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Development of Machinery Shed As a Teaching Resource: Implication on Students' Performance and Practice of Concept

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Abstract: *Not using required environment and lack of teaching resources can adversely affect students' academic performance. This research focuses on development of machinery shed as a teaching resource and its implication on students' performance and practice of concept. The population for the study consisted of all students of agricultural education both in degree and NCE during first semester of 2021/2022 academic session. 36 samples were drawn from each arm and from the samples drawn, 18 students were randomly selected for learning at the machinery centre whereas another 18 students randomly drawn were taught in the traditional classroom environment. Both groups were taught the same topics. The result shows mean scores of 18.31 and 12.56 for those at machinery centre and those at traditional classroom respectively. In both cases, the result compared using t-test yielded a positive result for students taught at the machinery shed irrespective of levels of classes.*

Keywords—teaching resources, Machinery, Evaluation, Academic, Performance

1. Introduction

Agriculture is the bedrock of growth as well as national development and higher institutions of learning have been recognized as channels for driving this growth. In pursuance of this and as enshrined in the Nigerian certificate in education minimum standards [1], the Federal Government approved establishment of agricultural education and science departments in various institutions of learning. This no doubt is to boost the acquisition of knowledge which will aid the transformation of farming processes through mechanization for the actualization of its policy of promoting self-reliance in food production and poverty eradication [2]. However, for this to be realized, education must be transformed from the theoretical abstraction in classrooms to a tangible proof of policy actualization on method adoption, farm expansion and increase food production. Government effort in this regard has been scaled up by the supply of farm power and machineries to various institutions of learning including colleges of education through its organ: the tertiary education trust fund (tetfund).
Farm mechanization involves the use of machines on the farm to execute various farming activities from land clearing to post-harvest. Report has shown that farm power and technologies beyond simple farm tools of hoes and machete proved to be more advantageous in terms of land area cultivated, total yields achieved, levels of drudgery reduced, prospects of expansion and redeployment of family labour as well as household food security. According to research households depending largely on manual labour as farm input cannot expand beyond subsistence level. This is true because when a household works with hoe, they can cultivate just up to 1.5 ha per year, but with tractors, cultivated land goes beyond 20 ha per year [3]. Federal and state government of Nigeria knowing that agriculture remains the bed rock of growing nations have beside approving departments to offer theoretical agriculture in tertiary institutions approved the deployment of farm power and machineries for practical demonstration of real intention which is to inculcate the concept of increase food production with less labour through farm mechanization. Achieving this will require new approach which is focused on re-definition of the educators' – lecturers or teachers' role from the transmitter of content to a facilitators of learning [4]. This will involve both availability of teaching resources and teachers creative capability to drive learners beyond specified content to learning motive or intent which in this case is the effective replication of learned concept in classroom situation to practical application in real life situation to improve household farming practices [5, 6].

It is important to note however that it will be clearer how lecturers will change their teaching strategies and focus on what and how students learn more especially when provision is made beyond the teaching content to making available teaching resources. This will encourage a shift from methodology that promotes mastery of content to constructivist ones that help learners to build their knowledge using action- based learner centered approaches [7].

The introduction of farm mechanization in secondary school agriculture and the deployment of farm machines to tertiary institutions is a real motivation and the motivation to mechanize is primarily driven by the fact that students haven been subjected to the theoretical and practical application of the machines and witnessing its benefits on the school farm will on graduation wish to transfer knowledge gained to increase family's food security, increase household income, or improve their quality of life [3].

There appears to be a disconnect between what the students should really learn in practical terms to be stimulated so as to embrace enthusiastically the concept of farm mechanization and what is specified in the curriculum content. Hence the effect of the machines

base on its intended objective may not be felt to a replicative degree by the students on graduation. The challenge of this situation will be promotion of unemployment, propagation of wastage of human resources and acceleration of static knowledge [8]. [9] reiterated that the major role of instructional materials is to provide a wide range of alternative avenues through which the same unit of instruction can be presented to learners. He submitted that the effective utilization of instructional aids in schools, makes students to learn in a meaningful way and so, they become actively involved mentally, perceptually and substantially.

To this end, educational system that focuses on what the learners can learn [10] and not just what the teachers are required to teach has been advocated with the understanding that teaching can be ineffective when it focuses solely on the transmission of curriculum content without considering whether anything is being learnt [11]. According to [12], teaching should go beyond the theory that content can completely be passed to students because all learners will inevitably obtain the correct content. This may be the case if it is used to prepared student only for passing examination and acquiring certificate as a target.

However, research has to the contrary shown that this is not the case as learners need to be engaged actively in the learning process which must be supported and supervised with clear intention to be profitable and focused on developing the learner's desire to be skillful and employable after graduation [13]. Availability and use of teaching resources in terms of farm machinery has a great role to play in educating students in the concept of improved farming as it can determine teaching method hence steering teachers toward students and employment through replicative skill as the focus on the teaching and the learning process [14, [15].

This research is therefore designed to ascertain the effect of availability and use of farm machinery as teaching resources in promoting the concept of farm mechanization compared to traditional classroom learning situation.

2. **Methodology**

A farm power and machinery teaching, demonstration and discussion shed measuring 9m x 5m was developed. The tractor and other machinery for tillage, planting and fertilizer application were arranged and labeled. Operational components of each machinery were also labeled and spaces for moving around the machineries for observation was provided.

The population for the study consisted of all students of agricultural education both in degree and NCE during first semester of 2021/2022 academic session. 36 samples of the students' population were drawn from each arm and from the samples drawn, 18 students were randomly selected for learning and performance evaluation at the developed farm power and machinery demonstration and discussion shed (experimental group) whereas another 18 students randomly drawn were taught and evaluated in the traditional classroom situation for each of the categories.

The same topics drawn from farm power and machinery for farm mechanization namely: plough, harrow, ridger, planter and plant maintenance machinery-seed drill cum fertilizer distributor were used to teach the Degree group DA (control group). They were taught by explanation of concepts, listing and explanation of components making up specified tillage equipment and their interconnectivity during operation on the farm. The instruction was conveyed by means of pictures and sketch of components. On the other hand, the experimental groups, Degree group DB, were taught at the machinery shed. The students were taught by direct reference to the entire framework of the machine. Each component was identified by direct touch during listing while the students observed and how components were connected for farm work was demonstrated. Where necessary, some parts of the machine were measure and dimensions recorded by the students. Discussion followed demonstration and explanation. The student worked round the machine and felt the various components after the class. Similar approach was used for the NCE students, NA for the control group and NB for the experimental group. After the classes in the different learning environments and teaching resources spanning two weeks for each categories, a concept based multiple choice test questions was administered. Figures 1 and 2 shows the students learning at the different environment with different resources.

Fig.1: Students taught at farm power and machinery shed examining and taking notes of machine parts and functions

Fig. 2: Student learning at the traditional classroom situation paying attention and taking notes

Data Analysis

Data obtained was compared using t - test

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3. Results and discussion of findings

Table 1: Response score of students taught at the farm machinery centre and in traditional classroom

Degree		NCE	
Experimental group DB scores	Control group DA scores	Experimental group NB scores	Control group NA scores
19	13	17	7
17	11	18	10
20	14	18	8
16	10	15	9
18	11	18	11
19	14	18	9
20	12	17	8
17	12	18	11
16	11	16	10
18	14	16	9
19	13	19	11
20	13	17	10
17	12	19	10
20	15	16	8
19	14	17	7
18	12	19	9

Table 1, shows scores for experimental and control group for student in Degree and NCE. In both cases, the experimental group scores are higher. Table 2 is the result of statistical evaluation of the students' performance with respect to statistical significance difference in the scores for degree students. From the table the t-stat is far higher than t-critical in the t-test analysis at 5% significance.

Table 2: Performance evaluation of students' scores at the teaching environments (Degree students)

Experimental group DB scores	Control group DA scores
19	13
17	11
20	14
16	10
18	11
19	14
20	12
17	12
16	11
18	14
19	13
20	13

t-Test: Two-Sample Assuming Equal Variances

	Variable 1	*Variable 2*
Mean	18.3125	12.5625
Variance	1.9625	1.995833333
Observations	16	16
Pooled Variance	1.979166667	
Hypothesized Mean	0	
df	30	
t Stat	11.56036787	
P(T<=t) one-tail	7.04858E-13	
t Critical one-tail	1.697260887	

17	12	P(T<=t) two-tail	1.40972E-12
20	15	t Critical two-tail	2.042272456
19	14		
18	12		

The result shows that there is a statistical significant difference among the population mean of the scores of the degree students.

Table 3 shows the result of statistical evaluation of the students' performance with respect to statistical significance difference in the scores for NCE students. From the table the t-stat is far higher than t-critical in the t-test analysis at 5% significance.

Table 3: Performance evaluation of students' scores at the teaching environments (NCE students)

Experimental group NB scores	Control group NA scores			
17	7	t-Test: Two-Sample Assuming Equal Variances		
18	10			
18	8		*Variable 1*	*Variable 2*
15	9	Mean	17.375	9.1875
18	11	Variance	1.45	1.7625
18	9	Observations	16	16
17	8	Pooled Variance	1.60625	
18	11	Hypothesized Mean Difference	0	
16	10	df	30	
16	9	t Stat	18.27215355	
19	11	P(T<=t) one-tail	4.15719E-18	
17	10	t Critical one-tail	1.697260887	
19	10	P(T<=t) two-tail	8.31439E-18	
16	8	t Critical two-tail	2.042272456	
17	7			
19	9			

Similarly the result shows that there is a statistical significant difference among the population mean of the scores of the NCE students.

Table 4 shows the scores of students for both Degree and NCE after they were taught and assessed in the traditional classroom. From the table, there is difference in this scores and t – test analysis shows that this difference is statistically significant.

Table 4: Performance evaluation of students' scores in the traditional classroom (Degree/NCE students)

Control Group DA	Control group NA			
13	7	t-Test: Two-Sample Assuming Equal Variances		
14	10			
14	8		*Variable 1*	*Variable 2*
13	9	Mean	13.9375	9.1875
16	11	Variance	1.529166667	1.7625
15	9	Observations	16	16
12	8	Pooled Variance	1.645833333	

14	11	Hypothesized Mean Difference	0
16	10	df	30
13	9	t Stat	10.47238684
15	11	P(T<=t) one-tail	7.72374E-12
14	10	t Critical one-tail	1.697260887
15	10	P(T<=t) two-tail	1.54475E-11
12	8	t Critical two-tail	2.042272456
13	7		
14	9		

Table 5 shows the scores of students for both Degree and NCE after they were taught and assessed in the farm power and machinery centre. From the table, there is difference in the scores but the t – test analysis shows that this difference is not statistically significant.

Table 5: Evaluation of students' scores from farm machinery centre (Degree/NCE students)

Experimental group DB score	Experimental group NB score
19	17
17	18
20	18
16	15
18	18
19	18
20	17
17	18
16	16
18	16
19	19
20	17
17	19
20	16
19	17
18	19

t-Test: Two-Sample Assuming Equal Variances

	Variable 1	*Variable 2*
Mean	18.3125	17.375
Variance	1.9625	1.45
Observations	16	16
Pooled Variance	1.70625	
Hypothesized Mean Difference	0	
df	30	
t Stat	2.029994857	
P(T<=t) one-tail	0.025653215	
t Critical one-tail	1.697260887	
P(T<=t) two-tail	0.05130643	
t Critical two-tail	2.042272456	

The scores of the students in the test conducted differs and signifies the reproducibility capability of individual student based on how the information was registered and held in the student's mind depending on the teaching method used.

3.1. Discussion of findings

Table 2, showed a higher score for the students taught at the resource centre. Comparatively, there is a statistical significant difference in the mean population of the two groups. This was possible because demonstration was used often with discussion during the learning period. Gesture was used to draw students' attention to a machine part and to emphasize function and operational procedure and give a vivid description of reality and not abstraction in space. This method created visual contact that focused the students, providing a means of passage and possible retaining of point emphasized. Being surrounded by the instructional material, it was possible for the student and the lecturer to ask the desired question and stimulate exchange of thought that arouses the student's interest and help the student to reason on the point emphasized. The student were made to think actively and not listen passively. The farm machineries served as visual aid, it made teaching more effective as it held the student attention, make points clearer and create more lasting impression on the mind of the students. In agreement with [14], instructional resources provide bases upon which teachers can guide students in the learning process making it easier for recall and practice of concept subsequently.

On the other hand, the scores of the students taught in the traditional classroom is relatively lower. This was because in this environment, the teaching method is more of lecture whereby students takes notes dictated to them by the lecturer and their focus is divided between listening attentively to get the main points stressed, translating what is heard correctly in writing and writing fast

enough to meet up with the pace of the lecturer. Even with lecture notes or textbook provided, students become more passive and easily disconnected than active as communication become one way from the lecturer to the student. In the first case, though the notes taken aids in later recall, this interferes with immediate retention of information communicated in the lecture which is the bases for replication during assessment. Also because of coordinating listening attentively and writing correctly, the notes taken may be disjointed, illegible and unable to fulfil its objective of aiding recall of the main point during assessment which explain comparatively lower results obtained for both degree and NCE classes. In line with [16], without availability and effective use of instructional resources, students' performance will be very low and recall in case of practice of concept difficult.

When the traditional method was used for both the degree and NCE classes as shown in tables 2 and 3, their scores were respectively lower compared with the experimental method. However as shown in table 5 where the students were taught with the same method, it is observed that though the scores of the students differs, there was no statistically significant difference for both classes of degree and NCE students. These results highlighted the importance of adopting the experimental method because it produces similar and higher positive effect of retention and recall on students as well as ability to replicate the concept of farm mechanization in practical situation. This is in agreement with [17], using farm machinery as teaching resources could increase the effectiveness of teaching and learning of agricultural science as a subject as many students would besides improving their academic performances be able to acquire needed skill to direct the use of farm machines.

4. Conclusion

In teaching practical oriented course such as farm power and machineries, there is need to beside making the equipment available provide structures that can serve for machinery protection, teaching and demonstration environment. Such teaching in a practical demonstration environment as shown in this research will in addition of making demonstration and discussion method an integral part of teacher's communication also stimulates the student to be actively involved, producing a positive effect of retention and recall.

References

[1] National Commission for Colleges Education (2021). Nigerian certification in education minimum standard, NCCE, Abuja.
[2] National Policy on Education. (2014), NERDC Press, Yaba, Lagos, Nigeria
[3] Bishop-Sambrook C. (2005). Role of farm power to smallholder livelihoods in sub-Saharan Africa, *Food and Agriculture Organization of the United Nations*
[4] Abimbade, A. (2002). Principles and practice of education technology. International publishers limited, Ibadan.
[5] O'Dwyer, L. M., Wang, Y., Shields, K. A. (2015). Teaching for conceptual understanding: A Cross-national comparison of the relationship between teachers' instructional practices and student achievement in mathematics. Large-scale Assessments in Education, 3(1), 1-30
[6] Boonen, T., Van Damme, J., Onghena, P. (2014). Teacher effects on student achievement in first grade: which aspects matter most? School Effectiveness and School Improvement, 25(1), 126-152.
[7] Vermertte P. J. (2009). Making cooperative learning work, student terms in K-12 classroom. Upper Saddle River, Prentice Hall.
[8] Kabugi S.W. (2013). Challenges to teaching and learning of agriculture in secondary schools in Kakuyuni Division, Kangundo district, Machakos County, Kenya. Unpublished M.Ed., Kenyatta University, Kenya.
[9] Darko R. O., Offei-Ansah C, Shouqi Y, Jun-ping L (2015). Challenges in teaching and learning of agricultural science in selected public senior high schools in the Cape Coast Metropolis. Agric. Sci. Sci. Edu. Centre North Am. 3(1):13-20
[10]Daluba, N. E. (2013). Effect of Demonstration Method of Teaching on Students' Achievement in Agricultural Science. World Journal of Education, Vol. 36, pp 1-7
[11]Bok, D. (2006). Our under achieving colleges; A candid look at how much students learn and why they should be learning more. Princeton and Oxford: Princeton University press.
[12]Isa, S. G., Mammam, M. A., Badar, Y. and Bala, T.(2020). The impact of teaching methods on academic performance of secondary school students in Nigeria. International Journal of Development Research, Vol. 10 (6), pp 37382-37385
[13] Brindley, S. (2015). Teacher perspectives on integrating ICT into Kenyan system of education. 1st Regional conference on e-Learning, Kenya.
[14]Seraphine, S. A.,Jacob, J. J. O., Joash, K. k. (2017). Influence of instructional resources in learning

agriculture in secondary school on employment creation in Vihiga County, Kenya. Int. J. Educ. Admin Pol. study. Vol. 10(1), pp. 1-9

[15] Owino, O. A., Yungungu, A. M., Ahmed O., Ogolla, B.O. (2015). The relationship between availability of Teaching/learning resourece and performance in KCSE Biology in selected secondary schools in Nyakoach Subcounty, Kisumu County, Kenya. Int. J. Contemporary Applied Sci. 2(7):153-168

[16]Bukoye, S. O. (2018). Utilization of Instruction Materials as Tools for Effective Academic Performance of Students: Implication for Counsellinga. 2nd Innovation and creative education and teaching International conference, Badajoz, Spain, 20-22, June 2018

[17] Tesha, M. W. (2018). Effectiveness of teaching and learning agricultural science subject in selected secondary schools in Tanzania. A thesis submitted in fulfilment of the requirements for the degree of doctor philosophy Sokoine University of agriculture. Morogoro, Tanzania