Appraisal of the Impact of Agricultural Science Teachers Computational Skills on Student's Learning Outcomes in Secondary Schools, Nigeria

Famiwole, Remigius O. (Ph.d)

Email: remifamiwole@gmail.com

Odu, Bimbola Kemi (Prof.)

Email:bimbolaodu@yahoo.co.uk

Popoola Abiodun A. (Ph.d)

Email: popabiodun2013@gmail.com

Ayodele, M. Olagoke (Ph.d)

Faculty of Education, Ekiti State University, Ado-Ekiti, Nigeria
Email: goksmann@yahoo.com

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Abstract

This study investigated the impact of the computational skills of teachers of Agricultural Science on student's learning outcomes in secondary schools in Nigeria. The descriptive research design of the survey type, ex-post-factor were adopted in the study. The sample used consisted of 60 teachers and 300 students of Agricultural Science who were randomly selected from the 320 secondary schools in Ekiti State, using purposive sampling technique. Two sets of questionnaires and a structured questionnaire were used for data collection. The data collected were analyzed using frequency counts, percentages, mean, standard deviation, t-test and ANOVA. Hypotheses were tested at 0.05 level of significance. The study revealed that the teachers often avoid teaching computational contents of the curriculum. The students were found to be faced with poor Mathematical problem solving skills in Agricultural Science. Based on the findings of the study, it was recommended that school supervisors should monitor the teachers output and ensure that all areas of the curriculum, including contents requiring computations, are adequately covered. Teachers of Agricultural Science should groom their students very well in calculations and mathematical problem solving areas of the curriculum right from the Junior Secondary School, year one. The students poor learning outcomes in mathematical problem solving exercises call for retraining programs for the teachers and motivational packages for the students.

Keywords: *Agricultural Science Curriculum, Teachers Computational Skills, Student Learning Outcomes, Performance, Competencies*

1. Introduction

Mathematics is generally considered a basic tool for optimum performance in all occupational and Agricultural endeavors (Gliem and Warmbrod, 1985). It is the science of numbers, based on the ability to add, subtract, multiply, divide number and construct many shapes using percents, decimals, and multi-step word problems. Papritan (1978) noted that students of Mathematics are required to have basic arithmetic skills necessary for solving problems in the instructional units. In agriculture, also, instructions and learning experience in both cognitive and psychomotor domains are expected to prepare the learners to develop basic competency in computational skills in Farm Mathematics but it appears the situation in Ekiti State Secondary School is not so.

Skill, according to Hull (1992), was defined as manual dexterity acquired through the repetitive performance of an operation. According to Hornby (1980), skills involve the ability to do something expertly well. Aderogba (2011) expressed skills as the possession of expertise needed to perform a particular job or tasks and in essence, it ought to consist of habit that ensures adaptation. Olaitan (2010) posits that although students might have studied Mathematics in school as a subject, teachers of Agricultural Science or Agricultural Education should not overlook the teaching of the application of Mathematics to Agriculture. According to him, Mathematics is very important in calculating the area of the school farm,

yield of crop per hectare, profit or loss accruing from farm enterprise, amount of feed needed per head of animal per unit body weight gain, amount of work done by tractor to ascertain efficiency, the bulk density of soil, soil PH, soil analysis experiments and rate of fertilizer application among others.

It has been observed by the researchers that those who do not posses basic skills in Farm Mathematics are usually disadvantaged in solving farm problems or carrying out some farm activities successfully. In which case, lack of effective technical skill in Mathematical calculations had been noted by Gliem and Warmdrod (1985) as being significant in creating problems on a long run, whenever a student of Agriculture is selecting and preparing for a life long career after graduating from school and colleges in Nigeria. Popoola (2013) remarks that if student's studying Mathematics are not adequately prepared in basic skills development, they may experience difficulty in finding employment and in later performance on the job. The ability to compute well are therefore regarded as very critical to subsequent learning and employability of a student entering the labour market.

It has been observed by Burton, Daane, and Giesen (2008) that teachers of Mathematics have little knowledge and understanding of school Mathematics than is required for the task they face in the classroom. According to them, many teachers of Mathematics in many countries have less than the required knowledge of the content of Mathematics they teach. These conditions can probably be informed by the extent of the relevance and mastery of the content of the curriculum which the teachers were exposed to during their training. In the same context, if the Agricultural Science curricular in the training departments, schools or colleges were full of topics in Farm Mathematics and the teachers were able to master the topics, perhaps they would be able to display high level of competency and preparation in the mastery of computational skills in Farm Mathematics contents (Popoola, 2013). A teacher cannot teach more than what he/she knows or had been exposed to.

Learners generally are expected to engage some activities in the school before learning can take place. The learning can takes place is the result of students – teachers reaction and their environment. For a successful achievement of educational objectives and enhanced learning outcome, contents or subject matters to be learnt must be carefully selected to meet student individual deference's through learning by doing. Students background knowledge is also very essential when they are computing or learning new concepts. The prior knowledge of both the student and teacher can help them to understand new lesson especially when they are activated and they serve as pre-requisite information. Popoola (2013), noted that professional teacher should give adequate attention to the prior knowledge of the students most especially when dealing with computations exercise.

Teachers of Agricultural Science are exported to link the theory in the classroom with practicals and computational problem solving content of the curriculum for a worthwhile learning outcome, and effective transfer of learning experience. It has been observe that teachers experience plays a big role in the effectiveness of every teaching and learning process. Teachers with more years of experience had been observed to be able to teach more effectively than the beginning teachers, Whitelaw et al (2000) states that teachers sex is an important variable related to pupils performance. Gender traits in boys and girls have shown in their attitude towards Agricultural Science. There is a bias that majority of females still choose not to opt for Agricultural science. The differences in the persistence of males and females studying Agricultural Science have been a topic of concern to researchers in Agricultural Science Education for years. Similarly, it has been observed that male teacher have more positive attitude towards the teaching of Agricultural Science, achieve better and have higher preferences for Agricultural practicals and Mathematical problem solving in Agriculture than female teachers. Gender in this case is the behavioural, cultural or psychological traits associated with ones sex.

Defining the major roles of the teachers of Agriculture in schools and college, Olaitan (2011) posited that a teacher of Agriculture is not only a "common teacher" but also a technician in Agriculture. According to him, the roles of a teacher of Agricultural Science differ to some extent from that of the other teachers in the school system because they are expected to deal with cognitive, psychomotor and affective outcomes of teaching learning process. The teacher of Agricultural Science is often looked upon as a master of definite skills in mathematical and problem solving skill. This means therefore, that the teacher of Agricultural Science are supposed to give all round education to their students as well as helping them to acquire definite skills that are necessary for efficient performance in all aspects of agriculture where the learner may wish to specialize.

Teachers of Agriculture are expected to teach Mathematical aspect of the subject either in soils science, crop and livestock Husbandry, agricultural engineering or farm survey and the likes. The National Curriculum Council,(NCC) specified that Agricultural Science should be taught in secondary schools in other to create and sustain students interest in agriculture, and to serve as a foundation for future advancement in the study of Agricultural Science (NCC, 2009). This study intends to appraise the impact of Agricultural Science teacher's computational skills on students learning outcome in secondary schools in Ekiti State, Nigeria.

2. Research Questions

1. What are the computational skill development areas of the curriculum covered by the teachers of Agricultural Science in secondary schools in Ekiti State, Nigeria?
2. What is the level of students learning outcomes in mathematical problem solving areas of Agricultural Science curriculum in secondary schools in Ekiti State, Nigeria?

3. Hypotheses

The study tested these hypotheses:

HO_1: There is no significant difference in the computational skills possessed by female and male teachers of Agricultural Science secondary schools in Ekiti State, Nigeria.

HO_1: There is no significant difference in the mathematical problem solving areas of the curriculum covered by the teachers of Agricultural Science based on their years of experience.

4. Methodology

The descriptive research of the survey design and ex-post-facto were adopted in the study. The population of the study was the teachers of Agricultural Science and students in the Senior Secondary Schools studying Agricultural Science in Ekiti State, Nigeria. The sample used consisted of 60 teachers and 300 Senior Secondary School (SSS 3) students of Agricultural Science who were randomly selected from the 320 secondary schools in the state using purposive random sampling techniques. Two sets of instruments and an achievement test were used. Instrument A consisted of 3 items to solicit information from the teachers on what area of the curriculum, theory, practice or problem solving content they had been teaching. Instrument B consisted of 22 items to determine the computational skill development areas of the curriculum that were taught or covered by the teachers of Agricultural Science in secondary schools in Ekiti State, Nigeria. The questionnaire was used as a structured interview/observation for the teachers to determine the level of coverage of the curriculum area in crop production, Agricultural Economics and Agric-business, Agricultural Engineering and Mechanisation, Soil Science and Animal husbandry. A set of mathematical problem solving test was drawn from the Senior School Certificate Examination past question, (SSCE, 2008-2013) to test the student's level of achievement or learning outcomes in farm mathematics.

The instrument was face and content validated yielding a reliability co-efficient of 0.79 through test and retest method. The collected data were analyzed using frequency counts, percentages, mean, t-test and ANOVA. The hypotheses were tested at 0.05 level of significance, using Pearson Moment Correlation Coefficient.

Table 1: Mean and Standard Deviation responses on Computational skill development areas covered by teachers

	Curriculum areas requiring computations	Mean	Std. Deviation	Remarks
A.	**Crop Production**			
a.	Calculation of seed Germination Test/Viability	2.73	.936	Partially covered
b.	Calculation of Farm area	3.03	.882	Partially covered
c.	Volume of herbicide to spray per Hectare	2.45	.872	Partially covered
d.	Planting seed rates per area of land	2.58	.1.109	Partially covered
B.	**Agric Economics/Agric Business**			
a.	Calculation of depreciation	2.42	.962	Partially covered
b.	Calculation of profit and loss	2.83	.960	Partially covered
c.	Calculation demand and supply of farm produce	2.88	.825	Partially covered
D.	**Agric Mechanisation And Engineering**			
a.	Percentage of loss during harvest of crop	2.18	.930	Partially covered
b.	Rate of work perform per tractor/hectare	1.23	.427	Poorly covered
c.	Tractor efficiency performance	1.03	.258	Poorly covered
d.	Percentage discount on farm implement	1.00	.000	Not covered
D.	**Soil Science**			
	Calculation of ; a. Soil pH	1.00	.000	Not covered
	b. Rate of fertilizer application	1.00	.000	Not covered
	c. Soil alkalinity	1.57	.810	Poorly covered

	d. Irrigation and drainage rate	1.00	.000	Not covered
	e. Mechanical soil analysis	1.00	.000	Not covered
E.	**Animal Production**			
a.	Population of livestock per space per pen/house	1.00	.000	Not covered
b.	Percentage mortality of livestock	2.71	.767	Partially covered
c.	Feed ration formulation	2.97	.863	Partially covered
d.	Meat live weight gain per day/livestock	2.77	.945	Partially covered
e.	Percentage feed consumption per livestock	1.00	.000	Not covered
f.	Meat dressing percentage	1.00	.000	Not covered

Responses from Table 1 reveals that 11 items were partially covered, 3 were poorly covered while 8 were not covered. The findings shows that calculations of farm areas was mostly covered (X = 3.03; SD .882).

Table 2: Percentage scores on mathematical problem solving test by senior secondary school (SS3) students

Scores	Frequency	%	Cumulative %
0	09	3	3
1	11	3.67	6.67
2	14	4.67	11.34
3	12	4	15.00
4	45	15	20.00
5	53	17.67	47.01
6	41	13.67	60.68
7	23	7.67	68.35
8	02	67	69.02
9	09	3	72.02
10	17	5.67	77.69
11	10	3.33	81.02
12	14	4.67	85.69
13	09	3	88.69
14	15	5	93.69
15	16	5.33	99.02
Total	**300**	**100**	**100**

Table 2 presents the scores on mathematical problem solving test by SS 3 students reflecting their learning outcome. The scores ranges from 0 to 15. Most of the students score clusters around 4, 5 and 6 indicating low performance or achievement.

Table 3: Frequency counts and percentage response of teachers of agriculture in secondary schools

S/N	Items	*f*	%
1.	I prefer teaching theory and farm practicals	35	58.3
2.	I prefer teaching theory alone	17	28.3
3.	I prefer teaching theory, practical and problem solving contents	08	13.3
	Total	**60**	**99.9**

Information contained in Table 3 shows that 58.3% (35) of the respondents prefer to teach theory and farm practicals. Only 13.3% (8) respondents prefer teaching both theory, practical and problem solving content.

Table 4: t-value of respondents computational skill based on sex

Variable Sex	No	X	Sd	df	Cal t-value	Critical t	Remark
Male	43	41.69	2.56	58	0.19	1.96	NS*
Female	17	41.76	1.99				

NS = Not significant at 0.05 level of significance

Table 4 shows that the calculated t-value (0.019) is lesser than the critical t-value (1.96) at 0.05 level of significance and 58 degree of freedom. The hypothesis is therefore accepted. The implication is that there is no significance difference in the computational skills possessed by the respondents based on sex (male and female).

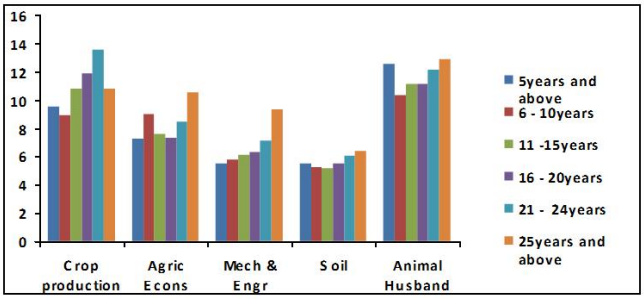
Table 5: ANOVA description of the computation skill development curriculum content covered by teachers based on their years of experience

	Sum of Squares	df	Mean Square	F-cal	Sig.
Between Groups	913.784	5	182.757	2.000	.93*
Within Groups	4935.199	54	91.393		
Total	**5848.983**	**59**			

Table 5 shows Fcal 2.000 is significant at .093. Thus, the hypothesis is rejected, that is there is significant difference in the computational skill development area (curriculum content) covered by the teachers of Agricultural Science based on their years of experience.

Figure 1 below further illustrates the significance of the differences in the content areas covered by the teachers based on their years of experience. Computations in Soil Science and Agricultural Mechanical/Engineering appeared to be less covered. Teacher with 21-24yrs and 25 years and above in teaching experience covered more grounds than other sets of teachers.

Fig. 1: Illustration level of significance in the curriculum content areas covered by the teachers, based on their years of experience.



5. Discussion of Findings

The study revealed that the teachers partially covered the curriculum areas requiring computation. This finding is related to the observations of Oyinloye and Popoola (2011) that prior knowledge is considered a very important factor in the teaching and learning process. According to them, the prior knowledge of the teacher helps in their lesson delivery process. When a teacher has a strong background knowledge of the topic to be taught, he/she becomes confident to teach and more resourceful to accomplish the set goals. This might be responsible for the poor performance of students in the test given to them. Most of the computation areas were either poorly covered or not taught at all. None of the computation areas were well taught. This might be responsible for the poor performance of students in their learning outcomes. According to Papritan (1978) student of vocational agriculture are required to have basic arithmetic skills that are necessary for solving agricultural and instructional problems. Similarly, Olaitan (2011) emphasized that the teachers perception of a subject matter is a factor for and against quality delivery of vocational and pre-vocational education subjects like Agricultural Science. In which case, the teacher should always teach computational problem solving topics in the curriculum so as to develop students interest in worth while Agricultural practices during and after leaving the school.

The null hypothesis shows that there was no significant difference in the computational skills possessed by both male and female teachers. This finding is in line with Popoola (2013) that prospective male and female teachers have little knowledge and understanding of school Mathematics than is required for the task they face in the classroom. Haylock and Cockbum (2003) and Lamb and Booker (2003) also noted that teachers do not feel comfortable in teaching Mathematics related content. The lack of confidence is as a result of lack of understanding of Mathematics contents and

low level of Mathematics attainment while in school without any gender biased. Teachers either male or female, should therefore braise up to meet up with the challenges of modern day Agricultural Science and Vocational Agriculture curriculum.

The second hypothesis reveals that there is significant difference in the computational skill development area of the curriculum covered by the teachers based on their years of experience. Experience is the best teachers Teachers performance is a function of their background and techniques for creating an effective instructional outcome. A teacher generally, is a person who helps another person to learn something more quickly and easily than the learner could by himself. The teacher therefore, requires the most effective communication skills, the most balanced temperament, the largest variety of useful instructional materials and equipment, and the most conducive working or training environment to make the teaching of farm mathematics realizable (Umar, 2008).

6. Conclusion

Based on the findings of the study and the discussion that followed, the following conclusions are drawn.

1. Teachers of Agricultural Science in secondary schools in Ekiti State partially teach the computational problem solving contents in the Agricultural Science curriculum.
2. The teachers probably have poor background in computational skill thereby making it not convenient for them to adapt to the modern requirement in Agricultural Science in schools.
3. Students poor performance in the Mathematical problem solving test is an indication of the low level of preparation from their teachers.
4. There is no significant difference in the computational skills possessed by respondents based on their sex (male and female).
5. There is no significant difference in the mathematical problem solving areas of the curriculum covered by the teachers of Agricultural Science based on their years of experience.

7. Recommendations

The findings of this study clearly showed that there is the need to address the issue of effective teaching and learning of 'computational problem solving techniques' in secondary schools.

In view of this, the following recommendations are considered relevant.

1. School supervisors should effectively monitor the teachers output and ensure that all areas of the course content including areas that require computations are adequately covered.
2. Teachers of Agricultural Science should develop their students very well in calculations and Mathematical problem solving areas of the curriculum from the Junior Secondary year one
3. Teaching and learning process on the school farm, in the laboratory, on storage facilities, in workshops should emphasis elements of computational problem solving skills in Agricultural operations.
4. Teachers of Agriculture should constantly upgrade themselves by attending workshops and re-training programmes and computer literacy classes so as to be relevant conversant with modern instructional delivery strategies.
5. All students of Agricultural Science should take pleasure in solving farm Mathematical problems in their day to day activities on the farm.
6. The curriculum should be reformed or re-engineered to include more computational problem solving contents and learning experience.

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