

**Research Article**

# Investigating Academic Performance in Practical Agriculture: Evidence from Single-Sex and Co-Educational High School Students

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This study investigated the attitudes of students to practical agriculture and examined whether there were significant differences in the mean scores in Practical Agriculture Achievement Test (PAAT) among the three categories of schools used for this study. This study was a descriptive survey design carried out in Ibadan Metropolis, Oyo State, Nigeria. Nine (9) public secondary schools were randomly selected from three different Local Government Areas (LGAs) out of eleven (11) present in Ibadan zone comprising three (3) Boys' only, three (3) Girls' only and three (3) Co-educational schools. A total of two hundred and fifty-five (255) Senior Secondary Schools (SSSIII) students from three selected categories of schools participated in this study. PAAT and AtPAQ were the research instruments used for data collection. The data collected were analysed using descriptive statistics, Chi-square test of independence, ANOVA and multiple comparison techniques. The ANOVA test was significant ( $p = .00$ ). Boys' only schools had the highest mean scores of 48.14 followed by Girls' only schools with 42.72 while Co-educational schools had 34.92. Least Significant Difference (LSD), a multiple comparison technique, on the ANOVA showed that there existed significant differences in the mean scores of PAAT for all pairs of the three categories of schools. There was no association between students' mean scores and selected attitudinal variables. The study recommended awareness campaign on the importance of agricultural science education and training as a vocational subject which can make them self-employed after leaving school and also boost agricultural productivity in the nation.

**Keywords:** Practical Agriculture; Students' attitudes; Academic success; Co-Educational Schools; Single-sex schools.

## INTRODUCTION

Nigeria, with an estimated population of 193 million persons is undoubtedly regarded as the most populous country in Africa (NPC and NBS, 2018; Otegunrin *et al.* 2019a). With growth rate of 2.43 percent per annum and population projected to reach an unprecedented 390 million by 2050. The population has an estimated 42 percent falling within the 0-14 years age bracket indicative of the fact that there are more young people which is one of the strong pillars of any vibrant economies in the world (IITA, 2017; Matemilola and Elegbede, 2017; Otegunrin *et al.* 2019a). Nigeria is the 10<sup>th</sup> largest crude oil producer globally, attaining the status of a middle-income country in 2014. Despite Nigeria's oil wealth, 68% of her citizens live below the poverty line of \$1.25 per day (FGN, 2014; Otegunrin *et al.* 2019a).

Agriculture in Nigeria remained a key sector of the economy capable of bringing food to the tables of her teeming population, provision of foreign exchange earnings, income for agricultural farming households and employment opportunities for about 70 percent of the population (Otegunrin *et al.* 2019b). According to Inusa *et al.* (2018) and Otegunrin *et al.* (2019b) which reinstated the fact that "Agricultural sector has started regaining its lost

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glory in recent time through a viable economic plan referred to as Economic Recovery and Growth Plan (ERGP) in which Agriculture is one of the major sectors of the economy considered in the ERGP to help solve ravaging incidence of food insecurity, reduce unemployment, improve foreign exchange earnings and resuscitate industrialization". Since the steady decline in the revenue accruable from crude oil especially from the international market, educational and economic experts have been devoting a lot of attention to how to restore agriculture to its enviable position (Otekunrin *et al.* 2017a; Otekunrin *et al.* 2017b; Otekunrin *et al.* 2019b).

This has led to the formulation of various policies. One of these policies from the educational standpoint is the inclusion of Agriculture as a pre-vocational subject at the primary and junior secondary schools and as a vocational subject in the senior secondary school level (FRN, 2004). With current Educational Policy, Agricultural Science in Junior Secondary Schools is currently taught in combination with Home Economics and now referred to as "Pre- Vocational Studies" while Agricultural Science in Senior Secondary School (JSS) is now an elective subject for the students and some branches or aspects of the subject are now offered as subjects like Fisheries Management and Animal Husbandry (Otekunrin *et al.* 2019b).

Moreover, Agricultural Science given the status of a vocational subject and other subjects like Animal Husbandry and Fisheries Management are part of the elective subjects students can offer at the Senior Secondary School (SSS) levels with the main focus of arousing the interested students to acquire practical agricultural knowledge that is capable of making them self-reliant in near future. (Otekunrin *et al.* 2019b)

The specific objectives of introducing Agricultural Science in secondary schools as listed in FRN (2007) and cited in Otekunrin (2014); Otekunrin *et al.* (2017a) and Otekunrin *et al.* (2019b) are as follows:

- (a) to stimulate and sustain students' interest in agriculture
- (b) to provide students the interest to advance in farming
- (c) to advance food production through improvement of agricultural production techniques in students
- (d) to provide occupational entry level skills in agriculture to the interested students
- (e) to prepare students adequately for producing and marketing farm commodities efficiently and profitably; and,
- (f) to enable students to acquire basic knowledge and practical skills required for future studies in agricultural field.

Despite Nigerian government policies and programmes through the education sector, examination records of the West African Examination Council (WAEC) showed that

Agricultural Science results are generally poor in Nigeria (WAEC, 2015) and cited by Otekunrin *et al.* (2017a); Otekunrin *et al.* (2017b); Otekunrin *et al.* (2019b).

Poor academic achievement of students in Agricultural Science (both in practical and theory sections) leaves many stakeholders in serious concern that a lot of them may not have arousing interest in taking up agriculture-oriented courses in the higher institutions of learning in near future. The reality of this is that many youths will not have interest in agriculture as a career and also may serve as a source of discouragement for other students that may want to taking up a career in agriculture or related ones (Otekunrin *et al.* 2019b).

This may lead to the problem of food insecurity in the country. Agricultural Science as a subject is not complete without the aspect of functional agricultural practical laboratory and availability of a school farm for on-the-farm experience for the students.

School farm is a major component of the school and with a vision to bring back unprecedented rebirth in the teaching and learning of agricultural science that is practical oriented and able to complement what the students are been taught in the class room environment. With seasoned and well-trained teachers in this field coupled with the availability of other instructional materials, the students can be encouraged to create interest in the subject which may reflect ultimately in their academic performance in both practical and theoretical aspect of the subject.

## LITERATURE REVIEW

Practical agriculture is basically the involvement in farming activities (crops and livestock and other aspects of agriculture like aquaculture among others) while agricultural education is the acquisition of needed skills and knowledge in agricultural science with the aim of imparting these knowledge and skills into prospective agricultural science students at all educational levels (primary, secondary and tertiary levels) to become self-reliant, employer of labor and contribute meaningfully to the government drive of attaining food security status as a nation. Africa especially Sub-Saharan Africa is facing critical hunger and food insecurity situation which need urgent attention (Otekunrin *et al.* 2019c). Nigeria, regarded as the most populous nation in Africa is now referred to globally as the "World Poverty Capital" by World Data Lab in June, 2018 where extreme poverty is growing by six (6) persons every minute (*Business Day*, 2018; Kazeem, 2018; Otekunrin *et al.*, 2019a). Giving practical training in agricultural practices is very essential especially for the young students from SSS to increase their knowledge in agriculture and this can help increase food productivity in the country and consequently reduce level of food insecurity.

Students in secondary schools in Nigeria (both single sex and co-educational) need to be engaged in practical agriculture where they would be taught thoroughly practical aspects of agricultural science and how to start agriculture-related businesses after their secondary school education. Farming activities in crop production, aquaculture, and animal husbandry among other aspects of agriculture. According to Chukwudum (2013); Otegunrin *et al.* (2019b) who reiterated that the two-key teaching-learning environments for inculcating practical knowledge of agriculture to students are the school farm (crop and livestock farms) and the agricultural science laboratory. This paper also focuses on the effective utilization of school farms in creating and progressively developing students' interest in practical agriculture.

According to Okorie (2001), Practical agricultural education encompasses farming and agro-allied business organizations including others involved services and sales in agriculture.

According to Fiske and Taylor (2008), attitudes are regarded as cognitive and affective orientations or dispositions towards an object, idea, person and situation, among others. Attitudes can also be defined as "a disposition to respond favourable or unfavourable to an object, person, institution or event" (Ajzen and Timko, 1986). According to Ajzen and Timko (1986) students' attitude towards a particular subject is regarded as one the most critical factors of their professional behaviour. This corroborates the fact that if students had undesirable attitude towards Agricultural science, then they may not want to engage in agriculture oriented or agriculture related career path in future (Anwiti, 2017; Otegunrin *et al.* 2019b).

However, some researchers have also observed some desirable attitudes among students towards agriculture. Examples include the works of Onuekwusi and Okorie (2008); Joshua *et al.* (2008); Thoron and Burleson (2014); Darko *et al.* (2016); who found out that students exhibited desirable attitudes towards agricultural science.

According to Akinsorotan (2007), school farm is a selected plot of land in the school environment where student' carry out practical agriculture both in the aspect crop production and animal husbandry. Also, Williams *et al.* (1985) outlined some benefits of school farm to students, which include:

- 1) Generating circumstances for students to market agricultural products.
- 2) Providing students with supervised occupational experience in agricultural productivity.
- 3) Encouraging the use of records and reports similar to those used in agriculture.

Also, Onwumere *et al.* (2016) pointed out that majority of school farms are faced with inadequate basic farm tools and equipment, inadequate or unavailability of improved seeds, feeds, fertilizers (inorganic) and other operating

suppliers, inadequate (technical know-how) training for teachers among others. In another vein, considering the aspect of students' interest in the study of agricultural science (both practical and essay), Usman and Memeh (2007), Nsa *et al.* (2013); Olajide *et al.* (2015); Otegunrin *et al.* (2017a), and Otegunrin *et al.* (2019) opined that students' background, students' undesirable attitude towards Agriculture, poor teaching techniques (mainly without appropriate instructional materials) among others as causes of poor performance in the subject. Moreover, Marsh (2004) supported that students' self-perception of academic ability will affect their performance in school. The "perceived self" influences an individual's perception of the world and his or her behaviour which in turn influences his or her academic achievement (Onyejiaku, 2001).

In this study, therefore, we examined whether there were significant differences among the mean scores obtained by the students in PAAT in the three categories of schools (Co-Educational, Boys' only and Girls' schools) in Ibadan, Oyo State, Nigeria. Also, we examined whether there was any relationship between scores obtained by the students in PAAT and their attitudes to the subject. We investigated whether there were significant differences in the mean scores obtained by the students in PAAT in the three categories of schools (Co-Educational, Boys' only and Girls' schools). Also, we examined whether there was any relationship between the mean scores of students in PAAT and selected variables.

### Statement of the Problem

Poor academic achievement of students in agricultural science examinations and particularly the aspect of agricultural science practical has generated a lot of concerns for all stakeholders in the Agricultural/vocational education sector in Nigeria. The un-encouraging academic performance is linked to factors such as; students' lack of interest and undesirable attitude to the subject (especially practical agriculture), inadequate or nonexistent of teaching instructional materials; inadequate funding and mostly nonexistent school farms to practice agriculture. Agricultural Education has been of great concern to the government, the teaching and learning of Practical Agriculture at secondary school level leaves much to be desired (Otegunrin *et al.* 2017b; Otegunrin *et al.* 2019b). According to Onwumere *et al.* (2016), Otegunrin *et al.* (2017b) and Otegunrin *et al.* 2019b, agriculture education in Nigeria at secondary and post-secondary school levels is faced with so much challenges frustrating the achievement of its goals. The interest of teachers and students in agricultural science is at the lowest ebb. This is not unrelated to common approach to teaching agricultural science which is no longer interesting and endearing to boost the desired interest. However, some works have reiterated the fact that little attention is paid to practical knowledge and skill acquisition among SSS offering agricultural science which is actually impeding

agricultural science students' competence and employability (Modebelu and Nwakpadolu, 2013; Darko *et al.* 2016; Diise *et al.* 2018b; Otekunrin *et al.* 2019b). The best way the youth in schools can be taught agricultural science is by both theoretical aspect and by "doing" in the practical sense of it (Antwi, 2017; Diise *et al.* 2018a; Otekunrin *et al.* 2019b). This study therefore examined the attitudes and academic performance of students in selected secondary schools (Boys' only, Girls' only and Co-educational) in practical agriculture in Ibadan Metropolis, Oyo State, Nigeria.

This study therefore shed more light on these salient issues so as to obtain concrete evidence for highly impactful policy interventions.

### Research Questions

1. What are the students' attitudes towards practical agriculture as an aspect of agricultural science subject in the study area?
2. Are there any significant differences in the mean scores obtained by students in the nine schools in the study area?
3. Are there any significant differences in the mean scores obtained by the students in PAAT in the three categories of schools in the study area?
4. Is there any relationship between academic performance of students in practical agriculture and their attitudes to the subject?

Specifically, our hypotheses are:

- a.  $H_0$ : There are no significant differences in the mean scores obtained by students in PAAT for the three categories of schools used for this study.  
 $H_1$ : There are significant differences in the mean scores obtained by students in PAAT for the three categories of schools used for this study.
- b.  $H_0$ : There is no association between students' mean scores and agricultural science as a major requirement for gaining admission into higher institution of learning.  
 $H_1$ : There is association between students' mean scores and agricultural science as a major requirement for gaining admission into higher institution of learning.
- c.  $H_0$ : There is no association between students' mean scores and teachers' use of relevant instructional materials during agricultural science lesson  
 $H_1$ : There is association between students' mean scores and teachers' use of relevant instructional materials during agricultural science lesson.
- d.  $H_0$ : There is no association between students' mean scores and availability of school farm for practical agriculture.  
 $H_1$ : There is association between students' mean scores and availability of school farm for practical agriculture.

- e.  $H_0$ : There is no association between students' mean scores and sustained interest to participate actively in practical agriculture.  
 $H_1$ : There is association between students' mean scores and sustained interest to participate actively in practical agriculture.
- f.  $H_0$ : There is no association between students' mean scores and time allotted for practical agriculture on the time table.  
 $H_1$ : There is association between students' mean scores and time allotted for practical agriculture on the time table.

### METHODOLOGY

The descriptive survey design was adopted for the study. Simple random sampling technique was used to select three Local Government Areas (LGAs) from the eleven LGAs in Ibadan. A total of nine (9) public secondary schools (comprising three (3) Boys' only, three (3) Girls' only and three (3) Co-Educational schools) were randomly selected from the three LGAs which include; Ibadan North (3 schools), Ibadan North East (2 schools) and Ibadan South West (4 schools). Seventy (70) SSS III students were selected in Boys' Only Schools, ninety-seven (97) students were selected in Girls' Only Schools while eight-eight (88) students were selected in Co-Educational (mixed) Schools resulting in a total of 255 sampled students and all of them are in SSS III classes preparing for their final internal and external examinations.

### Research Instruments

Two research instruments were used for data collection. They were:

### PRACTICAL AGRICULTURE ACHIEVEMENT TEST (PAAT)

PAAT was used to measure the students' academic achievement in Practical Agricultural Science. The test is composed of 9-specimen (specimens A-I). The specimens were selected to test students' knowledge in the area of general agriculture, crop and livestock production. The practical test comprised three (3) questions, 9 specimens with 50 minutes duration. The questions and specimens were selected using item analysis technique. The PAAT was administered on all the 255 SSS III Agricultural Science students in three categories of schools (nine schools) who were preparing for their forth coming external exterminations like West African Senior Secondary School Certificate Examinations (WASSCE) and National Examination Council (NECO) Examinations. The performance of the students in the PAAT was categorized using the standards in subjects' format of the West African Examinations Council (WAEC) (Table 1).

**Table 1: Standards used for PAAT**

Score (%)	Grade	Interpretation
80% - 100%	Grade A <sub>1</sub>	Excellent
70 % - 79%	Grade B <sub>2</sub>	Very Good
65% - 69%	Grade B <sub>3</sub>	Good
60% - 64%	Grade C <sub>4</sub>	Credit
55% - 59%	Grade C <sub>5</sub>	Credit
50% - 54%	Grade C <sub>6</sub>	Credit
45% - 49%	Grade D <sub>7</sub>	Pass
40% - 44%	Grade D <sub>8</sub>	Pass
0 % - 39%	Grade F <sub>9</sub>	Fail

Source: www.mywaectimetable.com

### Attitude towards Practical Agriculture Questionnaire (AtPAQ)

AtPAQ was a structured questionnaire designed to assess agricultural science students' attitudes towards practical agriculture. It contained items placed on a four-point Likert-type scale of Strongly Agree (4), Agree (3), Strongly Disagree (2) and Disagree (1). The content and face validity of the questionnaire was established by two experts on Agricultural Science Education and Educational Management. The instrument was pretested in a school that was not part of the schools eventually used for the study and necessary changes were made to the instrument before it was administered on the 255 students.

### Method of Statistical Data Analysis

Data collected were analysed using frequency counts and percentages. Also, relevant hypotheses were formulated. One-way Analysis of Variance (ANOVA) was used to test for significant differences in mean scores of students from all the nine schools and also among the three categories of schools (3 Boys' only, 3 Girls' only and 3 Co-Educational schools). Chi-Square tests of independence were also conducted to validate if there exists any relationship between students' mean scores in Practical Agriculture Test (PAAT) and their attitudes to practical agriculture.

## RESULTS

The results of the study are presented in the order of the research questions:

### Research Question 1

What are the students' attitudes towards practical agriculture in the study area?

Table 2 showed the responses of students' attitudes to the study of agricultural science as a subject and particularly the aspect of practical agriculture. The responses of the students to some attitudinal variables focused on agricultural science practical in the nine schools. From the responses, majority of the students (93.3%) responded that practical agriculture is interesting and fascinating while sixty-five percent (65%) disagreed that agricultural science is not a major subject requirement for gaining admission into higher institution of learning in Nigeria. Moreover, majority of the students (93.9%) confirmed that their parents did not react negatively to their studying of agricultural science as one of their subjects in school while ninety percent (90%) disagreed that agricultural science is a subject for boys alone. Also, majority of the students (84%) responded that school farm is readily available for their agricultural science practical lesson while eighty-two percent (82%) of the students confirmed that their teachers use relevant instructional materials for teaching.

Furthermore, fifty-five percent (55%) of the students disagreed that the time allotted for practical agricultural science on the time table was small while seventy percent (70%) of the students confirmed that they have opportunity of making use of agricultural science laboratory for their practical lessons.

### Research Question 2

Are there significant differences in the mean scores among the nine schools used for the study?

The results of the one-way ANOVA test to determine if there are significant differences in the mean scores of the students in PAAT for the nine schools are presented in Table 3. Since  $P = .000$  is less than  $\alpha = .05$ , we conclude that there are significant differences in the mean scores of students in PAAT among the schools. Post Hoc (*Tukey HSD*) analysis in Table 4 showed schools with mean scores significantly different from one another. Mean plots of the PAAT scores of the students are presented in *Figure 1* while *Figure 2* showed the distribution of scores of students in the nine schools.

**Table 2: Students responses to AtPAQ N = 255**

Perceptions	Strongly Agree (%)	Agree (%)	Strongly Disagree (%)	Disagree (%)
The number of students that take agricultural science as a subject is very few.	59(23.1)	83 (32.5)	38(14.9)	75(29.4)
Practical in agricultural science is interesting and fascinating	91(35.7)	147(57.6)	4(1.6)	13(5.1)
Students' interest in Agric. Science is sustained throughout the lesson period	43(16.9)	134(52.5)	15(5.9)	63(24.7)
Agric. Sc. Is not a major subject requirement for gaining admission into higher institution of learning	24(9.4)	66(25.9)	74(29.0)	91(35.7)
My parents would want me to take up agriculture as a career	35(13.7)	71(27.8)	41(16.1)	108(42.4)
My parents react negatively to my study of Agric. Sc.	11(4.3)	30(11.8)	91(35.7)	123(48.2)
Parents see Agric. Sc. Subject as the subject for children from poor parents	15(5.9)	33(12.9)	98(38.5)	109(42.7)
Agric. Sc. as a subject is for boys alone	8(3.1)	18(7.1)	120(47.1)	109(42.7)
Boys want to study core science than Agric. Sc.	33(12.9)	110(43.1)	31(12.2)	81(31.8)
The school farm is available for Agricultural Science practical	81(31.8)	132(51.8)	15(5.9)	27(10.6)
The teacher is always punctual in class for Agric. Sc. Lesson	118(46.3)	115(45.1)	6 (2.3)	16(6.3)
The teacher uses relevant instructional materials for teaching	74 (29.0)	134(52.6)	9(3.5)	38(14.9)
The teacher gives copious note to write during lesson	38(14.9)	92(36.1)	27(10.6)	98(38.4)
The time allotted for the subject on the time table is very small	21(8.2)	67(26.3)	44(17.3)	123(48.2)
The teacher uses relevant instructional materials during practical Lesson	63(24.7)	140(54.9)	13(5.1)	39(15.3)
The time allotted for practical Agric. on the time table/no time is allotted	25 (9.8)	93(36.5)	43(16.9)	94(36.9)
The students are always ready to participate actively during the practical lesson in the laboratory or on the school farm	73(28.6)	148(58.1)	11(4.3)	23(9.0)
Students have the opportunity of making use of Agric. laboratory for their practical	51(20.0)	128(50.2)	19(7.4)	57(22.4)
The teacher does not know how to teach very well during Agric. practical lesson	12(4.7)	17(6.7)	98(38.4)	128(50.2)
There is inadequate fund to manage practical oriented Agric Sc. Subject	37(14.5)	108(42.4)	36(14.1)	74(29.0)

**Source:** Authors' computation from field survey, 2018. The values in parentheses are the percentages

Table 3: ANOVA test on the nine schools					
	Sum of Squares	df	Mean Squares	F	Sig.
Between Groups	15008.136	8	1876.017	14.212	.000
Within Groups	32472.365	246	132.001		
Total	47480.502	254			

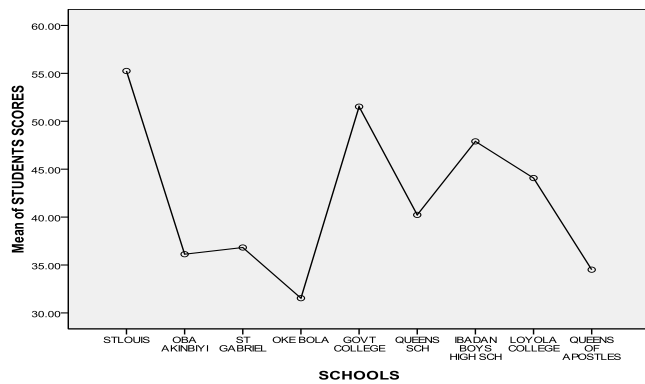
**Table 4: Multiple Comparisons - Post Hoc (Tukey HSD) Analysis**

(I) Schools	(J) Schools	Mean Difference (I-J)	Standard Error	Sig.
St. Louis	Oba Akinbiyi	19.12*	10.09	.000
	St. Gabriel	18.42 *	8.90	.000
	Oke Bola	23.71*	13.99	.000
	Queens Sch	15.02*	5.93	.000
	Loyola Coll.	11.18*	1.25	.015
	Queens of Apostles	20.74*	11.65	.000
Oba Akinbiyi	St. Louis	-19.12*	2.89	.000
	Govt. Coll.	-15.40*	2.94	.000
	Ibadan Boys'	-11.78*	3.33	.014
St. Gabriel	St. Louis	-18.42*	3.04	.000
	Govt. Coll.	-14.70*	3.10	.000
	Ibadan Boys'	-11.08*	3.47	.042
Oke Bola	St. Louis	-23.71*	3.10	.000
	Govt. Coll.	-4.59*	3.16	.000
	Ibadan Boys'	-16.36*	3.52	.000
	Loyola Coll.	-12.54*	3.25	.005

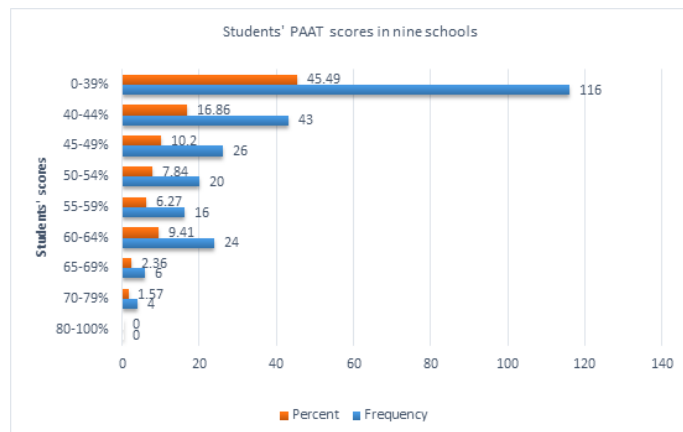
**Table 4 continued: Multiple Comparisons - Post Hoc (Tukey HSD) Analysis**

(I) Schools	(J) Schools	Mean Difference (I-J)	Standard Error	Sig.
Govt. College	Oba Akinbiyi	15.40*	2.94	.000
	St. Gabriel	14.70*	3.10	.000
	Oke Bola	19.98*	3.16	.000
	Queens Sch	11.29*	2.96	.005
	Queens of Apostles	17.01*	2.96	.000
Queens School	St. Louis	-15.02*	2.90	.000
	Govt. Coll.	11.29*	2.96	.005
Ibadan Boys' High School	Oba Akinbiyi	11.78*	3.33	.014
	St. Gabriel	11.08*	3.47	.042
	Oke Bola	16.36*	3.52	.000
	Queens of Apostles	13.39*	3.35	.003
Loyola College	St. Louis	-11.18*	3.17	.015
	Oke Bola	12.54*	3.25	.005
Queens of Apostles	St. Louis	-20.74*	2.90	.000
	Govt. Coll.	17.01*	2.96	.000
	Ibadan Boys'	13.35*	3.35	.003

\*The mean difference is significant at the 0.05 level



**Figure 1:** Mean plots of the scores of students in PAAT for the nine schools



**Figure 2:** Distribution of scores obtained by students in PAAT in the nine schools

Source: Authors' graph from field survey data 2018

**Research Question 3**

Are there significant differences in the mean scores obtained by the students in PAAT in the three categories of schools used for the study?

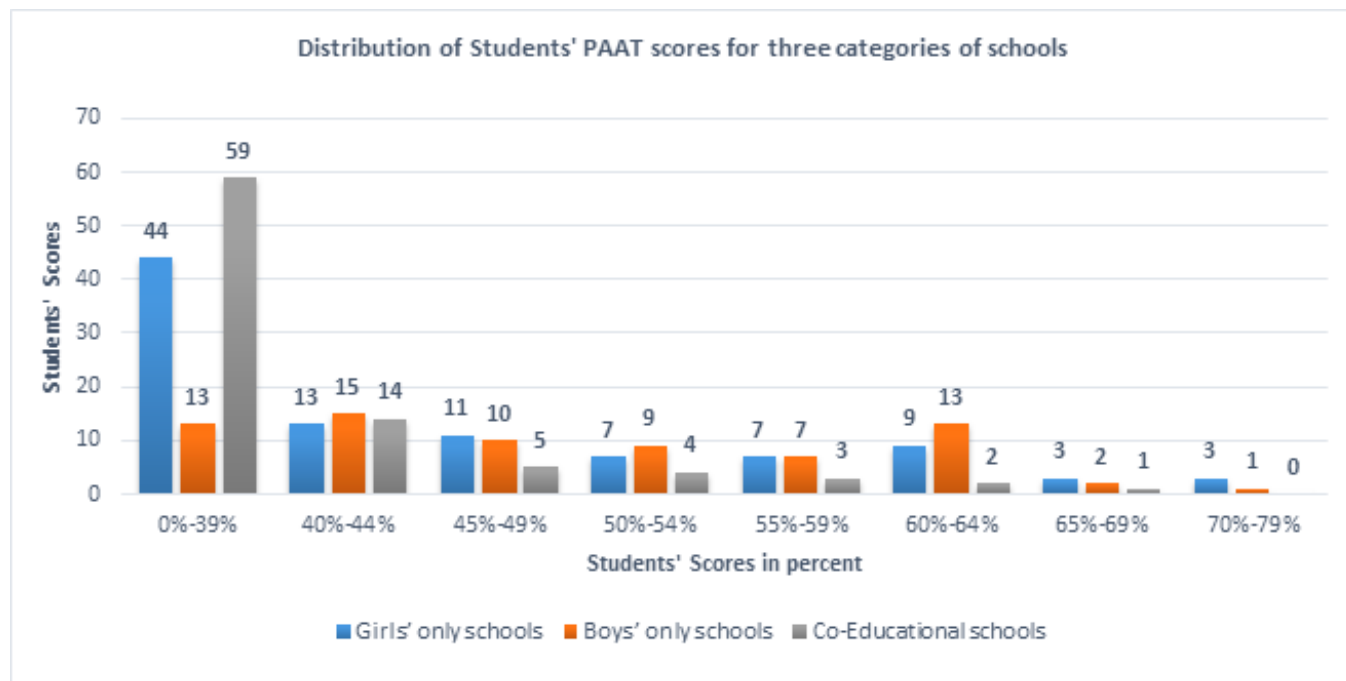
The results of the one-way ANOVA test to determine if there are significant differences in the mean scores of the students in PAAT for the three categories of schools are presented in Table 5. Since  $P = .000$  is less than  $\alpha = 0.05$ , we conclude that there are significant differences in the mean scores of students in PAAT among the three categories of schools. Multiple comparison tests (Table 7) on the ANOVA using Least Significant Difference (LSD) showed that there are significant differences between Girls' only and Co-educational schools; Boys' only and Co-Educational schools mean scores respectively. The distribution of scores in PAAT from the three categories of schools are presented in Table 6 and Figure 3 while Figure 4 showed the mean plots of the students' PAAT scores in the three categories of schools.

**Table 5:** ANOVA test on the three categories of schools

	Sum of Squares	df	Mean Squares	F	Sig.
Between Groups	7032.301	2	3516.150	21.750	.000
Within Groups	40738.261	252	161.660		
Total	47770.562	254			

**Table 6: Mean Scores of Students in PAAT from the three categories of schools**

Category of schools	Number of students	Mean	Standard Deviation	Standard Error	Minimum Score	Maximum Score
Girls' only schools	97	42.72	13.63	1.38	20.00	73.3
Boys' only schools	70	48.14	11.89	1.42	15.56	71.11
Co-Educational schools	88	34.92	12.29	1.31	6.67	68.89
Total	255	41.52	13.71	.86		



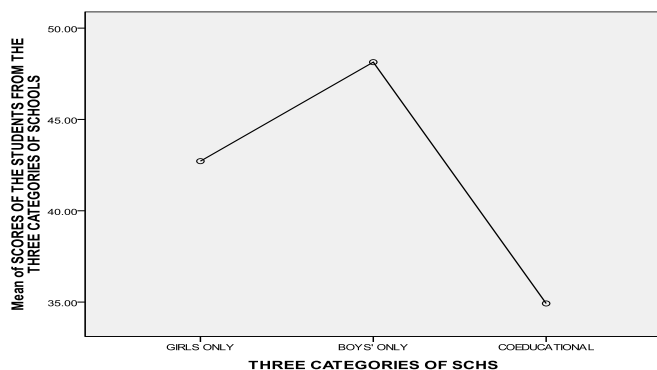
**Figure 3:** Distribution of PAAT scores for three categories of schools

Source: Authors' graph from field survey, 2018

**Table 7: Multiple Comparisons- Least Significant Difference (LSD) Test**

(I) Three Categories of Schools	(J) Three Categories of Schools	Mean Difference (I-J)	Standard Error	Sig.
Girls' Only	Boys' Only	-5.42*	1.99	.007
	Co-Educational	7.79*	1.87	.000
Boys' Only	Girls' Only	5.42*	1.99	.007
	Co-Educational	13.21*	2.04	.000
Co-Educational	Girls' Only	-7.79*	1.87	.000
	Boys' Only	-13.21*	2.04	.000

\*The mean difference is significant at the 0.05 level.



**Figure 4:** Mean plots of the scores of students in PAAT in the three categories of schools

**Research Question 4**

Is there any relationship between academic performance of students in PAAT and their attitudes to the subject?

Table 8 showed the Chi-square results of the relationship between academic performance of the students in PAAT and their attitudes to the subject.

We cannot reject the null hypothesis ( $H_0$ ) of no association between students' mean scores and availability of school farm for practical agriculture since  $p = 0.860 > 0.05$ . Moreover, we cannot reject the null hypothesis of no association between students' mean scores and time allotted for practical agriculture on the time table since  $p = 0.386 > 0.05$ .



**Table 8: Results of Chi-square tests of independence between students' scores in PAAT and selected variables to AtPAQ**

Hypothesis	Chi-square statistic ( $\chi^2$ )	P-value	Decision
H <sub>0</sub> : There is no association between students' mean scores and agricultural science as a major requirement for gaining admission into higher institution of learning. H <sub>1</sub> : There is association between students' mean scores and agricultural science as a major requirement for gaining admission into higher institution of learning.	22.362	.379	Fail to reject H <sub>0</sub>
H <sub>0</sub> : There is no association between students' mean scores and teachers' use of relevant instructional materials during agricultural science lesson H <sub>1</sub> : There is association between students' mean scores and teachers' use of relevant instructional materials during agricultural science lesson.	21.336	.439	Fail to reject H <sub>0</sub>
H <sub>0</sub> : There is no association between students' mean scores and availability of school farm for practical agriculture. H <sub>1</sub> : There is association between students' mean scores and availability of school farm for practical agriculture.	14.216	.860	Fail to reject H <sub>0</sub>
H <sub>0</sub> : There is no association between students' mean scores and sustained interest to participate actively in practical agriculture. H <sub>1</sub> : There is association between students' mean scores and sustained interest to participate actively in practical agriculture.	14.635	.841	Fail to reject H <sub>0</sub>
H <sub>0</sub> : There is no association between students' mean scores and time allotted for practical agriculture on the time table. H <sub>1</sub> : There is no association between students' mean scores and time allotted for practical agriculture on the time table.	22.239	.386	Fail to reject H <sub>0</sub>

## DISCUSSION

From the findings of this research, majority of the students (93.3%) responded that practical agriculture is interesting and fascinating. Furthermore, fifty-six percent (56%) believed that the number of students who take Agricultural Science as a subject is very few when compared to other subjects. These results validated the findings of Azubuike (2011); Otegunrin (2014); Otegunrin *et al.* (2017a); Otegunrin *et al.* (2017b); Diise *et al.* (2018a); Obayelu and Fadele (2019) and Otegunrin *et al.* (2019b) that the number of students who take vocational subjects (including Agricultural Science) is very few and that vocational subjects are interesting and fascinating when they are put into practice. Also, Darko *et al.* (2016) supported the findings that both male and female students are ready and willing to participate actively during agricultural science lesson. Furthermore, ninety percent (90%) disagreed that agricultural science is a subject for boys alone. This finding was supported by Darko *et al.* (2016); Otegunrin *et al.* (2019b) that revealed in their findings that gender had no significant influence on students' attitude towards the learning of agricultural science.

Eighty-five percent (85%) of the student affirmed that they have school farms available for practical agriculture and also seventy percent (70%) of them supported that they have opportunity of making use of the agricultural science laboratory for their practical lessons. These findings are in line with the work of Ladele and Agbebaku (2006) Onwumere *et al.* (2016) and Otegunrin *et al.* (2019b) who suggested adequate practical exposure of students to the practice of farming within the provision of available technology in the school while Egbule (2004)

recommended that agricultural science teacher must be current in subject matter and its pedagogy which will also enhance the practical aspect of the subject

Furthermore, considering the mean scores obtained in PAAT by the three categories of schools used for this study, Boys' only schools had the highest mean score (even though lower than average) of 48.14 followed by Girls' only schools with 42.72% while Co-educational schools had the lowest mean score of 34.92. The PAAT scores for all students in the three categories of schools are significantly different from each other (Table 7). Also, in PAAT, only three (3) students scored between 70% and 79% in Girls' only schools while just one (1) student obtained that score in Boys' only schools and no students from Co-educational (mixed) schools had such score. Co-educational schools had the highest number of students (59) that obtained scores less than 40% in PAAT, followed by Girls' only schools with 44 students while Boys' only schools had the lowest number of students (13) with less than 40%. These results corroborated the works of Smithers and Robinson (2010); Busari (2016); Otegunrin *et al.* (2017a) and Otegunrin *et al.* (2019b) that concluded that students in single-sex schools (Boys' only and Girls' only schools) perform better than students from Co-educational (mixed) schools.

In another vein, from this study, no association was found between scores obtained by the students and the use of relevant instructional materials by the teacher during practical agricultural science lesson periods. This result was in agreement with the work of Otegunrin (2014); Otegunrin *et al.* (2017a) and Otegunrin *et al.* (2017b). This might be due to the fact that the use of instructional materials by the teacher only may not necessarily result

into desirable academic performance of the students but rather, other variables investigated by other works such as school environmental facilities, type of school management system, teaching methods, psychosocial environment of agricultural science classroom among others might be associated with students' academic performance (Idris and Fraser, 1997; Modebelu (2012); Hedjazi and Omid (2012); Daluba, 2013; Egunsola, 2014). Also, there was no association between students mean scores and availability of school farm for practical agriculture. This suggests that availability of the school farms in the public schools is not enough to bring about the needed boost in the academic performance of the students. This result supported the findings of Onwumere *et al.* (2016) and Otekunrin *et al.* (2019b) that school farm, is capable of contributing positively to the teaching of agricultural science in senior secondary schools in Abia and Oyo State but emphasised the fact that it may not necessarily be the major determining factor contributing to the overall increase in academic success of the students in agricultural science examinations. Hedjazi and Omid (2012) corroborated this finding that from the scientific standpoint, nature and content of courses and educational facilities were not among the factors affecting an agriculture student's academic success. Other factors other than the availability of the school farms may be responsible for this (Idris and Fraser, 1997; Modebelu 2012; Daluba, 2013; Egunsola, 2014; Otekunrin *et al.* 2019b).

Furthermore, from the findings of this study, there is no association between students' mean scores and sustained interest to participate actively in practical agriculture. This finding did not agree with the findings of Otekunrin *et al.* (2017a) which reported association between the scores obtained in Agricultural Science Achievement Test (ASAT) by the students and sustained interest in agricultural science throughout the lesson period. It should be noted that ASAT in Otekunrin *et al.* (2017) focused only on theoretical aspect of Agricultural Science. This implies that other factors including high cognitive ability of the students, quality of the school, home background, and influence of old students association (Alumni association) among others may influence students' academic performance in the subject (Idris and Fraser, 1997; Modebelu, 2012; Hedjazi and Omid 2012; Daluba, 2013, Egunsola, 2014; Otekunrin *et al.* 2019b).

## CONCLUSION AND RECOMMENDATIONS

In this study, we examined the attitudes and academic performance of students in Practical Agricultural Science in selected secondary schools- three categories of schools (Boys' only, Girls' only and Co-educational) in Ibadan Metropolis, Oyo State, Nigeria.

Using PAAT, failure rate was highest in the co-educational schools followed by girls' only schools while it was lowest

among the boys' only schools. There existed significant differences in the mean scores of PAAT for all pairs of the three categories of schools. There were no relationships between selected attitudinal variables and students' scores in practical agriculture.

Concerning PAAT among the three categories of schools used for this study, only three (3) students scored between 70% and 79% in Girls' only schools while just one (1) student obtained that score in Boys' only schools and no students from Co-educational (Mixed) schools had such score. Co-educational schools had the highest number of students (59) that obtained scores less than 40% in PAAT, followed by Girls' only schools with 44 students while Boys' only schools had the lowest number of students (13) with less than 40%.

Therefore, we recommend that, regardless of the category of school a student attends, stakeholders should make conscious effort to encourage students to develop interest in practical agriculture so as to enhance their academic performance and equip them with relevant skills that will make them self-reliant after leaving school and contribute to the overall development of Nigeria's economy.

Furthermore, to tackle inadequate funding of practical oriented agricultural science, Nigerian government and relevant stakeholders (like Parent Teachers Association (PTAs), school alumni association and Non-Governmental Agencies) are implored to provide adequate human resources (competent agricultural science teachers) and needed infrastructural facilities (like school farms and practical agriculture laboratories) for effective teaching and learning of agricultural science in public secondary schools in Nigeria.

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