EFFECTS OF AGRICULTURAL SCIENCE PRACTICAL ACTIVITIES AND ALTERNATIVE TO PRACTICAL ON SENIOR SCHOOL STUDENTS' ACHIEVEMENT IN OBSERVING AND MEASURING SKILLS

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ABSTRACT

Agricultural science students lack needed skills for basic agricultural practices and as such cannot solve problems requiring such skills. The study therefore investigated the effect of Agricultural Science Practical Activities and Alternative to Practical on students' achievement in observing and measuring skills. Two research questions and two null hypotheses guided the study. A quasi-experimental research design was adopted. The population is 366,593 senior secondary students in Imo State with a sample of 87 students drawn from two schools out of 301 public Schools using purposive random sampling technique. One of the schools was assigned practical activities and to the other alternative to practical. Researcher made test instrument titled "Agricultural Practical Activity Achievement Test" containing 25 practical test items was used for data collection. The instrument was validated by three specialists. The reliability coefficient of 0.76 was obtained using Kuder-Richardson 21 (K-R21). Research questions were answered using mean and standard deviation while ANCOVA was used in testing the hypotheses. Findings include that students taught Agricultural Science (AS) with practical activities performed higher than their counterparts taught using alternative to practical. There is a significant difference in the mean scores of acquisition of observing and measuring skills between students exposed to practical activities and those exposed to alternative to practical. It was recommended among others that teachers should encourage students to develop skills such as observing and measuring skills in agriculture by engaging them in real farm practicals that will inculcate such skills in them.

Key words: *Agricultural Science, practical activities, observing, measuring skills*

Introduction

The primary role of practical agricultural teaching and learning is to equip students with the requisite knowledge, attitude, practice and skills in undertaking agricultural tasks. Practical skills training in agriculture is also expected to motivate and generate entrepreneurial skills among students (Onuekwusi & Okorie, 2008). The inclusion of agricultural science (AS) as a pre-vocational subject at the basic level (primary and junior secondary schools) and as a vocational subject at the senior secondary school level is one of the educational initiatives meant to effectively restore agriculture to its enviable position (FRN, 2013).

In spite of all the policies and programmes initiated by the Federal government, records of the West African Examinations Council (WAEC) showed that agricultural science results are generally poor in Nigeria (WAEC, 2015, 2019). Many stakeholders have expressed serious concerns about the poor academic performance of Agricultural Science students (both in the practical and theoretical sections), since many of them may not have sufficient interest in enrolling in agriculture-related courses in the near future. Otekunrin, Oni & Otekunrin, (2019) noted that this may result in food insecurity in the nation and ongoing reliance on other nations to feed the growing population (importing food). To remedy the poor performance in science subjects, including agricultural science, the Chief Examiners for the science subjects generally recommended that candidates should be taken through many practical lessons to improve their performance as well as be allotted more time during practical lessons (WAEC, 2019).

As a result of this poor achievement of students as well as poor skills in agriculture and the resultant food insecurity in the nation, it is important that students must be exposed to laboratory/ field work and agricultural experiences at an early age in order to develop a solid understanding of agricultural concepts, acquire skills and to be able to avoid making simple mistakes and errors that are made during practicals in external examinations such as WAEC and NECO (Ige, Busari & Ojo, 2016). Hence, practical skills in teaching and learning as well as in assessment of students' outcomes are of paramount importance in agricultural science education, for food security, national development and global food security. These can be achieved through practical activities in the school farm.

School farm is a major component of the school and with a vision to bring back unprecedented rebirth in teaching and learning of AS that is practical oriented and able to complement what the students are being taught in the classroom environment. Unfortunately, many schools do not have functional school farms where students practice skills they learnt theoretically in classrooms.

Observing and measuring skills are foundational skills among the basic process skills which are essential in the development of sound and balanced agricultural science students who will use their skills in solving man's problems. The basic science process skills include: observing, measuring, inferring, classifying, predicting and communicating. In this study, the researcher concentrated on observing and measuring skills. The formation of Science Process Skills (SPS) is the first step in learning science from birth to maturity. This is due to the fact that science process skills act as a motivator for learners to engage in the kinds of activities that foster reflective thinking and knowledge acquisition (Idiege, Nja, and Ugwu 2017).

Observing skills include the use of senses of seeing, hearing, feelings, touching and smelling. Its results constitute primary experience or a primary source which is a major ingredient in science learning. According to Idiege, Nja and Ugwu (2017) students are said to have acquired observing skills when they are able to notice details in objects, break things into parts, draw what they see and label parts of the drawing, be able to identify characteristic changes and compare objects and sequence of events.

Measuring involves using standard and non-standard measures to describe dimensions. When we measure some properties, we compare the property to a referent called unit. Measuring gives a better description of the item under consideration. The ability to identify the measurement required, specify the instrument to be used, compare the measurement with specific instrument and add up to the total measurement for the purpose of determining

accuracy is a demonstration of measuring skills (Idiege, Nja &Ugwu, 2017). Acquiring observing and measuring skills by AS students require adopting an efficient teaching and learning strategy. According to Diise, Zakaria and Mohammed (2018) several teaching methods (lecture, demonstration, practical method, etc) have been employed in teaching and learning of agriculture to impact the needed knowledge, attitude, practices and skills on students.

Lecture method is the most commonly used method in teaching in schools. However, Bello, Ibi and Bukar (2016) observe that the lecture method is considered ineffective due to the fact that it creates little impact on learners' academic performance because the lesson is dominated by a teacher talking to the learners where the learners remain passive listeners and recipient of knowledge unlike in practical method where learners participate actively in the lesson. Demonstration method refers to the type of teaching method in which the teacher is the principal actor, while the learners watch with the intention to act later. Here the teacher systematically shows whatever the learners are expected to do at the end of the lesson by showing them how to do it and explaining the step-by-step process in undertaking the task (Diise, Zakaria & Mohammed, 2018). Adopting demonstration teaching strategy in lesson delivery improves recall as well as acquisition of skills when students are allowed to practice on their own, either in groups or individually following the step by step procedure given by the teacher. It therefore involves practical demonstration of the skills in the task.

Practical teaching and learning is a process of creating learning experience in which students interact with materials or with secondary sources of data to observe and understand the natural world (Lunetta, Hofstein and Clough, 2007). Resilient educator (2020) observed that the purposes of class project (practicals) in agricultural education have expanded beyond skill acquisition and proficiency to include personal development for diverse career preparation beyond agriculture. Organizing practical learning process in order to create concrete experience from proper teaching and assessment for learners has been a concern for researchers, teachers and academics. According to Chukelu (2009), practical activity method is more effective in fostering students' acquisition of science process skills than the lecture method. Practical lessons which is often referred to as practical work or 'hands on' experience or sometimes experiential learning is aimed at exposing students to practical reality of learning objects to enhance students familiarity and mastering of the objects of learning in agricultural science (Diise, Zakaria& Mohammed 2018).

Despite the following challenges militating against the adoption of practical activities in teaching and learning of agriculture: Teaching skills of teacher; negative attitude of students; poorly developed school farm/garden; inadequate tools and instructional materials; lack of funds; limited period on the school time table (Kabugi 2013; Diise, Zakaria and Mohammed 2018), practical approach to learning agriculture remains the faster way of inculcating skills in students in senior secondary schools.

Alternative to Practical paper is simply an alternative mode of assessment to the Practical Examination paper of WAEC and NECO. Students do not need to go to the farm to pass this paper. To Nwana (2007), these alternative to practicals feature essentially theoretical simulations of practical situations. According to Otive as cited by Acholonu (2011), it emphasizes theoretical knowledge at the expense of technical, vocational and entrepreneurial education. It is also devoid of the real practical work which can equip learners with the knowledge and skills to face the challenges of the Nation and the emerging global change. It is

contrary to Constructivist learning environment which provide learning environments such as real-world settings or case-based learning instead of predetermined sequences of instruction.

The theory of constructivism by John Dewey (1916) is relevant to this study. It has a contemporary view of learning which states that learning is an active process of creating meaning from different experiences. In other words, students will learn best by trying to make sense of something of their own with the teacher as a guide to help them along the way.

Therefore exposing students to real life experiences in the farm will stimulate faster learning and consequently inculcate practical skills in them that will make them capable of solving human problems.

Poor skills of students in agricultural science has been a recurring decimal over the years, resulting to poorly equipped citizens who will help to solve the problems of food insecurity in Nigeria. AS students often lack the needed practical skills to undertake basic agricultural practices. Despite the fact that AS is a practical oriented subject, students rarely have opportunities to practise what they learn in the classrooms in relation to real life situations. Practical activities are mostly taught to students only for a short period before they write external examinations (WAEC and NECO SSCE) which has little or no impact in their skill acquisition. The WAEC Chief Examiner in his report (2019), lamented that the responses of candidates to some of the science subjects including agriculture, showed that they were not adequately prepared for the examination. Students find it difficult to display skills which require their five senses such as observing and measuring during practical examinations. Furthermore, there is over reliance on lecture and demonstration teaching methods in the classroom for teaching agricultural skills, which often failed to impart in students the required skills and attitudes to be able to take up farming after graduation. Could this be due to ill preparation of these graduates with practical skills in agriculture? To worsen it is the assessment of AS students in practicals using the "Alternative to practicals" by Examination bodies like WAEC and NECO as against farm practical examinations, which do not encourage skill acquisition.

To the best of the researchers' knowledge, little or no work has been done to solve this problem. To further discover the best way of teaching and learning of agriculture in senior secondary schools to enhance skills acquisition, the researchers wonder if investigating the effects of agricultural science practical activities and alternative to practicals on students' observing and measuring skill acquisition could improve their performance, hence, this study.

The study is aimed at determining the effects of agricultural science practical activities and use of alternative to practicals on students' acquisition of observing and measuring skills.

The following research questions guided the study;-.

1. What are the mean scores of students exposed to observing skills in agricultural science using practical activities and those exposed using alternative to practicals?

2. What are the mean scores of students exposed to measuring skills in agricultural science using practical activities and those exposed using alternative to practicals?

The following null hypotheses (Ho) were formulated and tested at significance level of 0.05:

Ho_1: There is no significant difference in the mean scores of observing skills of students exposed to practical agricultural science activities and those taught using alternative to practicals.

Ho_2: The mean scores of measuring skills of students exposed to Agricultural practical activities and those exposed to alternative to practical do not differ significantly.

Method

A quasi-experimental research design was adopted for the study. The population consists of 366,593 senior secondary students in Imo State. A sample of 87 students was drawn from two schools out of 301 public Secondary Schools in the twenty-seven L.G.A. using purposive random sampling technique for the ease of assessment of the students in both schools. One of the schools was assigned practical activities while the other school was assigned alternative to practical. Intact streams were used in both schools. Researcher made test known as Agricultural Practical Activity Achievement Test (ASPAAT) developed by the researcher was the instrument for data collection. It consists of 25 practical test items was the instrument used for data collection. The instrument was validated by two specialists in Agricultural science Education and one in Educational measurement and evaluation. The reliability test was done using Kuder-Richardson 21 (K-R21) which gave a reliability index of 0.76.

Experimental procedure: The regular Agricultural Science (AS) class teachers were used for the study in both Practical Activity (PA) and Alternative to Practical (AP) groups. The AS teachers who took the Practical group were guided on the application of the practical instructional approach while the AS teacher who took the AP group used the demonstration and lecture method since intact streams were used. Both teachers were given lesson plans prepared by the researcher to ensure that they do not deviate from the procedures needed to deliver both practical lessons and alternative to practicals. Agricultural Science Practical Activity Achievement Test (ASPAAT) was used for both pre-test and post-test. The PA group consisted of teaching selected AS concept: Weeds and weed control and Livestock nutrition using practical activity method. This involved exposing students to practical exercises in the farm/field, use of specimen/materials to concretize learning as well as foster students' interaction with their environment as the students were made to observe weeds and livestock feed stuff and to identify them or measure them as the case may be and also interact with their teacher. The AP group was taught the same AS skills using demonstration and lecture method. Lesson plans for both the PA and AP groups were the same in terms of contents, basic instructional objectives, length of time for teaching and mode of evaluation except for practical activities in the PA group. The post-test was administered by the teacher (under the supervision of the researcher) after reshuffling the items at the end of four (4) weeks of twelve periods to the subjects in the two groups using ASPAAT. The specimens used for the test were provided by the researcher. The scripts from both pre-test and post-test of the two groups were marked, scored using the marking guide and the data analyzed using mean, standard deviation for the research questions and analysis of co-variance (ANVOVA) for the hypotheses at 0.05 level of significance. ANCOVA helped to compare the mean of the two treatment groups using pre-test result as covariate for the post test and to take care of the initial differences.

RESULTS:

Table 1: Mean and standard deviation scores of observing skills of students exposed to Agricultural Science Practical Activities (PA) and those exposed to Alternative to Practical (AP).

Treatment Group	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain
Practical Activities:	45	10.84	1.68	15.47	1.62	4.63
Alternative to Practical:	42	10.81	2.00	13.29	1.89	2.48

Result in Table 1 shows that students exposed to PA at pre-test and post-test obtained mean (x)and standard deviation (SD)of 10.84 and 15.47;and 1.68 and 1.62 respectively, while those exposed to AP at pre-test and post-test obtained (x)and SD scores of 10.81 and 13.29; and 2.00 and 1.89 respectively. Also the mean gain scores of observing skills of students exposed to PA and those exposed to AP are 4.63 and 2.48 respectively indicating that the students exposed to PA performed higher than those exposed to AP. The SD scores of 1.62 and 1.89 for students exposed to PA and those exposed to AP respectively at post-test also indicate that students exposed to PA performed better than those exposed to AP.

Table 2: ANCOVA result on difference in the mean scores of observing skills of students exposed to PA and those exposed to Alternative to Practical (AP)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	319.279[a]	2	159.640	292.633	.000
Intercept	59.983	1	59.983	109.953	.000
Pre-test	215.947	1	215.947	395.850	.000
Treatment	100.479	1	100.479	184.187	.000
Error	45.824	84	.546		
Total	18440.000	87			
Corrected Total	365.103	86			

a. R Squared = .874 (Adjusted R Squared = .872)

Result in Table 2 shows that the mean score of observation skills of students exposed to PA is significantly different from those exposed to AP. Therefore, the null hypothesis is rejected.

Table 3: Mean and standard deviation scores of measuring skills of students exposed to PA and those exposed to AP

Treatment Group	N	Pre-test Mean	SD	Post-test Mean	SD	Mean Gain
Practical Activities:	45	9.71	2.86	15.04	2.60	5.33
Alternative to Practical:	42	9.64	2.21	12.14	2.66	2.50

Result in Table 3 shows that students exposed PA at pre-test and post-test have mean scores (x) and standard deviation(SD) scores of 9.71 and 15.04; and 2.86 and 2.60 respectively while the students exposed to AP at pre-test and post-test have (x) of 9.64 and 12.14 with SD scores of 2.21 and 2.66 respectively. The mean gain scores of measuring skills of students exposed to PA and those exposed to AP are 5.33 and 2.50 respectively, indicating that the students exposed to PA performed higher than those exposed to AP. The SD of

2.60 and 2.66 for students exposed to PA and those exposed to AP respectively at post-test also shows that students exposed to PA activities performed higher than those exposed to AP.

Table 4: ANCOVA result on difference in the mean scores of measuring skills of students exposed to agricultural science practical activities and those exposed to alternative to practical

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	684.976[a]	2	342.488	338.547	.000
Intercept	109.187	1	109.187	107.930	.000
Pre-test	502.076	1	502.076	496.298	.000
Treatment	174.804	1	174.804	172.792	.000
Error	84.978	84	1.012		
Total	16965.000	87			
Corrected Total	769.954	86			

a. R Squared = .890 (Adjusted R Squared = .887)

Table 4 reveals that there is a significant effect of treatment on the students' acquisition of measuring skills in Agricultural science. Based on this result, the null hypothesis was rejected implying that the mean scores of measuring skills of students exposed to PA and those exposed to AP differ significantly at 0.05 level of significance.

Findings: 1. The mean score of observing skills of students exposed to agricultural science practical activities was significantly higher than the mean score of those exposed to alternative to practical.

2. The mean score of measuring skills of students exposed to agricultural science practical activities was significantly higher than the mean score of those exposed to alternative to practical.

Discussion:

This study found that students exposed to agricultural science practical activities scored on average higher on observing skills than students exposed to alternative practicals. This variation is important. It suggests that engaging children in real agricultural tasks has a big impact on how well they learn to observe things. This study is consistent with the findings of Diise, Zakaria, and Mohammed (2018), who found that the project style of instruction greatly enhances agricultural students' technical competency and skill acquisition. Project employs useful actions to operate more effectively. It is also in concordance with Nnorom and Obi (2013) who investigated the effect of practical activities on achievement in Biology among secondary school students in Anambra State. Their result revealed significant difference between students exposed to practical activities and those taught in the conventional way. This therefore suggests that students exposed to practical style of instruction acquire better skills such as observing skills than their counterparts taught in the conventional way. The ability to make good observations is also essential to the development of other science process skills.

It was found also that mean score of measuring skills of students exposed to agricultural science practical activities is significantly higher than the mean score of those

exposed to alternative to practical. This implies that agricultural science practical activities enhance students' acquisition of measuring skills more than just exposing them only to alternative to practical. This is in line with Chukelu (2009) who investigated the effects of biology practical activities on students' process skill acquisition in Abuja Municipal Area Council and found that practical activity method was more effective in fostering students' acquisition of science process skills than the lecture method. This is also in agreement with Ibe (2016) who investigated on the impact of Guided-inquiry teaching on Primary Pupils acquisition of Science process skills and Attitudes. The results show that the guided-inquiry enhanced the experimental group pupils understanding of primary science concepts as well as the science process skills more than the group taught with lecture method. The result therefore implies that the students exposed to practical activities mastered the different measuring instruments in AS and they also mastered solving simple conversion of units.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Teachers should encourage students to develop interest in practical activities by engaging them in practical activities early in life. This will help them develop observing skills early enough which would be mastered over time.

2. Every school must have adequate farm lands for students' practical activities. This is because the success of adopting practical activities lies on the availability of equipment and materials for students to practice with, in the school farm. This is pertinent because students cannot learn certain skills such as measuring without materials to measure with.

3. Examination bodies like WAEC and NECO should revert to farm practical method of evaluating agricultural science students rather than alternative to practicals. This will mandate teachers to expose their students to different process skills such as observing and measuring through practical activities. Students will therefore learn the skills which must be evaluated at the end.

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