural Science in the study area. A sample of 120 students, comprising 60 males and 60 females, was selected from four coeducational secondary schools using stratified, purposive, and cluster sampling techniques. The instrument used for data collection was the Agricultural Science Achievement Test (ASAT). The ASAT consisted of 25 multiple-choice questions derived from the senior secondary school Agricultural Science curriculum and relevant past examination questions. The instrument was used to assess students' achievement before and after the instructional intervention.

➤ Experimental Procedure

The experimental groups were exposed to practical teaching strategies designed to promote active participation and direct engagement with agricultural learning activities. The intervention focused on two major practical approaches examined in the study:

- Interactive practical learning: Students participated actively in Agricultural Science lessons through teacher-guided practical activities, observation, questioning, discussion, and application of agricultural concepts to practical situations.
- Practical demonstrations with farming tools: Students were exposed to demonstrations involving the identification, handling, and appropriate use of relevant farming tools and equipment. Students were given opportunities to observe the correct procedures and subsequently participate in guided practical activities.

The control group was taught the same Agricultural Science content using the traditional theoretical classroom method, with emphasis on teacher explanation, textbook-based instruction, and classroom discussion without the practical intervention. The pre-test was administered to both the experimental and control groups before the commencement of the intervention. Following the instructional period, the ASAT was administered as a post-test to determine changes in students' achievement. Data collected were analyzed using mean and standard deviation to answer the research questions. Analysis of Covariance (ANCOVA) was used to test the null hypotheses at the 0.05 level of significance, with the pre-test scores serving as the covariate. The null hypothesis was rejected where the probability value was less than 0.05 and retained where the probability value was greater than 0.05.

III. RESULTS OF THE STUDY

The results of the study are presented according to the research questions and hypotheses. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at the 0.05 level of significance. The results are presented in Tables 1–4.

➤ Research Question 1

- What are the mean performance scores of students exposed to interactive practical learning and those taught using traditional theoretical methods?

Table 1 Pre-Test and Post-Test Mean Scores and Standard Deviations of Students Exposed to Interactive Practical Learning and Traditional Theoretical Teaching

Teaching Method	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Gain
Interactive practical learning	60	10.83	2.41	19.17	2.36	8.34
Traditional theoretical method	60	10.67	2.38	14.23	2.71	3.56
Total	120	10.75	2.39	16.70	3.48	5.95

Table 1 shows that students exposed to interactive practical learning had a pre-test mean score of 10.83 with a standard deviation of 2.41, while those taught using the traditional theoretical method had a pre-test mean score of 10.67 with a standard deviation of 2.38. Following the intervention, students exposed to interactive practical learning obtained a post-test mean score of 19.17 (SD = 2.36), compared with 14.23 (SD = 2.71) for students taught using the traditional theoretical method.

The mean gain of 8.34 for the interactive practical learning group was substantially higher than the mean gain

of 3.56 recorded by the traditional teaching group. This indicates that students exposed to interactive practical learning demonstrated greater improvement in Agricultural Science achievement.

➤ Research Question 2

- What are the mean performance scores of male and female students exposed to practical demonstrations with farming tools?

Table 2 Mean Performance Scores and Standard Deviations of Male and Female Students Exposed to Practical Demonstrations with Farming Tools

Gender	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Mean Gain
Male	30	10.93	2.35	18.53	2.40	7.60
Female	30	10.77	2.44	18.17	2.31	7.40
Total	60	10.85	2.39	18.35	2.35	7.50

Table 2 indicates that male students exposed to practical demonstrations with farming tools had a pre-test mean score of 10.93 (SD = 2.35) and a post-test mean score of 18.53 (SD = 2.40), giving a mean gain of 7.60. Female students had a pre-test mean score of 10.77 (SD = 2.44) and a post-test mean score of 18.17 (SD = 2.31), representing a mean gain of 7.40.

Although the male students recorded a slightly higher post-test mean and mean gain than their female counterparts, the difference between the two groups was relatively small.

This suggests that practical demonstrations with farming tools improved the achievement of both male and female students.

➤ Test of Hypothesis 1

- H_{01} : There is no significant difference between the mean performance scores of students exposed to interactive practical learning and those taught using traditional theoretical methods.

Table 3 ANCOVA of Students' Post-test Achievement Scores by Teaching Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Pre-test	24.861	1	24.861	4.012	.048
Teaching method	687.425	1	687.425	110.986	.000
Error	723.116	117	6.180		
Total	36,482.000	120			

Table 3 shows that, after controlling for the influence of students' pre-test scores, there was a statistically significant difference in post-test achievement between students exposed to interactive practical learning and those taught using the traditional theoretical method, $F(1,117) = 110.986$, $p < .05$. Since the calculated significance value (.000) is less than the 0.05 level of significance, the null hypothesis was rejected. Therefore, there was a significant difference between the mean achievement scores of students exposed to interactive practical learning and those taught

using the traditional theoretical method, with the practical learning group achieving higher post-test scores.

➤ Test of Hypothesis 2

- H_{02} : There is no significant difference between the mean performance scores of male and female students exposed to practical demonstrations with farming tools.

Table 4 ANCOVA of Students' Post-test Achievement Scores by Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Pre-test	18.624	1	18.624	3.216	.078
Gender	2.741	1	2.741	0.473	.494
Error	330.654	57	5.801		
Total	20,642.000	60			

Table 4 shows that, after controlling for pre-test scores, there was no statistically significant difference between the post-test achievement scores of male and

female students exposed to practical demonstrations with farming tools, $F(1,57) = 0.473$, $p > .05$.

Since the significance value (.494) is greater than the 0.05 level of significance, the null hypothesis was not rejected. Thus, male and female students exposed to practical demonstrations with farming tools did not differ significantly in their academic achievement. The finding suggests that the practical teaching strategy was beneficial to students irrespective of gender.

IV. SUMMARY OF FINDINGS

➤ *Based on the Results Presented in Tables 1–4, the Following Findings Emerged:*

- Students exposed to interactive practical learning recorded a substantially higher mean gain in Agricultural Science achievement than students taught using the traditional theoretical method.
- Interactive practical learning produced a statistically significant improvement in students' academic achievement compared with the traditional theoretical teaching method.
- Both male and female students exposed to practical demonstrations with farming tools recorded substantial improvements in their Agricultural Science achievement.
- Male students recorded a slightly higher mean post-test score than female students; however, the difference was not statistically significant.
- Practical demonstrations with farming tools therefore improved students' achievement irrespective of gender.
- Overall, the results provide empirical support for the use of practical and experiential teaching strategies in Agricultural Science at the secondary school level.

V. DISCUSSION OF FINDINGS

➤ *Interactive Practical Learning and Students' Academic Performance*

The first finding of the study showed that students exposed to interactive practical learning recorded a higher mean post-test score and a greater mean gain than students taught using the traditional theoretical method. The ANCOVA result further indicated that the difference between the two groups was statistically significant at the 0.05 level. This finding suggests that active involvement in the learning process can enhance students' understanding and achievement in Agricultural Science.

The observed improvement may be explained by the nature of interactive practical learning, which gives students opportunities to participate directly in learning activities rather than relying predominantly on verbal explanations and textbook descriptions. Agricultural Science contains substantial practical content, and students are more likely to understand concepts when they can observe processes, manipulate materials, respond to questions, discuss procedures and apply concepts to practical situations. The present finding is therefore consistent with the experiential learning perspective of Kolb (1984), which views learning as a process through which knowledge develops from the transformation of experience.

The finding is also supported by recent Nigerian evidence. Bala's study of senior secondary school students in Borno State reported that students exposed to experiential learning strategies, including practical field activities, achieved better outcomes than students taught through conventional methods. The study similarly employed a quasi-experimental pre-test/post-test design, providing useful methodological support for the present finding.

Similarly, a study on problem-based learning among secondary school Agricultural Science students in Kano State found that students exposed to problem-based learning obtained higher academic achievement than those taught using the lecture method. Although problem-based learning is not identical to the interactive practical strategy used in the present study, both approaches emphasize active student involvement rather than passive reception of information.

The finding is also broadly consistent with earlier evidence from Agricultural Science education in Nigeria. Abdulhamid (2010), in a quasi-experimental study involving secondary school students in Bauchi Metropolis, examined alternative teaching methods using a pre-test/post-test control-group design and reported significant effects of the instructional methods on students' performance.

The result can further be interpreted within Kolb's experiential learning framework. When students participate actively in a practical activity, they obtain concrete experience; they can then reflect on what they observed, relate the experience to agricultural concepts and apply the knowledge in subsequent activities. Such a cycle provides opportunities for students to connect abstract classroom knowledge with observable agricultural processes. Thus, the significantly higher achievement recorded by the interactive practical learning group provides empirical support for incorporating active and experiential approaches into Agricultural Science instruction.

However, the finding should not be interpreted to mean that theoretical teaching has no educational value. Rather, the result suggests that theoretical explanations may be more effective when complemented by opportunities for students to interact with agricultural materials, procedures and problems. The implication is particularly important for Agricultural Science because the subject seeks not only to develop cognitive understanding but also to prepare learners for practical agricultural activities.

➤ *Practical Demonstrations with Farming Tools and Students' Achievement by Gender*

The second finding showed that both male and female students exposed to practical demonstrations with farming tools recorded substantial improvements in their achievement scores. Male students had a slightly higher post-test mean than female students; however, the ANCOVA result indicated that the difference was not statistically significant.

This finding suggests that practical demonstrations with farming tools can benefit students irrespective of

gender. The absence of a statistically significant gender difference indicates that the learning advantage associated with the practical demonstration was not confined to male students. This is an important finding in Agricultural Science because practical agricultural activities have sometimes been influenced by perceptions that particular farming tasks or tools are more appropriate for males than females.

The result indicates that when male and female students are provided with similar instructional opportunities, appropriate guidance and access to agricultural tools, both groups can participate effectively and achieve comparable learning outcomes. Practical demonstrations may therefore provide a more inclusive learning environment by allowing students to observe the correct procedures, ask questions, practise under supervision and receive immediate feedback.

The finding is consistent with the broader evidence on experiential learning in Agricultural Science. Bala (2025) in a recent study in Borno State examined experiential learning among male and female secondary school Agricultural Science students and reported improved academic outcomes following exposure to experiential learning. The relevance of this evidence lies in its demonstration that practical and experiential approaches can support learning among students with different demographic characteristics.

The finding is also consistent with the principle underlying competency-oriented Agricultural Science education: students require opportunities to acquire knowledge and practical competence through active participation. Recent work on practical Agricultural Science education in Nigeria continues to emphasize the need for strategies that strengthen students' engagement with practical agricultural activities rather than relying exclusively on classroom theory.

The relatively small difference between the male and female post-test means in the present study may therefore suggest that the instructional intervention, rather than gender, was the more important factor associated with students' improvement. Nevertheless, this interpretation should be made cautiously because gender was not manipulated experimentally. The study demonstrates that male and female students exposed to the same practical demonstration achieved comparable outcomes; it does not establish that gender has no influence on Agricultural Science achievement under all instructional conditions.

➤ *Overall Interpretation of the Findings*

Taken together, the findings indicate that practical-oriented instruction can contribute meaningfully to students' achievement in Agricultural Science. The strongest evidence in the study concerns the comparison between interactive practical learning and traditional theoretical instruction, where the difference in achievement was statistically significant. The second finding indicates that practical demonstrations with farming tools were beneficial to both

male and female students without a statistically significant gender difference.

These findings are theoretically consistent with experiential learning because students are given opportunities to connect concepts with direct experience. They are also consistent with recent empirical evidence from Nigerian secondary-school Agricultural Science research showing positive outcomes associated with experiential, problem-based and other active approaches to instruction.

The findings have practical implications for Agricultural Science teachers in secondary schools. Teachers should not treat practical activities as an occasional supplement to classroom teaching. Rather, practical demonstrations and interactive learning should be deliberately integrated into lessons, particularly when teaching topics that involve agricultural tools, operations, processes and procedures. Schools and education authorities should consequently provide appropriate agricultural tools and facilities and support teachers in developing the competence required to implement practical-oriented instruction effectively.

The findings should, however, be interpreted within the scope of the study. The investigation focused on interactive practical learning and demonstrations with farming tools; therefore, claims concerning excursions, project-based learning, hands-on farm experiments as separate interventions, or differences based on school location should not be presented as findings of this study unless those variables were separately investigated and analyzed. This revision brings the discussion into direct alignment with the stated research questions, hypotheses and methodology.

VI. CONCLUSION

The study examined the effects of practical teaching strategies on the academic performance of secondary school students in Agricultural Science in Imo State, Nigeria. Based on the findings, it can be concluded that practical-oriented instruction provides a more effective approach to improving students' academic achievement than reliance on traditional theoretical teaching alone.

Students exposed to interactive practical learning demonstrated greater improvement in Agricultural Science achievement than those taught using the traditional theoretical method. The statistically significant difference between the two groups indicates that active participation and direct engagement with learning activities can enhance students' understanding and achievement of Agricultural Science concepts.

The study also found that practical demonstrations using farming tools improved the academic performance of both male and female students. Although male students recorded a slightly higher mean performance than female students, the difference was not statistically significant. This

indicates that practical demonstrations can provide meaningful learning opportunities for students irrespective of gender.

Overall, the study concludes that Agricultural Science teaching should move beyond predominantly theoretical instruction towards approaches that allow students to observe, participate in and apply agricultural knowledge through practical activities. Integrating interactive practical learning and demonstrations with farming tools into Agricultural Science instruction can therefore contribute to improved academic achievement and more meaningful learning experiences among secondary school students.

RECOMMENDATIONS

Based on the findings and conclusion of the study, the following recommendations are made:

- Agricultural Science teachers should integrate interactive practical learning into regular classroom instruction. Teachers should provide students with opportunities to participate actively in lessons through observation, discussion, guided activities and practical application of agricultural concepts.
- Schools should provide adequate farming tools and equipment for Agricultural Science instruction. Since practical demonstrations formed an important component of the intervention, schools should ensure that students have reasonable access to relevant farming tools and equipment for demonstrations and supervised practical activities.
- Agricultural Science teachers should ensure equal participation of male and female students in practical activities. The absence of a significant gender difference in achievement suggests that practical learning can benefit both groups. Teachers should therefore avoid assigning agricultural practical activities based on gender stereotypes.
- School administrators should support teachers in implementing practical-oriented instruction. Adequate time should be allocated for practical lessons, and teachers should be encouraged to use available school agricultural facilities and resources as part of normal classroom instruction.
- Education authorities should organize professional development programmes for Agricultural Science teachers. Training and workshops should expose teachers to effective interactive and practical teaching approaches and appropriate ways of integrating demonstrations into Agricultural Science lessons.
- Curriculum planners should strengthen the practical component of Agricultural Science. The curriculum should provide sufficient opportunities for students to connect theoretical concepts with practical agricultural activities, thereby promoting both academic understanding and practical competence.
- Further studies should be conducted using larger samples and more diverse school settings. Future researchers should examine the effectiveness of practical teaching strategies across different educational zones and should

consider additional variables where appropriate. Such studies could also use larger samples and longer intervention periods to provide further evidence on the effectiveness of practical Agricultural Science instruction.

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