

Improving Agricultural Productivity Through Effective Teaching Of Agriculture Science To Girls In Secondary Schools, Kenya

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Abstract: In Sub-Saharan Africa, most countries rely on agriculture for economic and social development by way of improving food security, reducing unemployment and improving the livelihood of the agrarian communities. In Kenya, women contribute to about 70 percent of the food produced in the country. With the food insecurity issues in Kenya, it is important therefore to ensure that girls taking agriculture science in secondary schools are well equipped with basic agriculture knowledge and skills. This aspect is strengthened by the fact that research has proved there to be a positive correlation between secondary school agricultural education and agricultural productivity. Improved agricultural productivity would be a step towards fulfilment of some targets set by the Sustainable Development Goal 4. Use of appropriate teaching approaches can ensure that the girls, some of who will be the future farmers, have the basic knowledge and skills to carry out agricultural activities. This study aimed at investigating the effect of Co-operative Learning Approach (CLA) on girls' academic achievement in secondary school Agriculture science. A non-equivalent control group design under quasi-experimental research was used. Random assignment was done to place two of the selected schools in the experimental group taught using CLA and two schools in the control group taught using traditional learning approaches (TLA). The instrument used was the Agriculture Achievement Test (AAT) which had a reliability coefficient of 0.76. The data collected were analyzed using t-test of independent samples. The null hypothesis was tested at a 0.05 level of significance. The findings of this study show an improved academic achievement in Agriculture science among the girls where CLA was used. Therefore the use of CLA enhances the learning of Agriculture science and the researchers recommend its use in teaching of secondary school agriculture science to girls to ensure increased acquisition of agricultural knowledge and skills.

Keywords: Co-operative Learning Approach, Secondary School girls, Academic Achievement, Agriculture science, Sustainable Development Goals, Agricultural productivity.

I. INTRODUCTION

Agriculture plays an important role in the economic development of Kenya. It not only provides food for the growing population but also contributes to about 26 % of GDP directly and another 27% indirectly through links with other sectors (Government of Kenya, 2010; FAO, 2014). In addition, it provides 60% of total employment, more than 75% of industrial raw materials for industries and more than 50% foreign exchange earnings (Kenya Agricultural Research Institute [KARI], 2012). According to this author, agriculture contributes 45% of the government's revenue hence the sector

is key in the Kenyan economy. The Kenyan population growth and urbanization continues to fuel the local demand for food which there is apparent disparity between the rate of food produced and the demand (FAO, 2003). According to Mwangi (2008), agriculture accounts for 70 percent of the labour force in Kenya and women contribute 75 percent of that labor force. One of the major causes of this discrepancy is the lack of proper skills necessary to ensure increased production in the farms despite the challenges.

Overtime, issues of food insecurity have become prevalent affecting other areas of the economy. The Kenya Food Security Steering Group (2008) highlight that the

agricultural sector's primary objective is to ensure food security through providing access to safe, sufficient, and nutritious foods that meet the food preferences and dietary needs for a healthy and active life. However, the food security situation in Kenya is below its expected levels since a high percentage of individuals have no access to quality food whenever the need arises. Notably, about 10 million Kenyans are food insecure because the production levels in the farm are low, reducing the supply and resulting in increased food prices. For those who can afford the foods, the bills are quite high reducing the disposable income of most Kenyans and limiting their ability to make the necessary economic progress in their lives.

II. THE ROLE OF WOMEN IN AGRICULTURE

According to Palacios-Lopez, Christiaensen and Talip, (2015), 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. According to Wakhungu and Bunyasi (2010), women make up 70% of agricultural workers in Sub Saharan Africa and 80% of food processors. Since women face various skill-based and systemic challenges, the agricultural sector continues to underperform (Team & Doss 2011). One of the workable solutions to this challenge is to increase the farm-level production through equipping the key players on the farm 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 (Wakhungu & Bunyasi, 2010). 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 through 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.

III. TEACHING AGRICULTURE SCIENCE IN SECONDARY SCHOOLS IN KENYA

Considering the crucial role of women in agriculture not just in Kenya but also in other Sub-Saharan Africa Nations, it is prudent to explore as many options as possible in equipping women with the basic agricultural knowledge and skills. Education is key to the realization of the 2030 Agenda for Sustainable Development (UNESCO, 2015) and therefore all nations should endeavor 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 (Wakhungu & Bunyasi, 2010) which in turn would lead to increased food security. One way of improving the quality of education offered in our learning institutions is by using teaching approaches that will promote better learning.

A study done by Evelia, Mwangi, and Obara (2014) in Kenya revealed that agriculture subject teachers often use lecture, question and answer methods and some read from textbooks as students write notes during agriculture lesson; approaches which are largely teacher-centered. This is supported by Muma (2016) who declares that there is inappropriate delivery of agricultural education at all levels in Kenya. This traditional learning approach (TLA) is largely passive where the learners are expected to sit back, listen, absorb and recall (Peklaj, 2003). Therefore, if well-articulated in school, agriculture subject can be used to prepare a skilled workforce that can improve the agricultural productivity. Research done by Kipkemei, Kipsat, Sulo, Korir and Inyanje (2012) has shown that there is a positive correlation between secondary school agriculture 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 (Vijayaratham, 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). Evidently, 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 (Younger, 2016). Therefore, cooperative learning is one of the best approaches to use among girls pursuing agriculture science in secondary schools.

Learner-centered teaching approaches like CLA are crucial in helping Kenya make headways in accomplishing the objectives of teaching agriculture and by extension the sustainable development goals (SDGs) number two. SDG number two seeks to 'end hunger, achieve food security and improve nutrition, and promote sustainable agriculture' (Osborn, Cutter & Ullah, 2015). Accomplishing the targets set for SDG 2 is likely to occur if efforts of increasing agricultural

productivity are prioritized through women empowerment in knowledge and skills acquisition (Palacois et.al, 2015) 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 favorably and identify best marketing channels that maintains high profits.

The SDG 4 aims at ensuring access to equitable and inclusive quality and also enhances lifelong learning opportunities for every person (Klees, 2017). Quality education is one that addresses cognitive, social and academic needs of students to promote the well-being of the individual and that of the society. As such, quality education should teach the students how to think as opposed to what to think as noted by Abrami et al. (2015). Instructional approaches that will lead to cognitive development and the ability to critically consider a matter and be able to make the appropriate decision would be the best option in equipping the learners. Warren (2017) echoes this assertion by highlighting that when the instructor utilizes both behavioral and cognitive approaches, they assist the students in developing internal reinforcement which is instrumental to lifelong learning. One of the targets set for SDG 4 is to 'ensure all learners acquire knowledge and skills needed to promote sustainable development' (Osborn, Cutter & Ullah, 2015). Clearly, the utilization of CLA will enhance the quality of education as it focuses on assisting the learner to be able to take responsibility for their learning.

IV. METHODOLOGY

The study was based on the following null hypothesis:

H₀: There is no statistically significant difference in academic achievement in secondary school agriculture science between girls who learn the subject under CLA and those who learn the subject under TLA.

This study aimed at investigating the effect of Cooperative Learning Approach (CLA) on girls' academic achievement in secondary school Agriculture science. A non-equivalent control group design under quasi-experimental research was used. Four schools were randomly selected and one Form 1 class was selected from each school for the study. A total of 76 students were involved. Random assignment was done to place two of the selected schools in the experimental group and two schools 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 0.76. The instrument (AAT) was then administered to both the experimental and the control group after being taught similar agriculture science content for four weeks. The data collected were analyzed using t-test of independent samples. The null hypothesis was tested at 0.05 level of significance.

V. RESULTS

Achievement in agriculture science was then analyzed in the two study groups. The mean score of the group taught using CLA and TLA was 49.93 and 39.96 per cent respectively. The standard deviation for experimental and control groups were 13.73 and 15.45 respectively as shown in Table 1. The mean score for the experimental group was higher than the control group by 9.97 per cent.

To test whether the difference in the mean scores of the experimental and control groups was significant, a t-test for independent samples was done at a significant level of 0.05. The results for the independent samples t-test for AAT mean scores for girls taught using CLA and for girls taught under TLA was performed are shown in Table 2. The results indicates that the post-test AAT mean scores for the girls in the CLA group was higher than for girls in TLA group and the difference was statistically significant. A t-value of 2.0695; $t(df=74) = 2.0695, p > 0.05$, indicates that girls taught under CLA had improved significantly in their level of achievement in agriculture science compared to girls in the TLA group at the end of the treatment.

VI. CONCLUSIONS

Reference to major finding of the study was that students who learnt agriculture science under CLA performed significantly better in secondary school agriculture science than those who were taught using TLA. It's probable that CLA enhanced girls' interaction which made their academic performance to improve. The girls probably found it easier to seek further explanation from their fellow students within the group than asking questions from the teacher during the lesson. Girls are generally shy, thus refrain from asking questions in a large group but find it more comfortable to do so in a smaller group. From a study done by Peklaj (2003) on cooperative learning, it was found that girls within the small groups had a tendency to give 'elaborate answers and explanations' when responding to a question directed to them. It seems that the girls would find safety in speaking out in small groups than when they are taught as one large group.

Students who were taught through CLA achieved higher scores than those taught under TLA. Thus, CLA improves achievement in secondary school agriculture science 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. Since knowledge is the basis for proper decision making, girls with appropriate agricultural skills will utilize them at the farm level (Meijer et al. 2017). Alongside

knowledge retention, the girls taught using CLA are likely to learn other soft skills like team work, leadership, conflict resolution as they work in groups. These skills would be useful in life and more so as they practice agriculture after school.

VII. RECOMMENDATIONS

From the results of this study, the researchers would recommend the use of CLA in teaching agriculture science to girls in secondary school. This would lead to enhanced acquisition of agricultural knowledge and skills which would translate into better out of school application of agricultural practices. 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 not only in Kenya but also in other Sub-Saharan Africa member countries that face similar challenges.

Since women play such a critical role in agriculture, the acquisition of necessary skills should occur during class instruction and relevant exposure to agriculture related experiences in secondary schools. Re-engagement of the youth in agriculture and agribusiness is the key to sustainable agriculture in African countries given that they are the future stakeholders of the sector (UN Women, 2014). As such, involving girls in practical agriculture as they go through secondary school education is the right step towards averting inadequate food production. The attainment of the knowledge, skills and attitudes demands that teachers use appropriate teaching approaches. Cooperative learning approach (CLA) is a suitable method that will assist girls be relevant stakeholders in the agricultural sector once they take up farming as an income-generating venture. CLA as opposed to traditional teaching approaches will impart necessary agricultural skills since the interactions between students in classroom instruction as well as in carrying out agricultural projects lead to higher knowledge retention and better grades. Additionally, cooperative learning has been seen to develop problem solving skills, higher motivation, positive attitude towards the subject and also critical thinking skills (Felder et al. 2000). These skills are critical for improved productivity and performance in the farm since the combination of intrinsic motivation and necessary skills will increase efficiency and help the women in the farms attain optimal output. In the long run, as a result of this efficient teaching approach, sustainable agriculture and food security will be realized in Kenya.

Treatment	n	Mean	Std Deviation
Cooperative Learning Approach	40	49.93	13.73
Traditional Learning Approach	36	39.96	15.45

Table 1: Scores in agriculture achievement test by learning approach

Treatment	df	Mean	Std Deviation	t	P value
Cooperative Learning Approach	7	49.93	13.73	2.06	0.042
Traditional	4	39.96	15.45	95	17

Learning Approach

Significance level at 0.05

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

The p-value is less than the critical value of 5% hence the null hypothesis is rejected. This means that the difference in the means of the two groups is statistically significant.

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