

1 **Original Research Article**

2
3 **Attitude and Academic Success in Practical**
4 **Agriculture: Evidence from Public Single-Sex**
5 **High School Students in Ibadan, Nigeria**

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Abstract

This study examined the attitude and academic performance of public single-sex (Boys' and Girls' only) high school students in the teaching and learning of Agricultural Science in the aspect of practical knowledge of Agriculture. We investigated whether there were significant differences in the mean achievement test scores of students in practical Agriculture in the selected schools. We also examined the relationship between their academic performance in practical agriculture and their attitude to the subject. The study was a descriptive survey design carried out at Ibadan Metropolis, Nigeria. Six public single-sex (Boys' and Girls' only) schools were randomly selected from three Local Government Areas (LGAs) within Ibadan Zone comprising eleven LGAs in 2018. Sixty-nine Senior Secondary School (SSS III) students were randomly selected in Boys' only (3) schools while ninety-seven students were randomly selected in Girls' only (3) schools giving a total of 166 students that participated in this study. Practical Agricultural Science Students' Achievement Test (PASSAT) and Students' Attitude towards Practical Agriculture Questionnaire (SATPAGQ) were used for data collection. The data collected were analyzed using descriptive statistics, One-way Analysis of Variance (ANOVA), Multiple Comparison techniques and t-test for equality of means. The ANOVA test was significant ($p = .00$). Post Hoc (Tukey HSD) test, a multiple comparison technique on the ANOVA showed that PASSAT mean scores obtained by one Girls' only school was significantly different from one Boys' only schools another two Girls' only schools' mean scores at 5% significant level. It was found that availability of school farm, use of instructional materials were not enough to bring about significant boost in academic success in PASSAT especially in three of the schools with less than average mean scores of 34.51, 40.23 and 44.07. The study therefore recommended that government and relevant stakeholders (Parents-Teachers Association, Old Boys' and Girls' Association among others) should provide human resources and needed infrastructural facilities for effective teaching and learning of Agricultural Science in both single-sex and Co-educational schools for better academic performance.

9
10 *Keywords:* Practical Agricultural Knowledge; Academic Performance; Single-Sex Schools;
11 Students' Attitude; Students' Mean Scores

12
13 **1. INTRODUCTION**

14 In Nigeria, agriculture remained a major sector of the economy, providing food for her
15 teeming population, provision of foreign exchange earnings, income for smallholder and
16 commercial farmers and employment opportunities for about 70 percent of the population.

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17 Agricultural sector has started regaining its lost glory in recent time through a viable
 18 economic plan referred to as Economic Recovery and Growth Plan (ERGP) in which
 19 Agriculture is one of the major sectors of the economy considered in the ERGP to help solve
 20 ravaging incidence of food insecurity, reduce unemployment, improve foreign exchange
 21 earnings and resuscitate industrialization [1] [2] [3]. Since the steady reduction in the
 22 revenue accruable from crude oil from the international market, educational and economic
 23 experts have been devoting a lot of attention to how best to bring agriculture back to its lost
 24 enviable position [2]. This led to the formulation of various policies. One of these policies
 25 from the educational standpoint is the inclusion of Agriculture as a pre-vocational subject at
 26 the primary and junior secondary schools and as a vocational subject in the senior
 27 secondary school level [4]. With the recent Educational Policy, Agricultural Science in Junior
 28 Secondary Schools is at present taught in combination with Home Economics and now
 29 tagged Pre-Vocational Studies while Agricultural Science in Senior Secondary School (JSS)
 30 is an elective subject for the students and some branches or aspects of the subject are now
 31 offered as subjects like Fisheries Management and Animal Husbandry.
 32 However, Agricultural Science acquiring the status of a vocational subject and other subjects
 33 like Animal Husbandry and Fisheries Management are part of the elective subjects students
 34 can choose at the Senior Secondary School (SSS) levels in Nigeria.
 35 This is mainly to enable interested students to acquire practical agricultural skills that would
 36 make them self-reliant in future. Moreover, this would boost Nigeria's food productivity and
 37 closer to attaining food sufficiency status as a nation. The specific objectives of introducing
 38 Agricultural Science in secondary schools as listed in [5] and cited in [6] and [2] are as
 39 follows:

- 40
 41 (a) to stimulate and sustain students' interest in agriculture; (b) to provide students the
 42 interest to advance in farming; c) to advance food production through improvement of
 43 agricultural production techniques in students; (d) to provide occupational entry level skills in
 44 agriculture to the interested students;(e) to prepare students adequately for producing and
 45 marketing farm commodities efficiently and profitably; and, (f) to enable students to acquire
 46 basic knowledge and practical skills required for future studies in agricultural field.

47 In spite of all these policies and programmes of the Federal Government of Nigeria through
 48 the educational sector, examination records of the West African Examination Council
 49 (WAEC), a major examination body in the West African sub-region and National Examination
 50 body called National Examination Council (NECO) revealed that Agricultural Science
 51 examination results are generally poor in Nigeria. According to [7] as shown in Table 1,
 52 summary statistics of results of Agricultural Science students in WAEC May/June Senior
 53 Secondary School Examinations from 2008-2013 (2012 and 2014 not reported) for Paper III
 54 (Practical). Table 2 shows summary statistics of results of Agricultural Science students in
 55 WAEC May/June Senior Secondary School Examinations from 2008-2014 (2012 not
 56 reported) for Paper II (Essay).

57
 58 **Table 1: Summary statistics of May/June SSCE Agricultural Science (Practical paper)**
 59 **results (2008-2013)**

Year	Total No of Students	Raw Mean Score	Standard Deviation
2008	1,050,591	31	10.20
2009	1,059,609	32	7.48
2010	1,041,167	23	10.34
2011	1,192,571	21	10.63
2013	1,305,194	33	10.39

60 *WAEC Chief Examiners' Report, 2015*

61

62 **Table 2: Summary statistics of May/June SSCE Agricultural Science (Essay) results**
63 **(2008-2014)**

Year	Total No of Students	Raw Mean Score	Standard Deviation
2008	1,050,591	33	14.56
2009	1,059,609	28	13.48
2010	1,041,167	29	15.03
2011	1,192,571	29	14.73
2013	1,305,194	37	15.17
2014	952,983	38	16.63

64 *WAEC Chief Examiners' Report, 2015*

66 [8] emphasised that the two most critical and effective teaching-learning environments for
67 instilling practical knowledge of agriculture to students are the school farm (crop and
68 livestock farms) and the agricultural science laboratory. One of the key issues in this paper is
69 on the effective utilization of the school farm (garden) in developing students' (both boys and
70 girls) interest in practical agriculture. According to [9] which emphasised the benefits of
71 school garden (school farm) in students learning and gave the following objectives of school
72 gardens: (i) Increasing the relevance and quality of education for rural and urban school
73 children (students) through active learning and introduction of agriculture and nutrition
74 knowledge and skills including life skills into the curriculum; (ii) Providing students with
75 practical experience in food production and natural resource management, which serve as a
76 source of innovation they can take home to their families and apply in their own household
77 gardens and farms; (iii) Improving students' nutrition by supplementing school feeding
78 programmes with variety of fresh micro nutrients and protein rich products and increasing
79 their knowledge of nutrition to the benefit of the whole family. Also, the role and contributions
80 of women in agricultural development in the developing economies cannot be
81 overemphasised [10]. In previous studies, [11], identified some key variables related to
82 academic performance of students and classified them as ; (i) school-related variables (time
83 spent studying, time spent in the library, interest in the subject, distance of home from school
84 among others); (ii) home background-related variables (educational level of the parents,
85 family income, access to land by family); and (iii) individual student-related variables (age,
86 sex, personal interest in the subject, number of years living away from parents).

87
88 Poor academic performance of students (both male and female students) in Agricultural
89 Science indicates that students are not showing interest in acquiring agricultural skills and
90 lack of motivation in the school which can help them in becoming self-reliant and contribute
91 meaningfully to the economy of the nation. However, Agricultural science students, after
92 completing their Senior Secondary School examinations still lack required practical
93 skills/knowledge needed to be able to venture into basic agricultural practices and as this
94 makes it difficult to successfully engage themselves in agriculture enterprises [12] [13], [14],
95 [15].

96 Previous studies have shown that female and male students have exhibited contrasting
97 interests and attitudes towards studying science and science related courses including
98 agricultural science.

99 Moreover, it is important to note that more female students enrol in post-secondary
100 institutions of higher learning than that of their male counterparts and earn good grades in
101 science and engineering courses. Although, significant number of male students prefer to
102 study pure science courses or engineering while female students naturally prefer courses
103 like Home Economics, Food science and Technology among others [12]. Gender may be
104 referred to as the range of physical, biological, mental and behavioural characteristics
105 pertaining to and differentiating between the feminine and masculine (female and male)
106 population [16]. The aspect of considering academic performance in relation to gender is

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107 hinged basically on the socio-cultural differences between girls and boys. Studies have
108 shown that some career paths (vocations and professions) have been regarded as male
109 dominated such as engineering, sciences and science related courses including agriculture
110 science among others while others like food science and technology, typing, nursing, home
111 economics, etc are favourite of the female counterpart [17], [16].

112 In this study, we therefore examined the attitudes of the students (Boys' and Girls' only
113 schools) to the study of practical agriculture in Ibadan, Oyo State. We also examined
114 whether there were significant differences in the mean scores obtained by students in
115 PASAT in the six single sex schools. Furthermore, we investigated whether there was any
116 relationship between the mean scores obtained by the students in PASAT and their attitudes
117 to practical agriculture.

118 1.1 Statement of the Problem

119 Poor academic performance of high school students (both male and female) in agricultural
120 science examinations (both theory and practical agriculture) have generated a lot of
121 concerns for decision makers and all stakeholders in the Agricultural/vocational education
122 sector. This low level academic performance has been linked to several factors. These
123 included students' loss of interest and carefree attitude to the subject (practical agriculture),
124 inadequate innovative and relevant teaching techniques, inadequate funding and
125 nonexistent teaching farms to practice agriculture. Agricultural Education has been a priority
126 of the government, the teaching and learning of Practical Agriculture at pre-tertiary levels
127 leaves much to be desired. According to [18] and [14], Agriculture Education in Nigeria at the
128 pre-tertiary level is bedeviled with so much problems hindering achievement of its goals.
129 There exist low interest in both teachers and students. This low interest could be attributed
130 to the usual approach to teaching the practical oriented subject which is no longer interesting
131 and endearing to boost the required interest. The best way the students in schools can be
132 taught agricultural science is by both theoretical aspect and practical work (physical
133 activities) by "doing" in the practical sense of it and 'brains - on' activities (mental activities)
134 inside and outside the laboratory and school farms. [19], [2], [20].

135 Moreover, [21] emphasised the fact that practical lessons in science help to generate
136 students' motivation in science and enhance their understanding of scientific concepts and
137 events in their world. [22], also opined that blended learning with emphasis on students
138 taking charge of their own learning environment is effective in inculcating practical skills in
139 agricultural science on students.

140 This study therefore shed more light on these salient issues in single sex schools (Girls 'and
141 Boys' only) in Ibadan metropolis, in order to obtain concrete evidence for highly impactful
142 policy interventions.

Comment [do1]: There are no problems here

144 1.2 Research Questions

145 1. What are the students' attitudes towards practical agriculture in both Boys' and Girls' only
146 schools in the study area?

147 2. Are there any significant difference in the mean scores obtained by students in PASAT
148 among the six schools in the study area?

149 3. Is there any relationship between academic performance of students in the two
150 categories of schools (Girls' and Boys' only) in practical agriculture and their attitudes to the
151 subject?

152 Specifically, our hypotheses are:

153
154 H₀: There are no significant differences in the mean scores obtained by the students in the
155 two categories of schools (Boys' and Girls' only).

156 H₁: There are significant differences in the mean scores obtained by the students in the two
157 categories of schools (Boys' and Girls' only).

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159 Practical agriculture is basically the involvement in farming activities (crops and livestock)
160 while agricultural education is the acquisition of needed skills and knowledge in agricultural
161 science with the aim of imparting these knowledge and skills into prospective agricultural
162 science students at all educational levels (primary, secondary and tertiary levels) to become
163 self-reliant and agripreneurs and contribute meaningfully to the government drive of
164 attaining food security status as a nation [15], [14]. [23], concluded that attitudes are seen
165 as cognitive and affective orientations or dispositions towards an object, idea, person and
166 situation, among others.
167 According to [24] who stated that attitude is considered one major determinant of a person's
168 intention to perform a particular behaviour. Also, the *theory of attitude formation and change*
169 *by* [24] and cited by [25] posited that some key variables which include; students, parents,
170 personal experiences, observations, knowledge and value concerning agriculture
171 significantly affect students' attitude about agriculture and in turn influence their belief,
172 intentions and decision to participate actively. This will go a long way in affecting their
173 attitude towards agriculture and their interest in pursuing a career in agriculture related
174 courses in future.
175 However, some researchers have also observed some positive attitudes among students
176 towards agriculture. These include the studies of [12], [26], [27], [28] and [2] who found out
177 that students exhibited positive attitudes towards agricultural science but the teachers should
178 encourage them by providing the enabling environment for effective teaching and learning of
179 both the practical and the theoretical aspect of the subject in both Junior and Senior
180 Secondary Schools. [29], opined that College of Agriculture fresh students viewed
181 agriculture as being both scientific and technical and that they have more positive attitudes
182 toward agricultural programmes and agriculture as a career pathway than the students of
183 non-agriculture programmes.
184 According to [30], school farm is a selected plot of land in the school environment where
185 student' carry out practical agriculture both in the aspect crop production and animal
186 husbandry. [18], pointed out that majority of school farms are faced with inadequate basic
187 farm tools, equipment among others. Inadequate or unavailability of improved seeds, feeds,
188 fertilizers (inorganic) and other operating suppliers, inadequate (technical know- how)
189 training for teachers to use the farm for instructional purposes. In addition, inadequate staff
190 personnel to run the farm were one of the most serious problems facing the school farm.
191 In another vein, considering the aspect of students interest in the study of agricultural
192 science (both practical and essay), [31], [2], [32] and [33] opined that students' background,
193 students' negative attitude towards Agriculture, poor teaching techniques (mainly without
194 appropriate instructional materials) among others were causes of poor performance in the
195 subject. [11], also found out that out of eleven predictor variables using home and school
196 variables, only two (students' overall grade and science grade) were significant on
197 agriculture students' academic performance. [34], [35] revealed that only Grade Point
198 Average (GPA) was positively correlated to students' academic performance in practical
199 skills in agricultural science when considering their interest in agriculture, socioeconomic
200 status among other variables. According to studies by [34] and [36], they found significant
201 difference between male and female students' academic performance revealed through t-
202 test. Their findings revealed that female students had better scores than the male students
203 but the works of [17] refuted that findings and revealed that male students apparently
204 performed better in Agricultural science than female students and also in certain subject
205 areas especially the science related ones.

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2. Research Methodology

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211 The descriptive survey design was adopted for the study. Simple random sampling
 212 technique was used to select three Local Government Areas (LGAs) among the LGAs in
 213 Ibadan out of eleven LGAs present in Ibadan Zone. A total of nine (6) public secondary
 214 schools (comprising three (3) Boys' only and three (3) Girls' only) were randomly selected
 215 from the three LGAs which include; Ibadan North (1 schools), Ibadan North East (2 schools)
 216 and Ibadan South West (3 schools). Public single-sex schools are not as common as Co-
 217 educational schools. Sixty-nine (69) Senior Secondary School (SSSIII) students were
 218 selected in Boys' only schools, ninety-seven (97) students were selected in Girls' only
 219 schools resulting in a total of 166 sampled students and all of them are in Senior Secondary
 220 School (SSS III) classes preparing for their final internal and external examinations.

2.1 Research Instruments

222 Two research instruments were used for data collection. They were;

2.1.1 PRACTICAL AGRICULTURAL SCIENCE ACHIEVEMENT TEST (PASAT)

225 PASAT was used to measure the students' Academic Achievement in Practical Agricultural
 226 Science. The test is composed of 9-specimen (specimens A-I). The specimens were
 227 selected to test students' knowledge in the area of general agriculture, crop and livestock
 228 production. The practical test comprised three (3) questions, 9 specimens with 50 minutes
 229 duration. The questions and specimens were selected using item analysis technique. The
 230 PASAT was administered on all the 255 SSS III Agricultural Science students in three
 231 categories of schools (nine schools) who were preparing for their forth coming external
 232 examinations like West African Senior Secondary School Certificate Examinations
 233 (WASSCE) and National Examination Council (NECO) Examinations. The performance of
 234 the students in the PASAT was categorized after marking of the scripts using the standards
 235 in subjects' format of the West African Examinations Council (WAEC). This is represented in
 236 Table3.

237 **Table3: Standards used for PASAT**

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

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2.1.2 Students' Attitude towards Practical Agriculture Questionnaire (SATPAGQ)

243 SATPAGQ was a structured questionnaire designed to assess agricultural science students'
 244 attitudes towards practical agriculture. It contained items placed on a four-point Likert Scale
 245 of Strongly Agree (4), Agree (3), Strongly Disagree (2) and Disagree (1). The content and
 246 face validity of the questionnaire was established by two experts on Agricultural Science
 247 Education and Educational Management. The instrument was pretested in a school that was
 248 not part of the schools eventually used for the study and necessary changes were made to
 249 the instrument before it was administered on the 166 students. The Reliability Index obtained
 250 using Cronbach's Alpha was 0.71.

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254 **2.2 Method of Statistical Data Analysis**

255 Data collected were analyzed using frequency counts and percentages. Also, relevant
 256 hypothesis was formulated. One-way Analysis of Variance (ANOVA) was used to test for
 257 significant differences in mean scores of students from the all the six schools and also
 258 among the two categories of schools (three (3) Boys' only, three (3) Girls' only).

260 **3. RESULTS AND DISCUSSION**

261 **3.1 RESULTS**

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

263 **3.1.1 Research Question 1**

264 What are the students' attitudes towards practical agriculture in both Boys' and Girls' only
 265 schools in the study area?

266 Table 3 shows the responses (perception) of students' attitudes to the study of agricultural
 267 science as a subject and particularly the aspect of practical agriculture. The students'
 268 responses to some attitudinal variables focused on agricultural science practical in the two
 269 categories of schools. From the responses, majority of the students in Boys' only schools,
 270 ninety-seven percent (97%) were of the opinion that practical agriculture is interesting and
 271 fascinating while ninety-five percent (95%) of students in Girls' only schools also agreed to
 272 that assertion by the male students. Fifty-four percent (54%) of the male students (Boys' only
 273 schools) believed that their parents would likely want them to take up agriculture as a career
 274 but eighty-five percent (85%) of the female students did not agree to such statement. Also, it
 275 was evident that both male and female students believed that agricultural science subject is
 276 not to be offered by boys alone as ninety-percent (90%) of the male students and ninety-two
 277 percent (92%) female students disagreed with that statement. It is worthy of note that fifty-
 278 two percent (52%) of both male and female student were of the opinion that there is
 279 inadequate funding to properly manage practical oriented agricultural science in their
 280 schools.
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284 **Table 4 Students responses to SATPAGQ**

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S/No	Items	Strongly Agree (%)		Agree (%)		Strongly Disagree (%)		Disagree (%)	
		Male	Female	Male	Female	Male	Female	Male	Female
1	Number of students that take agricultural science as a subject is very few	14.49 (10)	34.02 (33)	42.03 (29)	26.80 (26)	11.59 (8)	11.34 (11)	31.88 (22)	27.84 (27)
2	Practical in agricultural science is interesting and fascinating	49.23 (34)	25.77 (25)	47.83 (33)	69.07 (67)	2.90 (2)	2.06 (2)	-	3.09 (3)
3	Students' interest in agricultural science are sustained throughout the lesson period	15.94 (11)	9.28 (9)	56.52 (39)	49.49 (48)	2.90(2)	10.31 (10)	24.64 (17)	30.93 (30)

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4	Agricultural Science is not a major subject required for gaining admission into higher institutions	11.59 (8)	7.22 (7)	21.74 (15)	31.96 (31)	33.33 (23)	20.62 (20)	33.33 (23)	40.21 (39)
5	My parents would want me to take up agriculture as a career	18.84 (13)	5.16 (5)	34.78 (24)	19.59 (19)	7.25 (5)	23.71 (23)	39.13 (27)	51.55 (50)
6	My parents react negatively to my study of agricultural science	2.90 (2)	5.16 (5)	11.59 (8)	8.25 (8)	42.03 (29)	24.74 (24)	43.48 (30)	61.86 (60)
7	Parents see agricultural science as the subject for children from poor parents	4.35 (3)	2.06 (2)	14.49 (10)	10.31 (10)	37.68 (26)	41.24 (40)	43.48 (30)	46.39 (45)
8	Agricultural science is a subject for boys alone	1.45 (1)	2.06 (2)	8.70 (6)	6.19 (6)	42.03 (29)	48.45 (47)	47.83 (33)	43.30 (42)
9	Boys want to study core science than agricultural science	5.80 (4)	15.46 (15)	56.52 (39)	45.36 (44)	4.35 (3)	12.37 (12)	33.33 (23)	26.80 (26)
10	The school farm is available for agricultural science practical	30.44 (21)	34.02 (33)	60.87 (42)	46.39 (45)	1.45 (1)	10.31 (10)	7.25 (5)	9.28 (9)
11	The teacher is always punctual for agricultural science lesson	52.17 (36)	35.05 (34)	40.58 (28)	55.67 (54)	1.45 (1)	4.12 (4)	5.80 (4)	5.15 (5)
12	The teacher uses relevant instructional materials for teaching	28.99 (20)	22.68 (22)	63.77 (44)	47.42 (46)	1.45(1)	7.22 (7)	5.80(4)	22.68 (22)
13	The teacher gives too much note to during lesson	13.04 (9)	20.62 (20)	28.99 (20)	43.30 (42)	10.15 (7)	6.19 (6)	47.83 (33)	29.90 (29)
14	The time allotted for the subject on the time table is too small	4.35 (3)	5.16 (5)	31.88 (22)	28.89 (28)	10.15 (7)	17.53 (17)	53.62 (37)	48.45 (47)

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15	Students participate actively during the practical class in the laboratory or on the school farm	28.99 (20)	20.62 (20)	57.97 (40)	61.86 (60)	4.35(3)	6.19 (6)	8.70 (6)	11.34 (11)
16	The teacher uses relevant instructional materials during practical agriculture lessons	52.17 (36)	11.34 (11)	46.58 (28)	56.70 (55)	1.45 (1)	8.25 (8)	5.80 (4)	23.71 (23)
17	The time allotted to practical agriculture on the time table is small	13.04 (9)	8.25(8)	5.80 (4)	30.93 (30)	43.48 (30)	17.53 (17)	37.68 (26)	43.30 (42)
18	Students have opportunity of making use of agricultural science laboratory for practical	14.49 (10)	17.53 (17)	56.52 (39)	51.55 (50)	4.35 (3)	11.34 (11)	24.64 (17)	19.59 (19)
19	The teacher does not know how to teach practical agriculture very well	1.45 (1)	4.12(4)	1.45 (1)	9.28 (9)	53.62 (37)	30.93 (30)	43.48 (30)	55.67 (54)
20	there is inadequate fund to manage practical oriented agriculture science	5.80 (4)	16.49 (16)	46.38 (32)	35.05 (34)	8.70 (6)	17.53 (17)	39.13 (27)	30.92 (30)

286 Field Survey data, 2018.

287 Note: No of Male students (Boys only) =69, No of Female students (Girls' only) = 97. The
288 values in parentheses are the number of students (frequencies)

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4.1.2 Research Question 2

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292 Are there any significant differences in the mean scores obtained by students in PASAT in
293 the six schools (Girls' and Boys' only) in the study area?

294 The results of the one-way ANOVA test (Table 5) to determine if there are significant
295 differences in the mean scores of the students in PASAT for the six schools (Boys' and Girls'
296 only). Since $P = .000$ is less than $\alpha = .05$, we conclude that there are significant differences
297 in the mean scores of students in PASAT among the six schools. Table 6 showed the
298 distribution of scores of students in the two categories of single sex schools while Post Hoc
299 (Tukey HSD) analysis (Post Hoc analysis is a multivariate comparison test employed when
300 there is a significant difference between two or more variables revealed by ANOVA) in Table
301 7 showed the schools with mean scores that are significantly different from each other at 5%
302 significant level. Figure 1 showed the mean plots of the PASAT scores of students in the six
303 schools (Boys' and Girls' only) and Figure 2 and 3 showed the distribution of PASAT scores
304 of students in the six (two categories) schools.

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307 **Table 5. ANOVA test on the six schools (Boys' and Girls' only)**

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Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8879.898	5	1775.980	14.395	.000
Within Groups	19739.298	160	123.371		
Total	28619.195	165			

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318 d Survey data, 2018.

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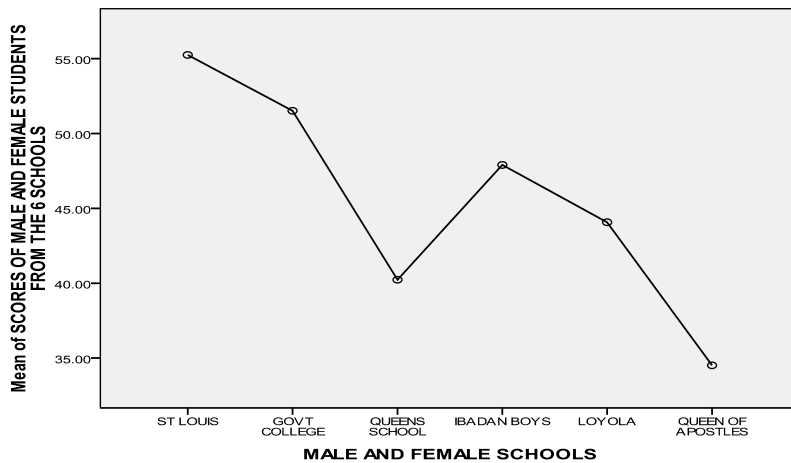
321 **Table 6: Distribution of PASAT raw scores in the two categories of schools**

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Categories of Schools	0%-39%	40%-44%	45%-49%	50%-54%	55%-59%	60%-64%	65%-69%	70%-79%	Total
Girls' only schools	44	13	11	7	7	9	3	3	97
Boys' only schools	13	15	10	9	6	13	2	1	69
Total	57	28	21	16	13	22	5	4	166

323 Field Survey data, 2018

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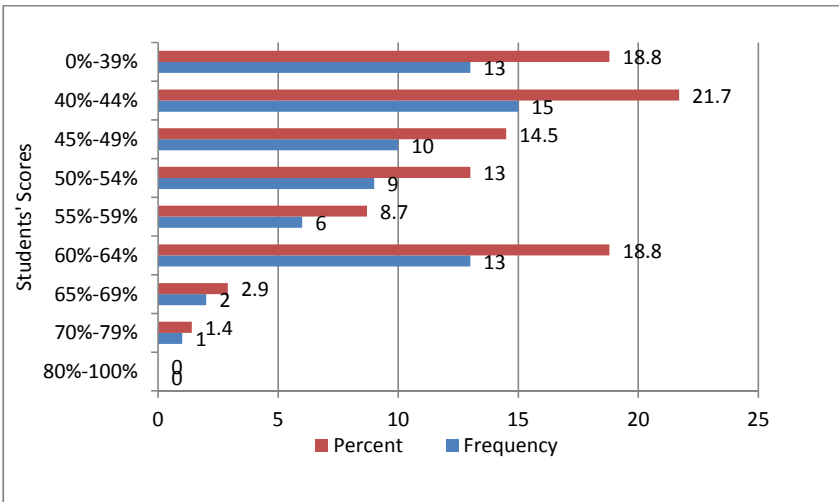
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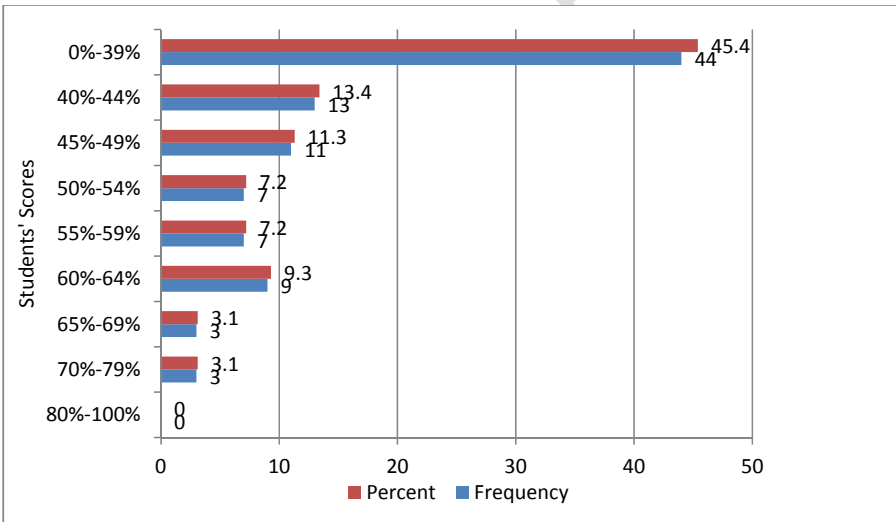
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Figure 1: Mean plots of the scores of students in PASAT for the six (two categories) schools



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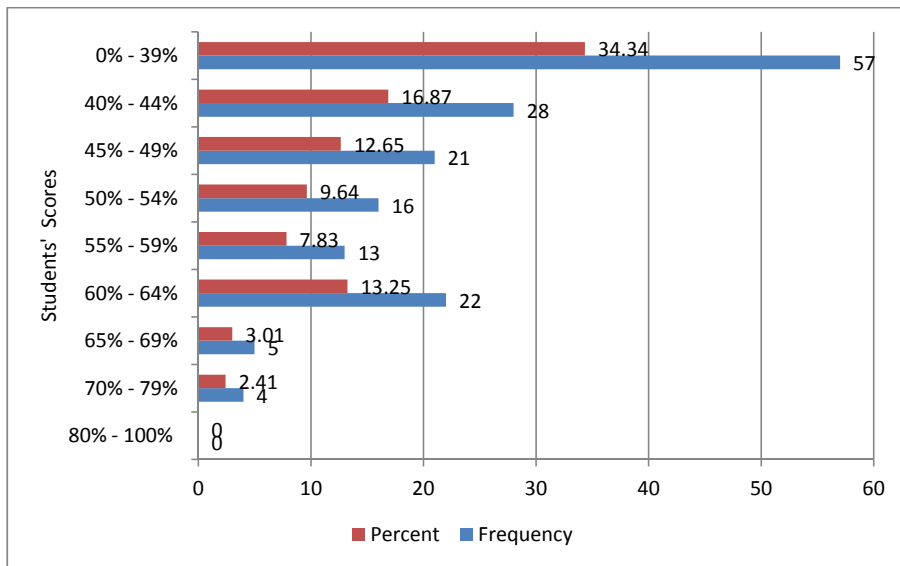
Figure2: Distribution of PASAT scores of students in Boys' only Schools



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Figure 3: Distribution of PASAT scores of students in Girls' only Schools

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Figure 4: Distribution of PASAT scores of students in the six single sex schools

Table 7: Multiple Comparisons - Post Hoc (Tukey HSD) Analysis

(I) Schools	(J) Schools	Mean Difference (I-J)	Standard Error	Sig.
St. Louis Grammar School	Queens' School	15.020*	2.808	.000
	Loyola College	11.176*	3.065	.005
	Queen of Apostles	20.738*	2.808	.000
Government College	Queens' School	11.293*	2.863	.002
	Queen of Apostles	17.011*	2.863	.000
Queens' School	Government College	-11.293*	2.863	.002
	St. Louis Grammar School	-15.020*	2.808	.000
	Ibadan Boys' High	13.390*	3.238	.001
Loyola College	St. Louis Grammar School	-11.176*	3.065	.005
	Queen of Apostles	9.563*	2.961	.019

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Queen of Apostles	St. Louis Grammar School	-20.738*	2.808	.000
	Government College	-17.011*	2.863	.000
	Ibadan Boys' High	-13.390*	3.238	.001
	Loyola College	-9.5625*	2.961	.019

351 Field Survey data, 2018. *The mean difference is significant at the 0.05 level.

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Table 8: Mean Scores of Students in PASAT from the two categories of schools

Category of schools	Number of students	Mean	Standard Deviation	Standard Error Mean	Minimum Score	Maximum Score
Girls' only schools (3)	97	42.72	13.63	1.38	20.00	73.33
Boys' only schools (3)	69	48.00	11.92	1.43	15.56	71.11

355 Field Survey data, 2018

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4.1.3 Research Question 3

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Is there any relationship between academic performance of students in the two categories of schools (Girls' and Boys' only) in practical agriculture and their attitudes to the subject?

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The distribution of scores obtained by the students in single sex schools (Boys' and Girls' only) in PASAT is presented in Table 5. Thirteen (13) agricultural science students in Boys' only schools obtained scores below 40% while quite a large number of students (forty-four (44)) in Girls' only schools had scores below 40%. Meanwhile, fifteen (15) students in Boys' only schools had between 40% and 44% but thirteen (13) students in Girls' only schools had the same score. Thirteen (13) students in Boys' only and nine (9) students in Girls' only schools scored between 60% and 64%. Only one (1) students in Boys' only schools scored 71% while three (3) students in Girls' only schools scored between 70% and 79%. No student scored 80% and above among the six single sex schools. Table 7 and 8 showed the mean scores distribution of the six single sex schools' performance in PASAT. In relation to the students mean scores in PASAT and their attitudinal variables (Table 4) considered in this study, it revealed that ninety-one percent (91%) of male students (Boys' only) and eighty percent (80%) of female students (Girls' only) agreed that school farm is always available for use during practical agriculture. Also, majority of male students, eighty-seven percent (87%) and eighty-three percent (83%) of female students were of the opinion that students participate actively during practical class in the agricultural science laboratory or on the school farm. Even though, agricultural science students in all the single sex schools used for this study responded positively to some major attitudinal variables as mentioned earlier and reflected in Table 3, it has not significantly boost the students' academic performance in practical agriculture.

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Moreover, the result of test of hypothesis (Table 11) revealed that since 0.011 is less than 0.05 (alpha value), we reject the null hypothesis of equality of means of the PASAT scores of students in the two categories of the single-sex schools (Boys' only and Girls' only) and conclude that there are significant differences in the means scores of students in the two categories of single sex schools. The male students had higher mean scores (48.00) than the female students with mean score of 42.72.

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Table 9: Mean Scores of Students (Girls' only schools) in PASAT

Field Survey data, 2018

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Girls' only Schools	No of Students (N = 97)	Mean Score (%)	Standard Deviation	Standard Error	Minimum	Maximum
Queens' School	34	40.23	10.94	1.88	20.00	60.00
St. Louis Grammar School	29	55.25	13.01	2.42	24.44	73.33
Queen of Apostles	34	34.51	7.98	1.37	20.00	48.98

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Table 10: Mean Scores of Students (Boys' only schools) in PASAT

Boys' only Schools	No of Students (N = 69)	Mean Score (%)	Standard Deviation	Standard Error	Minimum Score	Maximum Score
Ibadan Boys High School	18	47.90	13.10	3.09	15.56	64.44
Government College	27	51.52	10.19	1.96	33.33	71.11
Loyola College	24	44.07	12.04	2.46	20.00	62.22

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Field Survey data, 2018

Table 11: t-test for Equality of Means in PASAT (Boys' and Girls' only schools)

Scores of students (male and female) from the six schools	T	df	Sig. (2-Tailed)	Mean Diff	Std. Error Diff	95% Conf. Interval of the Difference	
	2.585	164	.011	5.271	2.040	1.245	9.298

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Field Survey data, 2018

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4.2 Discussion

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From the findings of this research, ninety-seven percent (97%) of the male students (Boys' only) and ninety-five percent (95%) of the female students (Girls only) were of the opinion that practical agriculture (agricultural practical lesson) makes learning more interesting and enjoyable. Moreover, fifty-four percent (54%) of the male students perceived that their parents would like them to take up agriculture as a career in the future but eighty-five percent (85%) of the female students refuted such statement. These results agreed with the findings of [6], [22] and [2] who reported that students enjoyed learning experiences when taken through practical oriented agricultural science lessons and also reiterated blended learning which placed emphasis on students taking control of their own learning environment which is capable of imparting needed agricultural skills on them.

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415 [16] opined that some vocations and professions have been regarded as those separated for
416 male (men) alone such as Agricultural Science, Engineering, arts and crafts among others
417 while others like Catering, Nursing among others are regarded as the juicy choice of the
418 female student. Furthermore, ninety percent (90%) of the male student respondents
419 disagreed to the statement that the subject (Agricultural Science) is for boys alone while
420 ninety-two percent (92%) of female student respondents also supported that the subject is
421 not to be offered by male students alone. This finding was supported by [28], [6], [12] and [2]
422 that revealed in their findings that gender had no significant influence on students' attitude
423 towards the learning of agricultural science.

424
425 Ninety percent (90%) of the male students and ninety-two percent (92%) female student
426 respondents affirmed that school farms are available for practical agriculture while seventy-
427 one percent (71%) male students and sixty-nine percent (69%) female students confirmed
428 that they have opportunity of making use of the agricultural science laboratory for their
429 practical lessons. These findings were in line with the works of [37], [18] and [20] who
430 suggested adequate practical exposure of students to the practice of farming within the
431 provision of available technology in the school.

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433 In Table 6 (Post Hoc analysis), there exist significant differences in the PASAT mean scores
434 obtained by St. Louis (Girls' only) when compared with the mean scores of Queens' school
435 (Girls' only), Loyola College (Boys' only) and Queen of Apostles (Girls' only) at 5 percent
436 significant level. Meanwhile, no significant differences exist in the PASAT mean scores
437 obtained by St. Louis when compared with that of Ibadan Boys and Government College
438 (Boys' only) at 5 percent significant level. From this result, it showed that St. Louis had the
439 best scores in PASAT among the Girls only schools with mean score of 55.25 and the
440 highest among the six single sex schools used for this study.

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442 Considering the mean scores obtained in PASAT by the two categories of schools used for
443 this study and t- test Equality of means in PASSAT (Table 7 and 9), Boys' only schools had
444 better mean score (even though lower than average score) 48.00 while Girls' only schools
445 had 42.72. It was revealed from Figure 2c that only (sixty students) thirty-six percent (36%)
446 of all the six single sex schools scored 50% and above while (one hundred and six students)
447 sixty-four percent (64%) had scores below the average score. It was evident from this results
448 that larger number of the students (male and female) had poor performance in PASAT. This
449 result corroborated the findings of [17] who revealed that male students apparently
450 performed better in Agricultural science than female students and also in certain subject
451 areas especially the science related ones.

452 Moreover, the relationship between students' PASAT scores and their attitudinal variables in
453 this study, it was found out that availability of school farms, use of relevant instructional
454 materials among other variables as confirmed by the students were not enough to bring
455 about better performance in PASAT especially in schools like Queen of Apostles, Queens'
456 school and Loyola College with below average mean scores of 34.51, 40.23 and 44.07
457 respectively. This result agreed with the works of [6] and [2] that there was no association
458 between students' scores in Agricultural Science Achievement Test (ASAT) and teachers'
459 use of relevant instructional materials. Furthermore, these results corroborated the works of
460 [38], [39], [15] and [20] which opined that other factors like high cognitive ability of the
461 students, quality of the school, teacher's teaching methods, home background, influence of
462 old students (Old Boys and Old Girls) association (Alumni association), psychosocial
463 environment of agricultural science classroom among others may necessarily influence the
464 needed boost in the students' academic performance in the subject and ultimately instill in
465 them the required skills and competencies in basic agricultural practices which can make
466 them self-reliant in near future.

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4. CONCLUSION AND RECOMMENDATIONS

473 In this study, significant differences exist in the mean scores obtained by students in PASAT
474 among the six single sex schools. Also, there existed significant differences in the PASAT
475 mean scores obtained by students of St. Louis (Girls' only) when compared with the mean
476 scores of Queens' school (Girls' only), Loyola College (Boys' only) and Queen of Apostles
477 (Girls' only) students at 5 percent significant level. Meanwhile, no significant differences exist
478 in the PASAT mean scores obtained by St. Louis when compared with that of Ibadan Boys
479 and Government College (Boys' only). It showed that St. Louis had the best scores in
480 PASAT among the Girls only schools with mean score of 55.25 and the highest among the
481 six single sex schools used for this study.

482 The result of the hypothesis of equality of means concluded that there are significant
483 differences in the mean scores of the students in PASAT in the two categories of single sex
484 schools used for this study. Considering the relationship between students' PASAT scores
485 and their attitudinal variables in this study, the availability of school farms, use of relevant
486 instructional materials among other variables as pointed out by the students were not
487 enough to bring about better performance in PASAT especially in schools like Queen of
488 Apostles, Queens' school and Loyola College with below average mean scores of 34.51,
489 40.23 and 44.07 respectively. This may be due to factors like; students' cognitive ability,
490 home background, quality of the schools (mostly public schools established by the
491 missionaries), government funding, presence of established and functional Old Student
492 Associations, and educational background of the parents.

493 The findings also revealed that both male and female students found practical agriculture
494 interesting and fascinating (enjoyable). Therefore, we recommend that students (male and
495 female) should be exposed practical agriculture and not limited to the theoretical aspects
496 taught in classrooms alone.
497 Inadequate fund to manage practical oriented agricultural science was one of the important
498 challenges identified. therefore, government and relevant stakeholders (like Parent
499 Teachers Association (PTAs), school alumni association among others) should provide
500 adequate human resources and needed infrastructural facilities for effective teaching and
501 learning of agricultural science in both single sex and co-educational secondary schools in
502 order to achieve better academic performance in the subject.

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COMPETING INTERESTS

507 Authors have declared that no competing interest exists

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REFERENCES

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1. Oji-Okoro, I. Analysis of the Contribution of Agricultural Sector on the Nigerian Economic Development. *World Review of Business Research* 2011. 1(1): 191- 200.

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2. Otekunrin, O. A., Oni, L. O and Otekunrin., O. A. Challenges, Attitudes and Academic Performance of Agricultural Science Students in Public Secondary Schools of Ibadan North, Nigeria. *Journal of Scientific Research & Reports* 2017a. 13(1): 1-11. Doi: 10.9734/JSRR/2017/31216
 3. Inusa BM, Daniel PC, Dayagal DF *et al.* Nigerian Economic Growth and Recovery: Role of Agriculture. *Int J Econ Manag Sci* 2018. 7: 512. doi: 10.4172/2162-6359.1000512
 4. Federal Republic of Nigeria (FRN). National Policy on Education. NERDC Press, Lagos, Nigeria 2004.
 5. FRN. National Curriculum for Agricultural Science for Secondary Schools. Lagos, Nigeria 2007.
 6. Otekunrin, O. A. Students' Attitude and Academic Performance in Agricultural Science: A Case Study of Public Secondary Schools in Ibadan North Local Government Area of Oyo State. Unpublished Postgraduate Diploma in Education (PGDE), National Open University of Nigeria (NOUN) 2014. Doi: 10.13140/RG.2.2.15927.83362.
 7. WAEC (West African Examinations Council) (2015). Chief Examiners' Report. Lagos, Nigeria 2015.
 8. Chukwudum and Ogbuehi (2013). Effective Utilization of the School Farm as Instructional Initiative for Developing Agricultural Interest among Primary School Children in Nigeria. *Academic Journal of Interdisciplinary Studies*, 2013. 2(6). doi:10.5901/ajis.2013.v2n6p113
 9. FAO (Food and Agriculture Organization of the United Nations). Improving child nutrition and education through the promotion of school garden programme 2004. Rome
 10. FAO. Eradicating Extreme Poverty: What is the role of Agriculture? Global Forum on Food security and Nutrition (FSN Forum) 2018. Available at: www.fao.org/CA0989EN/1/08.18
 11. Dlamini, B. The Relationship between Home and School-related Variables and Performance. *J. Agr. Educ. Extension*. 1995. 2: 59- 64.
 12. Darko R.O., Yuan S., Okyere D., Ansah,C.O., and Liu, J. Gender Difference in Attitude towards the Learning of Agricultural Science in Senior High Schools in Assin South District of the Central Region, Ghana. *Journal of Agricultural Science* 2016. 8(9) 19. doi:10.5539/jas.v8n9p143
 13. Blackie, M., Mutema, M. and Ward, A. A study of Agricultural Graduates in Eastern, Central, and Southern Africa: Demand, quality and job performance issues 2009.
 14. Otekunrin, O. A., Oni, L. O and Otekunrin., O. A. Agricultural science Education in Secondary Schools of Ibadan, Nigeria. An Analytical Aproach. LAP Lambert Academic Publishing, Germany 2017a. ISBN: 978-620-2-05199-6

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619
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15. Diise A.I, Zakaria H and Mohammed A.A. Challenges of Teaching and Learning of Agricultural Practical Skills: The case of Deploying Project Method of Teaching among Students of Awe Senior High School in the Upper East Region, Ghana. *International Journal of Agricultural Education and Extension* 2018a. Vol. 4(2), pp. 167-179
 16. Filgona, J and Sababa, L. K. Effect of Gender on Senior Secondary School Students' Academic Achievement in Geography in Ganye Educational Zone, Nigeria. *European Journal of Education Studies* 2017. 3 (4): 394-41
 17. Anyaegbu, B.C., Irebuisi, D and Onyeriri, J. Gender Differences in the Academic Performances of Students in Agricultural Science in Secondary Schools of Isu Local Government Area of Imo State. *Journal of Teacher Perspective* 2013. 7(4): 1-6
 18. Onwumere, M., Modebelu, M.N. and Chukwuka, I.E. Influence of School Farm on Teaching of Agricultural Science in Senior Secondary Schools in Ikwuano Local Government Area, Abia State. *Open Access Library Journal* 2016 3: <http://dx.doi.org/10.4236/oalib.1102742>
 19. Antwi., E. S. A (2017). Improving Pupils Attitude towards Practical Agriculture Lessons among Form Two Agriculture Pupils of Tamale Senior High School. Unpublished Postgraduate Diploma in Education, University for Development Studies, Ghana 2017.
 20. Diise A.I, Mohammed A.A and Zakaria H (2018b). Organizing Project Method of Teaching for Effective Agricultural Knowledge and Skills Acquisition: Comparison of Individual and Group Student Projects. *Journal of Education and Practice* 2018b. Vol.9, No.23 pp 56-66
 21. SCORE (Science Community Representing Education) (2008). Practical Work in Science: A Report and Proposal for a Strategic Framework. Gatsby Technical Education Project publication 2008. Available on <http://www.score-education.org/media/3668/report.pdf>
 22. Deegan D, Wims P and Pettit P (2016). Practical Skills Training in Agricultural Education—A Comparison between Traditional and Blended Approaches. *Journal of Agricultural Education and Extension* 2016. 22 (2).
 23. Fiske, S.T and Taylor, S.E. Social Cognition: From Brain to Culture. New York, NY 2008: McGraw-Hill.
 24. Fishbein, M., & Ajzen, I. Beliefs, Attitude, Intentions and Behaviours Readings, MA 1975: Addison-Wesley Publishing Company.
 25. Baliyan, S.P and Nenty, H.J. Factors Underlying Attitude towards Agriculture as Predictors of Willingness to Enrol in the Subject by Senior Secondary Students in Botswana. *Journal of Educational and Social Research* 2015: 5(1). doi:10.5901/jesr.2015.v5n1p377
 26. Thoron, A.C and Burleson, S. E. Students' Perceptions of Agric science when taught Through Inquiry- Based Instruction. *Journal of Agricultural Education* 2014. 55(1), 66-75. Doi: 10.5032/ Jae.2014.01066

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27. Onuekwusi, G. C., and Okorie, L. I. Attitude of secondary school students in Abia state towards careers in Agriculture. *Agriculture Journal* 2008. 3 (2) 102-106.
 28. Joshua, S. D, Pur, J.T., and Gwary, M. M. Attitudinal disposition of senior secondary school students towards agriculture in Maiduguri metropolitan state. *Agricultural Journal* 2008. 3 (2): 120-124
 29. Shenaifi, M. S. Attitude of students at college of food and agriculture sciences towards agriculture. *Journal of the Saudi Society Agricultural Sciences* 2013. 12(2), 117-120
 30. Akinsorotan, O.A. Effect of School Agricultural Programme of Oyo State on Career Choice of School Students in Ibadan South West Local Government Area of Oyo State, Nigeria 2007. *Agricultural Journal*, 2, 667-671.
 31. Usman KO and Memeh IM. Student and Teacher attitude toward and performance in an Integrated Science/Agriculture Course. *Paper presented at the 47th Annual Central Region Research Conference in Agricultural Education 2007*. St. Louis, MO.
 32. Nsa, S.O; Ikot, A. S and Udo, M. F .Instructional materials utilization and students' performance in practical agriculture. *Journal of Educational Research and Reviews* 2013. Vol. 1(4), pp. 49-54.
 33. Olajide, K., Odoma, M. O., Okechukwu, F., Iyare et al. Problems of Teaching Agricultural Practical in Secondary Schools in Delta State, Nigeria. *International Journal of Innovative Education Research* 2015. 3 (2), 7-12.
 34. Johnson, D. M. (1991). Student Achievement and Factors Related to Achievement in a State FFA Agricultural Mechanics Contest. *J. Agr. Educ.* 1991. 32(3): 23-28.
 35. Randl, S. R., Arrington, L. R. and Cheek, J. G. The Relationship of Supervised Agricultural Experience Program Participation and Student Achievement in Practical Skills in Agricultural Science. *J. Agr. Educ.* 1993 (34): 26- 33.
 36. Hedjazi Y and Omid, M. Factors Affecting the Academic Success of Agricultural Students at University of Tehran, Iran. *J. Agric. Sci. Technol.* 2008. Vol. 10: 205-214
 37. Ladele, A.A and Agbebaku OM (2006). Analysis of entrepreneurial skills development through farm practical training programmes of University of Ibadan and University of Agriculture, Abeokuta. *Journal of Agricultural Extension* 2006. Vol.9. 14-22
 38. Daluba, N. E. Effect of Demonstration Method of Teaching on Students' Achievement in Agricultural Science. *World Journal of Education* 2013. 2013: 3 (6), 1-7. doi:10.19044/esj.2016.v12n4p395
 39. Modebelu MN, Duvie AN. Innovative methods and strategies for effective teaching and learning. *Mediterranean Journal of Social Sciences.* 2012; 3(13): 145–54.

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