IMPROVING AGRICULTURAL SCIENCE EDUCATION FOR INCREASED PRODUCTIVITY: A Focus on NCE Students at College of Education, Bama, Nigeria

[1]Kolomi, A.U., [2]Minta. M.D., [3]Umar, M.S., [4]Usman, M.A., [5]Shedi. A.A. and [6]Mohammed, Y.

[1*,2,5,6]Department of Agricultural Education, Umar Ibn Ibrahim El-Kanemi College of Education Science and Technology, P.M.B 16, Bama, Borno State
[3]Department of Educational Psychology, Umar Ibn Ibrahim El-Kanemi College of Education, Science and Technology, Bama, Borno State, Nigeria
[4]Department of Political Science, Umar Ibn Ibrahim El-Kanemi College of Education, Science and Technology, Bama, Borno State, Nigeria

Abstract: In most countries of Sub-Saharan Africa, agriculture is regarded as the engine of economic growth and development by way of improving food security, reducing unemployment and improving the livelihood of the rural communities. In Nigeria, women contribute about 45% of the food produced in the country. With the current food insecurity issues in Nigeria, it is therefore important to ensure that girls studying agricultural science in colleges are well equipped with basic practical agricultural knowledge and skills. This aspect is strengthened by the fact that research has shown a positive correlation between agricultural education and agricultural productivity. Use of appropriate teaching approaches can ensure that the girls, some of whom will become future farmers, acquire the essential knowledge and skills for agricultural activities. This study investigated the effect of Cooperative Learning Approach (CLA) on girls' academic achievements at both NCE 1 & 2 in agricultural science. A non-equivalent control group design under quasi-experimental research was used. Random assignment was done to place two of the selected sets in NCE 1 in the experimental group taught using CLA and two sets in NCE 2 in the control group taught using Traditional Learning Approaches (TLA). The instrument used was the Agriculture Achievement Test (AAT) with a reliability Coefficient of 0.72. The data collected were analysed using t-test of independent samples. The null hypothesis was tested at 0.01 level of significance. The findings of this study show an improved academic achievement in practical agriculture among the girls where CLA was used. Therefore, the use of CLA enhances the learning of agricultural science and the researchers recommend its use in teaching of agricultural science to college girls to ensure increased acquisition of agricultural knowledge and skills.

Keywords: Academic achievement, Agricultural Productivity, Practical Agriculture, Cooperative Learning Approach.

Introduction

Agriculture play an important role in the economic development of Nigeria. It accounts for 26.21% of the country's GDP, employs over 70% of the population, and provides more than 75% of industrial raw materials for industries NBS, (2020). However, Nigeria's agricultural productivity has been in decline in recent years with most crops producing less than their potential Takeshima, H., (2016). With a cultivated area of 30 million hectares, two-third of Nigeria's rural populations depend on agriculture for their livelihood and income generation yet

its agriculture is still characterized with scattered landholdings of 0.5 – 4 hectares, low input technology, and a low-output labour productivity (FMARD 2013 and World Bank 2018). Nigeria's agricultural sector faces many challenges which impacts on its productivity. These include poor land tenure system, low level of irrigation farming, low technology, high production cost and poor distribution of inputs, limited financing, high post-harvest losses and poor access to markets. According to FAO (2021), these challenges have stifled agricultural productivity affecting the sectors contribution to the country's GDP as well as increased food import due population rise hence declining levels of food sufficiency which the country is experiencing now.

However, the Sustainable Development Goals according to World Bank (2018) has led to the emergence of various policies that have had impact on the agricultural sector. Some of them include the Nigerian "Agricultural Promotion Policy – 2016 – 2020" which focusses on food security through reducing food imports, Nigeria-Africa Trade and Investment Promotion Programme, Presidential Economic Diversification Initiative etc. All these efforts are aimed to increase agricultural productivity in order to provide sufficient quantities of food to meet domestic demand as well as an abundance of commodity crops for export in the international market. These policies in other wards are aim at increasing the agricultural productivity of subsistent farmers of which women contribute about 37- 45% of the labour force (Tologbonse et al. 2013).

The Role of Women in Agriculture

Agricultural development in Nigeria is a complex and challenging process with most farmers operating at the subsistence level. 'Rural women farmers play a vital role in food production and food security; making up to 37- 45% of labour force' Tologbonse et al. (2013). Even though rural women take the lead role in agricultural activities; their contributions to agriculture and rural development are seldom noticed (Ogunlela and Mukhtar, 2009). Palacios et al. (2015), also acknowledges that women perform the bulk of work in agriculture, and their input therefore continues to influence the extent of food production in the Sub-Saharan Africa. However, because women face various skill-based and systemic challenges, the agricultural sector continues to struggle. One of the workable solutions to this challenge, according to Team & Doss (2011) is to increase the farm-level production through equipping the key players on the farm (women) with the necessary skills.

A report by UN Women (2014) suggests that 'women are major food producers, household income earners and custodians of knowledge, yet their efforts are hampered by their lack of access to productive resources, technologies, services and markets'. The discrepancy between women's important role in agricultural production and the challenges they face indicates there is room for improving women's contribution in the agriculture sector. Therefore, empowering the women with necessary skills would increase the agricultural production significantly and allow for sustainable agriculture. Farnworth et.al (2013) acknowledges that empowering women would make them 'better and successful farmers who can make the most of the opportunities around them'. When women are empowered though education, their ability to make decisions and practice agriculture correctly will improve in the long run. Application of appropriate

agricultural practices and decision making skills will assist in the elimination of some the present barriers that hinder agricultural productivity.

Teaching Practical Agricultural Science to College Girls

According to UNESCO, (2015), Educating or providing women with the basic agricultural knowledge and skills is key to the realization of the 2030 Agenda for Sustainable Development; and therefore all nations should endeavour to improve the quality of education offered to its citizens. Quality education would enhance women's role and participation in agricultural practices by helping them understand and apply new technology which in turn would lead to increased food security (Wakhungu & Bunyasi, 2010). One way of improving the quality of education offered in our learning institutions is by using teaching approaches that will promote better learning.

In Nigeria, teaching style is teacher determined and a matter of personal conduct, it may be teacher centred - a more formal approach, which is controlled and autocratic and the teacher directs the how, what and when students learn, Bakare T.V., (2011). This traditional learning approach (TLA) is largely passive where the learners are expected to sit back, listen, absorb and recall. Therefore, if well-articulated in school, agriculture subject can be used to prepare a skilled workforce that can improve the agricultural productivity (Peklaj, 2003). It may also be learner centred, using a responsive, collaborative, problem-centred and democratic approach, in which both students and the instructors decide the how, what and when learning occurs, Liu, (2008). A research done by Kipkemei, et al., (2012) has shown that there is a positive correlation between agriculture science and agricultural productivity. Agriculture science should therefore be taught using teaching approaches that will allow the students to acquire not only the knowledge but also basic agricultural skills that can be applied in farming. Co-operative Learning Approach (CLA) is an instructional strategy that aims at developing cognitive, academic and social skills among students. Buchs and Butera (2015) explain that CLA represents a situation where teachers are required to organize students into small groups with the aim of 'maximizing both social and cognitive outcomes'. CLA actively engages the learners in their learning process by providing opportunities for teaching and learning to occur between peers. In the sub-groups, students learn from each other, network and work at attaining a common goal (Vijayaratnam, 2009). Such exposure is necessary for the agriculture students given that they will be working with other stakeholders in the agricultural value chain and their ability to work interdependently will go a long way in increasing the farm output. Also, the learner-centred approach enhances the student's individual learning and also equips the student with necessary skills and approaches to learn from others in their circles. Notably, the learning preferences, needs, and styles for girls are different from those of the boys and to exploit the potential for the female students, appropriate teaching approaches should be used (Gurian, 2010). According to Younger (2016), 'girls thrive in lessons that allow flexibility and are learner-centred such as the group discussions that provide opportunity for sharing one's ideas, participate in debates and share one's opinions regarding a matter'. The Learner-centred teaching approaches like CLA are therefore, crucial in helping to achieving the sustainable development goals (SDGs) number two; which seeks to 'end hunger, achieve food security and improve nutrition, and promote sustainable agriculture' (Osborn, et al., 2015).

Accomplishing the targets set for SDG 2 as Palacois et.al, (2015) emphasized; is likely to occur if efforts of increasing agricultural productivity is prioritized through women empowerment in knowledge and skills acquisition through appropriate learning methods that are learner-centred. Such skills will allow women to know the ideal time for various farm activities, the best farming techniques, ways of reducing cost of production, manage possible agricultural risks and also access financial resources to boost their farming. Additionally, empowered women will utilize technology for optimal production, and continuous production throughout the year like the use of greenhouses, organic farming and irrigation (Collier & Dercon, 2014). Such improved farming techniques will allow the women to further increase the farming acreage as the production will not be limited by the vagaries of weather. Further, women with high and continuous production will be able to fetch high prices for their produce and be least affected by the fluctuating prices due to forces of demand and supply. Moreover, women with relevant skills will be in a position to compete favourably and identify best marketing channels that maintains high profits.

Hypothesis

H_o: There is no statistically significant difference in academic achievement in agriculture science between girls who learn the subject under CLA and those who learn the subject under TLA.

Methodology

This study aimed at investigating the effect of Cooperative Learning Approach (CLA) on college girls' academic achievement in the departments of Agricultural Education at Umar Ibn Ibrahim El-kanemi College of Education Science and Technology, Bama, Borno State, Nigeria. A non-equivalent control group design under quasi-experimental research was used. Four classes two from NCE 1 & 2 (in the 2022/2023 & 2023/2024 Sessions) each were selected. A total of 76 students were involved. Random assignment was done to place two of the selected groups in the experimental group and two group in the control group. The experimental group (n=40) was taught using CLA while the control group (n=36) was taught using TLA. The instrument used was the Agriculture Achievement Test (AAT) which was pilot-tested and validated before use. The instrument had a reliability coefficient of 0.72. The instrument (AAT) was then administered to both the experimental and the control group after being taught similar practical agricultural science content for four weeks. The data collected were analysed using t-test of independent samples. The null hypothesis was tested at 0.01 level of significance.

Results

The academic achievement in the study was then analysed in the two study groups. The mean score of the group taught using CLA was 49.9% and TLA was 39.9%. The standard deviation for experimental and control groups (see Table 1) were 13.7 and 15.5 respectively. The mean score for the experimental group was higher than the control group by 9.97%. To test whether the difference in the mean scores of the experimental and control groups was significant, a t-test for independent samples was performed at the 0.01 significance level. The results indicated that the post-test AAT mean scores for girls in the CLA group were higher than those in the TLA group. The t-value was 2.0695; (t(df=74) = 2.0695, p = 0.4217), which is statistically significant

at the 0.01 significance level. This indicates that girls taught under CLA had significantly better academic achievement in courses taught than those under in the TLA group.

Table 1: Scores in agriculture achievement test by learning approach

Treatment	n	Mean	Standard Deviation
Cooperative Learning Approach	40	49.9%	13.7
Traditional Learning Approach	36	39.9%	15.5

Table 2: T-test of the agriculture achievement post-test Scores by learning approaches

Treatment	df	Mean	Std Deviation	t	P value
Cooperative Learning Approach	74	49.9%	13.7	2.06 95	0.042 17
Traditional Learning Approach		39.9%	15.5		

Significance level at 0.01

Conclusion

The major finding of the study was that students who learnt practical agriculture under CLA performed significantly better in the study than those who were taught using TLA. The statistically significant difference in academic achievement between the two groups supports the effectiveness of CLA in improving girls learning outcomes. The improved performance can be attributed to the interactive and collaborative nature of CLA, which likely facilitated better understanding and retention of the subject matter. CLA may have also fostered peer learning, where students found it easier to seek further explanations from their peers than asking the teacher during class. This study aligns with previous research (Peklaj, 2003) showing that smaller groups and peer discussions enable better learning for girls. Thus, CLA improves achievement in practical agriculture by increasing knowledge retention and acquisition of skills among girls undertaking the subject and expectantly this would translate into increased ability to apply the taught skills on the farms. The girls taught using CLA are also likely to learn other soft skills like team work and leadership as they work in groups. These skills would be useful in life as they practice agriculture after school. The researchers recommend the use of CLA in teaching of agricultural science to college girls to ensure increased acquisition of agricultural knowledge and skills. Application of appropriate agricultural practices by women farmers is likely to increase agricultural productivity and by extension food production. This would help to reduce food insecurity.

Reference

Bakare, T. V. (2011). Use of teaching methods and approach in the Nigerian university system: The curriculum and policy implications for change. Department of Adult Education, University of Lagos, Nigeria.

Buchs, C., & Butera, F. (2015). Cooperative learning and social skills development.

Collier, P., & Dercon, S. (2014). African agriculture in 50 years: Smallholders in a rapidly changing world. *World Development, 63,* 92–101.

FAO. (2021). World food and agriculture – Statistical year book 2021. Rome. Retrieved from https://www.fao.org/documents/card/en/c/cb4477en/

Farnworth, C., Sundell, M. F., Nzioki, A., Shivutse, V., & Davis, M. (2013). Transforming gender relations in agriculture in Sub-Saharan Africa. Published by Swedish International Agricultural Network Initiative (SIANI).

Federal Ministry of Agriculture and Rural Development. (2013). *Annual report.*

NBS. (2020). National Bureau of Statistics, "Labour force statistics: Unemployment and underemployment report" (Q2, 2020). Retrieved from https://www.nigerianstat.gov.ng/pdfuploads/Q2_2020_Unemployment_Report.pdf

Ogunlela, Y. A., & Muktar, A. A. (2009). Gender issues in agriculture and rural development in Nigeria: The role of women. *International Journal of Humanities and Social Sciences, 4*(1), 19–30.

Osborn, D., Cutter, A., & Ullah, F. (2015, May). Universal sustainable development goals: Understanding the transformational challenge for developed countries. In *Report of a study by Stakeholder Forum* (pp. 5–20).

Palacois-Lopez, A., Christiaensen, L., & Kilic, T. (2015). How much of the labour in African agriculture is provided by women? *Policy Research Working Paper 7282,* World Bank Group.

Peklaj, C. (2003). Gender, abilities, cognitive style, and students' achievement in cooperative learning. *Horizons of Psychology, 12*(4), 9–22.

Takeshima, H. (2016). Understanding irrigation systems diversity in Nigeria: A modified cluster analysis approach. *Irrigation and Drainage, 65*(5), 601–612.

Team, S. O. F. A., & Doss, C. (2011). The role of women in agriculture. *Economic Development Analysis Division (EDSA) Working Paper,* 11.

Tologbonse, E. B., Jibrin, M. M., Auta, S. J., & Damisa, M. A. (2013). Factors influencing women participation in Women in Agriculture (WIA) programme of Kaduna State Agricultural Development Project, Nigeria. *International Journal of Agricultural Economics and Extension, 1*(7), 47–54.

UN Women. (2015). The world survey on the role of women in development: Gender equality and sustainable development. A United Nations Report of the Secretary General-A/69/156.

Vijayaratnam, P. (2009). Cooperative learning as a means to developing students' critical and creative thinking skills. In *Proceedings of the 2nd International Conference of Teaching and Learning (ICTL 2009).* INTI University College, Malaysia.

Wakhungu, J. W., & Bunyasi, P. (2010). Gender dimensions of science and technology: African women in agriculture.

World Bank. (2018). Nigeria: Overview. Retrieved from http://www.worldbank.org/en/country/nigeria/overview

Younger, M. (2016). Effective pedagogies for girls' learning: A review of recent research. Retrieved from http://www.ncgs.org/pdfs/Resources/gdst-effectivepedagogies-girls-learning-research-report-mikeyounger.pdf