# TEACHERS' PERCEPTION ON INSTITUTIONAL PREPAREDNESS FOR COMPETENCY BASED TEACHING OF AGRICULTURE IN PUBLIC PRIMARY SCHOOLS IN NJORO SUB-COUNTY OF NAKURU COUNTY, KENYA

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**A Thesis Submitted to the Graduate School in Partial Fulfillment of the Requirements for the Master of Science Degree in Agricultural Education of Egerton University**

**EGERTON UNIVERSITY**

**JULY 2023**

## DECLARATION AND RECOMMENDATION

**Declaration**

This thesis is my original work and has not been presented for any award of diploma or degree.

Signature  Date 06/07/2023

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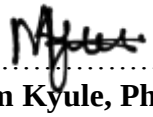
**EM11/13621/19**

**Recommendation**

This thesis has been submitted for examination with our approval as University Supervisors.

Signature  **Date:** 17/07/2023

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## DEDICATION

This is dedicated to my wife Cecilia Karani and daughter Princess Karani for their unwavering support and motivation made the master journey a success.

## ACKNOWLEDGMENTS

I would like to begin by expressing my heartfelt gratitude to the Almighty God, without whose grace and mercy the successful completion of my study would not have been possible. In addition, I acknowledge Professor F.U Ngesa, Egerton University Department of Agricultural Education and Extension for the moral support, mentorship and guidance he offered me during course work and research. I am indebted to Dr Miriam Kyule and Dr Joel Ng'eno for their timely feedback, which enabled me to complete my research within the stipulated period. Their mentorship has been instrumental in shaping my academic journey. I acknowledge Dr Mary M waiganjo who always gave me a shoulder to lean on while I was doing my master program. Finally, I acknowledge the mentorship, motivation and support extended by the late Prof John M. Mironga towards my academic journey.

## ABSTRACT

Most school leavers lack the necessary competencies for the World of Work (WoW). Therefore, the Government of Kenya through the Ministry of Education (MoE) and the Kenya Institute of Curriculum Development (KICD) has been improving the education system to equip learners with the necessary competencies. The introduction of the Competence-Based Education (CBE) system demanded that institutions be ready for its implementation. This study therefore focused on teachers' perceptions on institutional preparedness in equipping grade four learners with agriculture-related competencies under the Competence Based Education (CBE) system. The purpose of this was to determine the teachers' perceptions on adequacy of infrastructure, instructional resources, teacher training, and sustainability plans for instructional and infrastructural resources for the teaching and learning of agriculture at grade four. A descriptive research design was used employing a cross-sectional survey method that generated quantitative data. The study targeted 1087 primary school teachers in the Njoro Sub-County. The accessible population was 131 teachers of agriculture from the 96 public primary schools in Njoro Sub- County. A sample size of 96 teachers of agriculture was obtained from the 96 public primary schools. Research experts from the Department of Agricultural Education and Extension and Curriculum Instruction and Education Management validated the research questionnaire. A pilot study was conducted in the Molo Sub-County where a questionnaire was administered to 31 grade four teachers of agriculture. Cronbach's alpha coefficient was used to estimate reliability. Alpha coefficient of 0.743 was obtained and accepted as it met the minimum threshold of 0.7 recommended for social sciences. Descriptive statistics were used for data analysis using Statistical Package for Social Sciences (SPSS) version 25. The study found that 83.3% of schools had no infrastructural resources. All of the grade four teachers of agriculture had attended CBE training but a considerable proportion (49%) attended sessions, which were theoretical nature. The study observed that 35.4% of institutions had no maintenance schedule for instructional resources. The study, therefore, recommends the MoE facilitate schools in establishing infrastructure for teaching of Agriculture, implement practical based teacher training and sustainability guidelines for instructional resources in CBE to support competence acquisition effectively.

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| | |
|---|---|
| **CBE** | Competence-Based Education |
| **CBET** | Competence-Based Education and Training |
| **CDE** | County Director of Education |
| **COVID-19** | Coronavirus Disease of 2019 |
| **ICT** | Information Communication Technology |
| **KICD** | Kenya Institute of Curriculum Development |
| **KNEC** | Kenya National Examination Council |
| **MoE** | Ministry of Education |
| **REB** | Rwanda Education Board |
| **SDG4** | Sustainable Development Goal 4 |
| **UNESCO** | United Nations Educational, Scientific and Cultural Organization |
| **WoW** | World of Work |
| **VET** | Vocational Education and Training |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background information

Quality education is necessary for sustainable economic, social, and political development the world over (Rieckmann, 2018). Globally, countries have and are shifting from a cognitive- based education system to Competency-Based Education (CBE) which combines cognitive, psychomotor, and affective domains (Khanna & Mehrotra, 2019). In developed countries, CBE is offered by primary, secondary, and tertiary institutions. The CBE system aims at enabling learners to acquire practical relevant skills and develop positive attitudes and critical thinking. Among other aims of CBE is the facilitation of teaching and learning vocational subjects practically, enabling learners to identify their abilities and minimizing the school-dropout rate by learners (Mulder et al., 2017). The CBE system also aims to help learners acquire and apply skills and knowledge in school, workplaces, and environmental management to promote food security, self-reliance, and poverty alleviation (Van, 2017). The CBE has been adopted in some countries globally which include, the United States of America (USA), Australia, Finland, and Germany. In the USA agriculture subject is not limited to the classroom but aims at leadership mentorship in agriculture through Future Farmers of America (FFA), laboratory instruction, and experiential education which aims at promoting learners' competencies in and out of school (Tsichlis, 2015).

In Finland, the education system ensures that students go to school at age of 7 years when they can learn and apply learned skills. Students study for at most 5 hours a day with much time allocated for practical learning. There is adequate school preparation in terms of learning environment, and teacher preparation in terms of payment and training. Teachers' preparedness requires one to get a master's degree training to qualify in teaching any primary school in Finland. High teacher training is associated with better content delivery and facilitation of learning (Sahlberg, 2011). In Australia, the Education system provides excellent facilities for learning that allows learners to use video simulations, and computers since every school has internet within and outside classes that hold a capacity of a maximum of 30 students. Assessment is done by e-learning, classroom group discussions, and oral presentations. Although Australia has posted good academic records, it is after countries like Japan, South –Korea, Singapore, and Finland (Goodrum et al., 2012).

Countries that have successfully embraced CBE in Africa include South Africa, Rwanda, Zambia, and Tanzania (Nsengimana et al., 2020). After colonialism, most African countries have tried to change their education system to meet the increasing needs of their people. Since the 1990s most African countries have been making attempts to change and revise the education system from a content-based curriculum to a competence-based Education (CBE) or Outcome-based Education (OBE) to cope with the political, social, and sometimes tough economic factors (Ondimu, 2018a). In Zambia, the CBE was introduced in 2013 to equip learners with practical skills which enable youths to develop intrinsic motivation, self-respect, self-employment, and appropriate attitudes, and apply the four higher levels of blooms taxonomy. The youths make up two-thirds of the Zambian population and a quarter of the youths are not employed due to an inappropriate education system that was cognitive based despite high economic growth (Mulenga, & Kabombwe, 2019). In South Africa, the shift to CBE was sparked by a shortage of engineers, technicians, and artisans experienced in 1998. There was a need therefore to restructure the education system to ensure school leavers and graduates were able to apply learned skills, unlike training engineers who could not construct roads (Spaull, 2013).

The Kenya Vision 2030 emphasizes the connection between quality education and the labor market, and the need to create invention, innovational skills, and competencies that will support both public and private sectors (Ministry of Education, 2019). Practical teaching of vocational subjects is one way of empowering youths in the development of cognitive, psychomotor, and affective domains to reduce the level of poverty, unemployment, and crime in society (Miriti et al., 2014). In addition, practical teaching will help learners embrace good farming practices like climate smart agriculture, soils and water conservation which will boost Kenya in achieving no poverty (Sustainable Development Goal 1), zero hunger (Sustainable Development Goal 2) and decent work and economic growth (Sustainable Development Goal 8) (United Nations, 2021).

The teaching of agriculture in Kenya was informally done before the coming of the Europeans. African communities had their education system which had no classes or teachers but children were taught practical skills by the specialized elders through apprenticeship programs. Formal teaching of agriculture can be traced back to 1909 in the Fraser report which advocated for education being offered along racial lines whereby Europeans and Asians got academic education while Africans and Asians were trained in practical industrial and agriculture education. The main aim was to train Africans to acquire practical skills which

were meant to offer labor on British farms (Amukowa, 2013).

In 1925, the Phelps stroke commission drew a backup to the Fraser report and emphasized the need to improve agriculture, develop traditional industries and offer education that could improve Africans' practical skills (Ojiambo, 2009). This commission was succeeded by the Beecher report of 1949 which recommended the 4-4-4 education system. The Beecher commission proposed the control of the opening of independent schools to ensure the already established schools offered quality training. This commission identified several challenges such as institutional unpreparedness which were a result of the uncoordinated education system, inadequately trained teachers, and scarcity of resources due to the rapid growth of schools thus affecting the competencies and the practical teaching of vocational subjects (Mwangi, 2013). 1n 1952, the Binn report facilitated the 4-4-4 education system which succeeded in opening up the tertiary institution at Sigalagala in Kakamega which focused on the coordination of teacher training to improve the teaching and learning process hence improving learners' competencies (Chepng & Boit, 2015). The Binns education commission is key in appreciating the need for institutional preparedness for curriculum implementation through the emphasis on proper teacher training. In 1959, the agriculture subject was introduced at the secondary school level during the pilot program in Chavakali by Robert Maxwell. Agriculture was founded on proper teaching learning resources provision whether financial, tools and equipment, machinery, and school infrastructure. The Chavakali pilot program too laid the basis for institutional preparedness for proper teaching of agriculture subjects in schools (Chepng & Boit, 2015). The introduction of agriculture subjects to other schools was affected by inadequate teaching staff, school farms and instructional resources and schools embraced theoretical teaching (Chepng & Boit, 2015).

After independence, the Kenyan Government continued working on reforms to make the education system relevant to the needs of the people, and hence in 1982, the Mackay report recommended the need to change the education system to 8-4-4 which was meant to equip learners with practical skills for self-reliance to overcome the educated unemployment challenge among the youth. Therefore, more emphasis was put on practical teaching of Art and crafts, Agriculture, and Home Science. It was expected that the 8-4-4 education system was to adopt and encourage more practical teaching of vocational subjects but this was not the case in Kenyan schools since the implementation process was affected by several challenges including inadequate instructional resources, poor teaching staff preparedness, inadequate and in most occasions untrained staff. Therefore teachers adopted theoretical teaching of

agriculture compromising learners' competencies (Chepng & Boit 2015).

Due to criticism that the 8-4-4 education system was academic focused, the government of Kenya proposed Competency Based Education (CBE) system which was put under piloting in 2017. Successful teaching and learning of agriculture however grounded on resource availability, adequacy, use, and management of those resources. At the onset of 8-4-4, Agriculture was a compulsory subject at both primary and secondary school levels to nurture self-reliant youths who would overcome the unemployment challenges in the country at the time. The teaching of Agriculture subjects in the 8-4-4 education system was greatly affected due to institutional unpreparedness. Schools were found to have inadequate resources and the few schools that had resources, lacked sustainability plans (Seraphine et al., 2018). The new education system 2-6-3-3 focuses more on learners' competencies by promoting practical teaching of vocational subjects. Its implementation in 2018 was postponed since the government felt there was a need to prepare schools in terms of infrastructural, and instructional resources and provide teachers with quality training until 2019 (Ondimu, 2018). Communication and collaboration, citizenship, creativity and imagination, self-efficacy, problem solving, critical thinking, learning to learn and digital literacy are the core competencies recommended by CBE. However, the study focused on the Communication and collaboration, self-efficacy, critical thinking, problem solving and digital literacy competencies that are outstanding in the 22 sub-strands of the Grade Four agriculture design (MoE, 2019). Citizenship competence is not captured in agriculture while creativity and imagination is captured in 4 of the 22 sub strands, Grade four forms the foundation in middle primary for the teaching of agriculture for students who have transited from grade three. This implies that preparedness at grade four will give a firm platform for the learner’s competence acquisition in agriculture as they move to higher grades.

Communication and collaboration are expected to be achieved by ensuring learners work in groups in irrigation activities, sharing and consulting on tasks in the growing of fruits, taking care of fruits, consulting on procedures of storing digital photos, classifying and identifying vegetables, and preparing gardening containers (MoE, 2019). Critical thinking and problem-solving competencies will be characterized by learners' ability to determine organic wastes and solve soil fertility problems, use of locally available material and problem-solving in conserving scarce water resources for irrigation, participating in activities for own nutritional supplements, and participating in developing appropriate container gardens to solve land shortage problem. Self- efficacy will be characterized by the learner's ability to

make individual presentations on small wildlife using digital photo albums, being empowered to produce their food, conducting selected activities in the project, and getting money from the sale of fruit tree seedlings and own contribution to innovations. Digital literacy is expressed by learners' ability to take and store pictures (MoE, 2019).

However, for the learners to acquire the expected agricultural competencies institutions must put in place mechanisms that ensure learners, teachers, and the school environment are harmonized and synchronized to addresses the underlining objectives of teaching Agriculture in primary schools and more specifically in grade four. This study seeks to determine the institutional preparedness in teaching grade four agriculture for public primary schools in Njoro. Njoro Sub- County has proximity to institutions of higher learning like Egerton University and Rift Valley Institute of Science and Technology, which train agriculture. In addition, the main economic activity of residents of Njoro is agriculture with both small- and large-scale farming, which may accommodate field visits for students whose schools do not have schools farm, and some animals meant for the teaching of agriculture. One of the learning requirements of grade four agriculture is to ensure learners can visit farms outside the schools for practical lessons for effective teaching and learning (MoE, 2019).

## 1.2 Statement of the Problem

The introduction of CBE by the Kenyan Government is one way of improving education quality and relevance of school leavers to the world of work. To equip learners with the necessary competencies for the World of Work, institutional preparedness in terms of resource availability, adequacy, and use is paramount. In the 8-4-4 education system, institutional preparedness was never realized despite the numerous reforms that supported implementation of agriculture curriculum. The curriculum equips the learners with essential knowledge, skills, and competencies necessary for WoW. Institutions provide a conducive environment with resources, including state-of-the-art facilities, advanced technology, comprehensive libraries, specialized laboratories, and well trained teachers. However, institutions could not equip the youth with the skills and techniques they required for self-reliance due to inadequate teacher retooling, limited facilities, and resources necessary for teaching and learning agriculture. Implementation of the relevant agriculture competencies requires that the learning institutions be prepared in terms of infrastructure, teacher training, and instructional resources. Since curriculum implementation is an ongoing process, this study seeks to determine how the institutions are prepared to promote effective teaching and

learning of agriculture under CBE. Studies have been done on teacher preparedness for CBE but few have addressed the teachers' perceptions on institutional preparedness in the implementation of a competency-based agriculture curriculum at the primary school level at Njoro Sub-County.

## 1.3 Purpose of the Study

The study sought to determine teachers' perceptions on institutional preparedness in the teaching of Agriculture subjects under competency- Based Education in public primary schools in Njoro – Sub County.

## 1.4 Objectives of the Study

The Objectives of the study were to determine teachers' perceptions on;

i. Adequacy of infrastructure for teaching competency-based grade four agriculture in Njoro sub-County.
ii. The extent of teacher training for teaching competency-based grade Four agriculture in Njoro sub-County.
iii. Adequacy of instructional resources for the teaching of competency-based grade four agriculture in the Njoro sub-County
iv. Institutional sustainability plans for resources used for the teaching of competency-based grade four agriculture in Njoro Sub-County.

## 1.5 Research Questions

The following were the research questions of the study which sought to determine how do teachers perceive the;

i. Adequacy of infrastructure in the implementation of CBC Grade Four Agriculture?
ii. Adequacy of in-service training for CBC implementation?
iii. Adequacy of instructional resources in the implementation of CBC Grade Four Agriculture?
iv. Sustainability plan for infrastructure and instructional resources for CBC implementation?

## 1.6 Significance of the Study

The findings from this study sheds light to the MoE in identifying areas of institutional

Infrastructure improvement for quality implementation of the Competency-Based Agriculture curriculum for primary schools. The study also informs the MoE on the gaps in the teacher capacity in teaching Agriculture to learners in grade four. For middle school education, institutional preparedness may enhance practical learning of vocational subjects, and improve teaching methods by teachers and learning activities which may improve learners' competencies. For the teachers, the school administration, parents, and education financiers, the study informs on teaching learning resource areas that requires a priority in schools for proper teaching and learning.

## 1.7 Scope of the Study

This study covered public primary schools in Njoro Sub-County with a focus on teachers' perceptions on teaching of Grade Four Agriculture. Teachers' perception on institutional preparedness was limited to; infrastructural preparedness which was characterized by the presence of an agriculture room, computer room, electricity supply /ICT, agriculture library, agriculture farm store, presence of water supply, presence of furniture, classrooms, black\whiteboards, and laboratories. Teacher training in terms of training sessions attended, the mode of training, and the relevance of training to grade four agriculture strands. Instructional resources use like charts, cameras, farm tools, computers, the internet, pictures, and models.

## 1.8 Assumptions of the Study

This study assumed that;

i. All respondents were willing to participate and were truthful in their responses.

ii. All public primary schools had teachers of Agriculture who have undergone retooling under CBE.

## 1.9 Limitations of the Study

The findings of this study can only be generalized to teaching of agriculture subject since different subjects may have different infrastructures and resources endowment.

## 1.10 Definition of Terms

**Adequacy of instructional resources-**It is the amount or number of resources used in teaching and learning without teachers or students straining while using them (Mupa & Chinooneka, 2015). In this study, it refers to the frequency at which the resources are used for teaching and learning of grade four agriculture both in and outside classroom activities.

**Competency-Based Education:** Education that enables students to progress at their own speed, based on their mastery of a skill or competency, regardless of the context in which they are learning. This strategy is flexible enough to accommodate a wide range of student learning styles and strengths, and it has the potential to improve academic performance (MoE, 2019). In this study, it refers to an education that enables learners to apply learned knowledge, skills, and attitude adequately in a place of work, school, or at a personal level.

**Institutional preparedness:** Refers to ability of learning institutions to provide technical resources like devices and hardware, train human resources, provide access to resources and create a clear policy (Gyampoh et al., 2020). In this study, it refers to the extent at which public primary schools at Njoro Sub-County have achieved adequacy of infrastructure, adequacy of instructional resources, extent of teacher training and the sustainability plans for teaching agriculture at grade four.

**Instructional Resources:** It is availing of all materials and equipment used to enhance effective teaching and learning (Seraphine et al., 2018). This study refers to the school's ability to ensure the availability and adequacy of charts, cameras, video slides, school farms, internet, pictures, specimens, and models for the teaching of grade four agriculture.

**Perception:** Perception it is the ability of an organism to detect and become aware of something through sight touch or hearing (Birch et al., 2020). Therefore, teachers' perception refers to the their awareness about the training sessions, adequacy of infrastructure, instructional resources and the sustainability strategies that schools in Njoro-Sub County have put in place for teaching grade four agriculture.

**School type**: Schools are classified into broader categories ranging from public, private, special, half-a-day, all-day, traditional, autonomous, day, and boarding schools (Kim, 2018). In this study, the school type refers to the public day and public boarding primary schools.

**Sustainability:** This political, social, and economic balance to avoid the depletion of natural resources such that they can be in use for future generations (Ekardt, 2020)**.** This study refers to the teachers' perceptions on strategies the primary schools have put in place to ensure there is a safe store for instructional resources, proper records, maintenance schedule, and replacement to increase the longevity of resources.

**Teaching:** It is a process of sharing knowledge and experience to promote psychological and intellectual growth (Olo et al., 2020). This study refers to the extent to which the teacher inculcates critical competencies like collaboration, critical thinking, effective communication, digital, literacy, and self-efficacy among the learners.

**Teachers of Agriculture:** These are teachers who have been trained and specialized in teaching and certified by earning an undergraduate agricultural diploma or degree from a recognized and certified institution (Akhtar, 2019). This study refers to P1, diploma and bachelor degree teachers who have been certified to teach in Kenyan primary schools by accredited Colleges and universities and have been assigned to teach grade four Agriculture subjects in their respective schools.

**Teacher Training:** It is the individual and collective skills, attitudes, knowledge, readiness, and awareness of new ideas (Ondimu, 2018). In this study, it is the number of training sessions attended, the mode of training (theory, practical, or both), and the relevance of the training to grade four strands.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

This chapter provides an overview of recent research related to institutional preparedness in the teaching of Agriculture in public primary schools. The review has been divided into thematic headings which include; Competence Based Education, Institutional infrastructural preparedness, teacher preparedness in teaching Agriculture, agricultural instructional resources for competence- based agriculture subjects, and sustainability plans for instructional and infrastructural resources. It also presents the theoretical framework and conceptual framework used in the setting of independent variables and the dependent variables for the study.

## 2.2 The Competency Based Education (CBE) System

The CBE system aims at shifting learning from teacher to a learner-centered teaching approach. Under CBE a teacher is neither a source nor a dispersion of knowledge but facilitates learning with a greater focus on practical teaching of vocational subjects (Mulder et al., 2017). The CBE system is characterized by giving learners enough time to learn and allowing each learner to demonstrate acquired competencies. In addition, the CBE system discourages norm-referencing standardized tests which encouraged stiff competition among learners and institutions. The CBE also acknowledges reflective learning, mastery learning, and criterion referencing modes of assessment because they have succeeded in enabling learners to identify their abilities and interests (Lassnigg, 2017). Successful CBE implementation requires redesigning the existing learning environment, objectives, learning activities, and a high degree of innovation by teachers and institutions (Mulder et al., 2017).

**Table 1**

*Examples of innovative inspiring learning environments within the context of CBE*

| Learning environment | Description | Learning activities |
|---|---|---|
| Classroom instruction | The teacher provides suggestions and examples and shares experiences to inspire learners | • Classes<br>• Storytelling<br>• Cases |
| Laboratory | In-depth (practical) training by the teacher who guides the students individually and intensively (learning by doing). | • Demonstration<br>• Exchange experience with teacher<br>• Practical<br>• Course<br>• Training<br>• Workshop |
| Laboratory | Solving a real-life (technical) problem by experimenting with different solutions in a safe environment. Focus is on the development of content (i.e., product, concept, or solution). | • Problem analysis<br>• Exploration<br>• Protocols<br>• Simulation |

Source: Mulder et al. (2017)

Globally, countries have adopted CBE, others are pursuing to introduce curricula reforms in their respective education systems to ensure learners, and citizens acquire skills that will enable them to fit the WoW. Successful countries like Finland, Germany, the USA, Netherlands, and South Africa in implementing CBE systems have proved to promote high-quality teacher training, more teacher employment to reduce the high teacher-students ratio, supporting schools acquire modern instructional resources like the use of information communication technology (ICT) tools and associated resources. However, some countries like Tanzania have found it difficult to introduce the new recipe of CBE in their education system. Therefore, this has made the CBE system attach outcomes for assessments to the ongoing traditional process of assessing the cognitive advancement of a learner (Lassnigg, 2017).

The start of CBE in USA schools has a close connection to the objectives of the 1950s movement which focused on teachers' and learners' behaviors. American educators raised concern about low student achievement and poor teacher training that affected learners' competencies at their jobs and personal lives after school (Gustems-Carnicer et al., 2019). Therefore, there was a need for teachers to structure their objectives to observable behaviors and learners' practical abilities in vocational subjects. The implementation of CBE in the USA advocated for two models (Mulenga & Kabombwe, 2019). The first model focused on assessing the cognitive understanding of the teacher, assessing the teaching behavior of the teacher regarding the utilization of learning and instructional resources in and outside the classroom. It also focused on the ability of the teacher to examine learners' competencies that are relevant to learning objectives. The second model focused on the teacher's degree of invention and innovation abilities to interpret information and how the teacher conveyed the content to learners. Therefore the first step to CBE implementation was the provision of learning and instructional resources and teacher training to acquire the skills, norms, and attitudes needed in helping learners acquire positive attitudes, and self-motivation to meet societal expectations (Nsengimana, 2018).

However, the CBE system was not embraced after implementation due to raised concerns on the teacher training, available resources, and institutional autonomy concerning competencies to be measured. Teacher training was crucial in orienting teachers on what a learner should be able to do at each level of learning, mechanisms of assessment, and feedback (Nodine, 2016). A study conducted by the state department of education of the USA over CBE indicated that 90% of students demonstrated high competencies once the teachers were provided with resources supporting practical instruction of vocational subjects and extending time meant for practical learning. The CBE system has been done in three phases 1960 being the first phase that focused on teacher training and teaching of vocational subjects, and to date whereby the third phase is underway in improving higher education CBE. For instance, higher institutions in the USA are focusing on a hybrid CBE system where learning and instructional materials, assessment strategies, and feedback are conveyed online rather than through face-to-face interactions (Giray, 2021).

In the Netherlands, Competency-based education has become very popular in the Dutch Vocational Education and Training (VET) system after its confirmation of reducing the gap between the labor industry and unemployment among school graduates (Mulder et al., 2017). The CBE system in the Netherlands is a replication of the USA but it has undergone an

evolution since its implementation. For instance, VET's research indicates that CBE is important since it matches with the culture and societal expectations about education being empowering and making school graduates more competent than non-scholars, particularly in vocational skills. Despite its great impact on learning and teaching, educationists compare the CBE system to a bottle of old wine in a new bottle since there are challenges that existed before CBE and have continued to take place (Mulder et al., 2014). For instance, school dropout has not been curbed under CBE something that sparked a question, why do students drop out of school when teaching and learning are guided by learners' interests and abilities? Why do learners who acquire competencies need job supervision after going through CBE? Therefore the educationists in the Netherlands have been challenged to research whether there is a better education system than CBE where individuals who have acquired competencies work with no supervision (Tonni et al., 2020).

In the mid-1970s, many countries in Europe experienced greater economic instability (Alqarout, 2019). For instance, the United Kingdom (UK) experienced the highest youth unemployment something that sparked high criticism of the education system due to its production of youths who could not portray any vocational skills (Mulenga & Kabombwe, 2019). Therefore, between 1980-the 1990s there was a greater emphasis on introducing and teaching vocational subjects to bring a balance in the economy between blue and white cola jobs. The UK government introduced a policy known as Competency-based vocational qualification where a graduate was to demonstrate competencies during job interviews before employment. This led to the introduction of competency-based education and training(CBET) to reduce youth unemployment, provide them with skills, promote a positive attitude towards vocational subjects, and promote global economic development (Zuva & Zuva, 2020).

In Africa, CBE was first introduced and implemented in South Africa to address the crisis of a great shortage of engineers, technicians, and artisans experienced in 1998 (Jojo, 2019). The available engineers portrayed high incompetency in road construction something that made the South African government introduce the Outcome-Based Education (OBE) system which stressed much on teacher training through an adaption of American competency-based teacher education (CBTE). However, CBE system implementation was not smooth since the teachers did not understand and interpret the objectives of CBE. For instance, the grade one teachers reported that the infrastructures available were not matching with the CBE objectives. Schools lacked instructional and assessment resources due to inadequate financial support from the government. The workshops used to induct teachers did

not bear fruits since the training took only two days. Therefore, there was an introduction to both in-service and pre-service teacher training to improve teachers' competencies. Therefore, the introduction of CBE required institutions to create infrastructure and avail learning and instructional resources meant for vocational subjects to enable youths to develop self-confidence and positive attitudes towards training (Papadakis et al., 2021). According to Martin (2017) in his research conducted in Cameroon on CBE implementation, institutional preparedness and efficiency in the teaching of vocational subjects are dependent on quality teacher training, access, and availability of instructional resources. One of the objectives of Tanzania's Development Vision 2025 is to achieve quality education whereby graduates will be able to acquire and demonstrate a balance in cognitive, psychomotor, and affective skills in their daily activities. This comes after the Education for self-reliance introduced by Julius Nyerere was faced with high criticism since the learners demonstrated low competencies after school. By 2006 CBE became operational in Tanzania both at primary and secondary levels after heavy investment by the Education Development Sector program in teacher training and setting up infrastructures relevant for CBE instruction and tools used for learner's assessment at various levels (Mangwiro, 2016).

In Rwanda, the CBE system was introduced in April 2015 after Rwanda Education Board (REB) confirmed the lack of seriously trained individuals in the workforce, especially in technical fields (Mulenga & Kabombwe, 2019). Therefore, there was the need to introduce an education system that will help in the production of competent human resources to reduce poverty and ignorance and achieve Rwanda's vision of 2020, which is to create a knowledge-based and technology-led economy. The REB surveyed the CBE system in leading countries like Singapore, the USA, and the UK (Mbarushimana & Kuboja, 2016). The CBE system was launched with less focus on academic work and more emphasis on practical, skill-based learning and learner orientation towards the working environment, both at regional and international levels. Teacher training and the provision of both instructional and learning resources in vocational subjects for both learners and teachers supported the CBE implementation. On the teacher training, 100 national teacher trainers and 3,000 district master trainers; 300 teachers in each district were trained to reach schools in all districts. To improve teachers' competencies, 29,000 teachers who are subject leaders in newly introduced subjects were trained nationwide. The REB aims at producing learners who not only meet and demonstrate skills in the employment sector but also create jobs and employ others (Russell, 2019).

Kenya is not exceptional in CBE implementation after her 8-4-4 education system faced many criticisms on its focus on producing paperwork graduates which contributed to theoretical teaching of vocational subjects leading to youth unemployment of 11.7% (Kenya National Bureau of Statistics (KNBS), 2018). The Kenya vision 2030 focuses on the link between quality education and the labor market, and the need to create entrepreneurial skills and competencies that will strengthen both the public and private sector, and promote Kenya's global competitiveness (MoE, 2012). For Kenya to achieve vision 2030, there have been changes in the education system to ensure the production of competent human resources with skills and attitudes that will enable one to match with needs of the labor industry and be self-employed. For instance, the MoE and KICD implemented the CBE in 2017which aims at promoting education competencies and attaining a balance between academic specialization, technical skills, and market industry through practical teaching of vocational subjects to reduce the level of poverty, unemployment, and crime in society (Ajuoga & Keta, 2021).

### 2.2.1 Agriculture Subject under 8-4-4 Education System

The 8-4-4 education, which was launched in January 1985, aimed at promoting practical teaching of vocational subjects to improve learners' competencies. The vocational aspect of the system for instance was aimed at preparing students who would not join secondary schools after obtaining the Kenya Certificate for Primary Education (KCPE), those who would be self- employed, and those who would be seeking employment in the non-formal sector (Amukowa, 2013). After the implementation of 8-4-4 education, agriculture was introduced as a compulsory subject both at primary and secondary school levels to promote environmental conservation, self- fulfillment, and social, economic, technological, and industrial needs for national development. However, in early 1988 the 8-4-4 education system began to be critiqued for being only practically oriented on documents since the government did not construct infrastructures like workshops that were to be built in schools. Instead, parents and community members were required to construct workshops and laboratories as well as equip and replenish them with instructional resources (Milligan, 2017).

Agriculture subjects required well-equipped workshops, school farms, and machines at both primary and secondary schools. The demands for agriculture subject seemed to overwhelm the stakeholder something that led to the combining of agriculture with Science and making it an optional subject at secondary schools (Aholi, 2018). Provision of instructional resources remained key in the implementation of the 8-4-4 education system. The main resources for the teaching of agriculture included; an agriculture workshop

equipped with metal and woodworking tools, gas and electric welders, tractors, power generators, cultivators, fuel storage tank, a combined harvester, a science laboratory, laboratory facilities, the school farm, a departmental vehicle and funds for running the department. However, the machinery and equipment supplied went into mismanagement by teachers who did not understand how to repair and maintain them. This was a result of a lack of sustainability plans by schools to employ technicians (Seraphine et al., 2018).

The quality of agricultural knowledge acquired by learners is partly dependent on the quality of teacher training (Kyule et al., 2018). Teacher training was a challenge since there was improper training of teachers handling vocational subjects since the requirements for training like finances and attending seminars were observed to be expensive by the Government. Learners' competencies were jeopardized by schools employing untrained teachers and some of the trained teachers were from uncredited agriculture colleges (Kyule et al., 2018). From the foregoing literature its evident that school preparedness in Kenya in terms of resources, teacher training, and sustainability requires improvement for successful agriculture curriculum implementation.

## 2.3 Teacher preparedness in Teaching Agriculture

Curricula change in countries across the world is inevitable since education must be relevant and up-to-date concerning changes in social, economic, and political needs. However, curriculum response to societal change is dependent on how the teachers, students, parents, funding agencies, the government, and curriculum development bodies respond (Goodson, 2013).

According to Ondimu (2018), in a wide expansion of knowledge and curriculum change teachers' preparedness cannot be overlooked. In the Netherlands, teacher preparedness starts at the university to ensure proper embracing and application of new skills needed in new curricula. Change in the curricula first starts at university to ensure the graduate teachers are prepared for new changes (Mulder et al., 2014). The in-service training is also done to increase teacher competencies and full transfer of knowledge and skills to learners. The Dutch University training primary teachers recommend a training session of 4 years to ensure a teacher is fully prepared. For instance, grade 4 teachers in the Netherlands have acquired more competencies making them use 30-45 minutes a week in teaching science (Velthuis & Pieters, 2014). These hours are said to be less than one used in the USA, Japan, Hungary, Singapore, and Italy. Teachers are human beings who respond to stimuli and therefore they have attitudes, perceptions, and feelings. The 4-year training aims at ensuring teachers get a

positive perception of all their work, identify acceptable skills and approaches in teaching, and be aware of and able to use instructional resources (Velthuis & Pieters, 2014).

A study carried out on the use of ICT in science classroom instruction by primary school teachers in the Netherlands, indicated that pre-service training in ICT makes a teacher more prepared and competent than an in-service training teacher (Tondeur et al., 2017). Therefore, in- service teachers require more time and resources in training to increase their preparedness for teaching. In the USA CBE system was not embraced after implementation due to raised concerns on the teacher training, available resources, and institutional autonomy concerning competencies to be measured. Therefore, CBE implementation started with teacher preparation which was done in two models that focused on guiding the teachers to understand the CBE system. After teacher training, the assessment was done on the behavior exhibited by teachers when teaching theory and practice in vocational subjects, the degree of innovation and utilization of teaching and learning resources, teaching methods, and assessment techniques (Nodine, 2016).

Teachers' preparation and qualifications in Iceland and Luxembourg go beyond attaining university training. Teachers' preparation is determined by the period of the teacher training programs, the curriculum, and the induction process. In Iceland, teachers' preparation starts at higher institutions where institutions specialize in offering teacher education. In 2008, there was new legislation on teachers' preparation which introduced mandatory five-year training that's three years of Bachelor's degree and a two-year master's training. For teacher certification, one must acquire master's degree training from an accredited university and have a subject specialization. During the master's training, students are exposed to practical courses, and mandatory teamwork and each must be assigned a school for practical training (Sigurdardottir et al., 2018).

In Luxembourg, teacher training is key whereby in 2003 various institutions were merged to form Luxembourg University which is autonomous in teacher training(Peterka, 2016). Attaining master's degree training is not a guarantee of employment as a teacher since one must get teacher certification after passing state examinations. After employment, the teacher is assigned 7-18 hours per week and works under the guidance of a tutor who gradually orients the teacher to ensure one is competent and settled in a school (Ries, 2016).

In 2016, Finland introduced a new curriculum starting in grade six and in-service teacher training was done before, during, and after the change of the curricula to increase teachers' preparedness to handle and transmit new skills and knowledge fully and effectively

(Lavonen, 2018). However, teachers declined to embrace the 2016 changes since they felt the lesson hours allocated in the new curricula were half the time allocated to the lessons in the 1970s. Therefore, teachers requested adjustments in the time allocation among subjects (Huhtala & Vesalainen, 2017).The primary and secondary school teachers responded to the decline by saying the new curricula needed new teaching methods and resources regardless of the teachers' academic qualifications. In Finland, for one to be a teacher, one must have a master's degree qualification and a subject specialization whether at lower or upper primary (Halinen, 2018). Finish teachers were subjected to in-service training and later on, it was confirmed that the use of workshops and seminars made teachers effective in their teaching. Long-term in-service training was observed to make a teacher change at least one aspect of teaching and made students perform better. Teacher preparedness is not about inducting the teacher about the curricula alone but also about moral, social, and psychological counseling, guiding evaluation methods within and outside the classroom. In Finland, a teacher operates alone with no supervision, however, to increase preparedness co-teaching was introduced (Huhtala & Vesalainen, 2017).

At the onset of CBE introduction in South Africa, Concerns were raised regarding the quality and relevance of the teacher education and courses offered by colleges (Ramnarain & Hlatswayo, 2018). To improve teacher training and preparation, there was a merging of some universities and technical colleges to form a few accredited universities to offer education for teachers. The South African government invested in in-service teacher training to upgrade professional development for the already employed teachers (Ogunniyi & Mushayikwa, 2015). Since the CBE system demanded teachers' instructional strategies beyond the chalk-talk approach, institutions of higher learning had to do changes in their courses by developing infrastructures and resources meant for vocational courses to ensure that university graduates demonstrated competencies in vocational subjects (Ogunniyi & Mushayikwa, 2015).

In the year 2000, Uganda restructured its education at the primary level to ensure students acquired competencies in agriculture and enable young people to acquire and apply practical skills(Sidonia & David, 2019). There was an open teacher-training school for in-service mentorship. However, the teachers showed less interest and were not prepared to embrace practical teaching of vocational subjects since the training they got was not relevant to the available teaching resources. This teachers' unpreparedness resulted in theoretical teaching hence compromising learners' competencies (Okiror et al., 2017).

A study conducted in Tanzania in the year 2014 revealed that the pre-service teachers

were aware of the changes in their education system (Paulo, 2014). However, the pre-service teachers were not well trained in the utilization of instructional resources, teaching and assessment methods used under the CBE. For example, in classroom instruction Table 2 indicates in the application of learner-entered approaches, teachers were not able to effectively balance the various teaching methods leading to a theoretical and superficial teacher-centered approach. Those who formed group discussions formed groups of between (9-18) due to a large learner population and these were not effective to manage. A teaching method is a good indicator of teachers' preparedness, (Paulo, 2014).

**Table 2**

*Teaching methods observed during the pre-service teachers' classroom lessons*

| | Teaching Method | Frequency in 20 observations<br>Average time in minutes |
|---|---|---|
| Lecturer | 15 | 28 |
| Group Discussions | 13 | 16.5 |
| Questions and answers | 9 | 6 |
| Demonstrations | 5 | 6 |
| Presentations | 2 | 5 |

Source: Paulo (2014)

During assessment in the use of the critical thinking method, the teachers gave a short "wait time" between a question and the learner's response. All the teachers observed allowed a "wait time " of less than 10 seconds hence compromising the learner's ability to think and ability to classroom disclosure (Paulo, 2014).

Teacher preparation and training is a challenge in African countries where learners who have always scored low marks and grades are the ones admitted to the teaching profession something that has affected learners' competencies (Munishi & Road, 2016). For example, in a survey conducted in Butimba public teachers' College in Mwanza Tanzania, more than two-thirds of the student pursuing a Diploma course in teaching enrolled between 2010/2011 and 2011/2012 academic years had qualifications below the official requirement of two principal passes and a subsidiary (Munishi & Road, 2016). The effectiveness of the CBE system depends on relevant teaching methods, evaluation methods, and teachers setting their exams rather than relying on exams set by vendors since these exams do not measure competencies but topics. However, the KICD and KNEC have not given a clear guide on how to conduct teacher training concerning student evaluation (Momanyi & Rop, 2019).

Unlike countries like the Netherlands, Iceland, Luxembourg, and Finland, where teachers undergo extensive pre-service and in-service training, Kenyan teachers lack the necessary support and resources to adapt to changing curricula. This is evidenced by studies showing that pre-service training in ICT and other innovative teaching methods make teachers more competent in implementing a new education system. In addition, adequate teacher training increases the teachers' utilization of instructional resources thus empowering learners competence acquisition (Caena & Redecker, 2019).

## 2.4 Infrastructural Resources in Teaching of Agriculture

The Sustainable Development Goal Four (SDG4) of the United Nations aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all by improving learners' literacy-numeracy, physical development, social-emotional development, and learning (Donkor, 2017). Globally, some countries have and are making changes in their education system to promote the achievement of SDG4 by adapting relevant education systems like CBE. Well-implemented CBE has been found to reduce poverty levels, create self-employment, improve food security and enable learners to develop positive attitudes towards vocational subjects in developing countries. UN counties that have successfully implemented CBE have improved the learning environment particularly laboratories, workshops, and the store for farm tools and equipment used in teaching vocational subjects. The learning environment for vocational subjects is beyond classrooms and books since successful schools have electricity, clean drinking water, laboratories, libraries, computers, and internet right from primary schools (United Nations Secretariat, 2017). Schools have different class structures ranging from iron-wall, and timber-wall classrooms to those made of bricks (Bluyssen et al., 2018). However, the most important factor is the number of students a class can accommodate without learners struggling during the learning process. For instance, countries like Japan, South Korea, the USA, and Finland recommend a class to have between 20-30 students to ease the learning and teaching process (Goodrum et al., 2012).

Effective teaching of agriculture subjects goes beyond classroom instruction (Diise et al., 2018). Therefore countries that have successful curricula implementation institutions have proven to have in place adequate laboratories, workshops, classrooms, equipment, physical facilities, and teaching aid (Rufai & Muhammad, 2013). The teaching of Agriculture requires learners to draw and carry out measurements within and outside the classroom and this requires learners to have a free space for these activities. In addition, learners carry out

projects outside the classroom in either the farm, store, or laboratories. This learning activity needs students to be supplied with clean water for washing hands, and protective clothing like gloves, gumboots, and safety goggles during practicals to ensure students' health is not at risk (Omae et al., 2017).

A study on the factors impacting curriculum implementation and learners' performance in Agriculture science in South Africa indicated that lack or inadequate infrastructure affects curriculum implementation which later affects learners' competencies (Chauke & Kabiti, 2016). During the apartheid regime, schools meant for the Europeans were favored in terms of infrastructure unlike schools meant for Africans (Shepherd, 2016). This has made some provinces record high scores than others. The North-west province has always performed well in Agriculture subject recording (90.2%) efficiency while Limpopo province recorded 64% due to inadequate supply of infrastructures such as water, electricity, and farming space. To address the infrastructural challenge, the South African government has put into place room space (providing between $100m^2$ and 120 $m^2$) and garden grounds (4800 $m^2$) for projects (Chauke & Kabiti, 2016). Learning is a process and not an outcome (Hodges, 2012). Therefore, the calm environment in modern classrooms with proper air ventilation, classroom furniture, perimeter wall, and floor surface that is free from clouds of dust have been confirmed to contribute to learners' competencies (Hodges, 2012). In Zambia, for a school to be allowed to offer agriculture it must put into place agricultural land, physical facilities, and laboratories for conducting experiments (Chauke & Kabiti, 2016).

Availability, access, and utilization of infrastructures in teaching vocational subjects are directly proportional to learners' competencies at primary, secondary, and tertiary levels and in the labor industry (Nuraeni & Suwadji, 2020). For instance, Ward-schools opened all-over Tanzania in 2006 and operated for 6 years without an adequate number of teachers, classes, laboratories, ICT tools, and libraries something that compromised the implementation of the CBE system. East African Community (EAC) members have more learning institutions with inadequate infrastructure and this has led to high incompetency among graduates from universities, colleges, and Technical and Vocational Education and Training (TVET). Employers complain that neither do graduates have competencies, and innovational skills knowledge in their areas of study, nor are conversant with current affairs in their fields. For instance, a survey by Munishi and Road (2016) revealed the of jobs in competencies across East African Countries was high as indicated in Table 3.

**Table 3**

*The extent of lack of job competencies among graduates in East Africa*

| Country | Tanzania | Burundi | Rwanda | Kenya |
|---|---|---|---|---|
| Percentage | 61% | 55% | 52% | 51% |

Source: Munishi and Road (2016)

Therefore, inadequate infrastructure, including classrooms, laboratories, workshops, and equipment, have a negative contribution towards practical teaching of agriculture (Wanyama, 2022). Inadequacy of resources have hindered the acquisition of hands on skills, as well as the development of competencies needed for the WoW. In addition, overcrowded classrooms with insufficient space, poor ventilation, and inadequate furniture is another challenge that hinders the learning process (Kinoti et al., 2022).

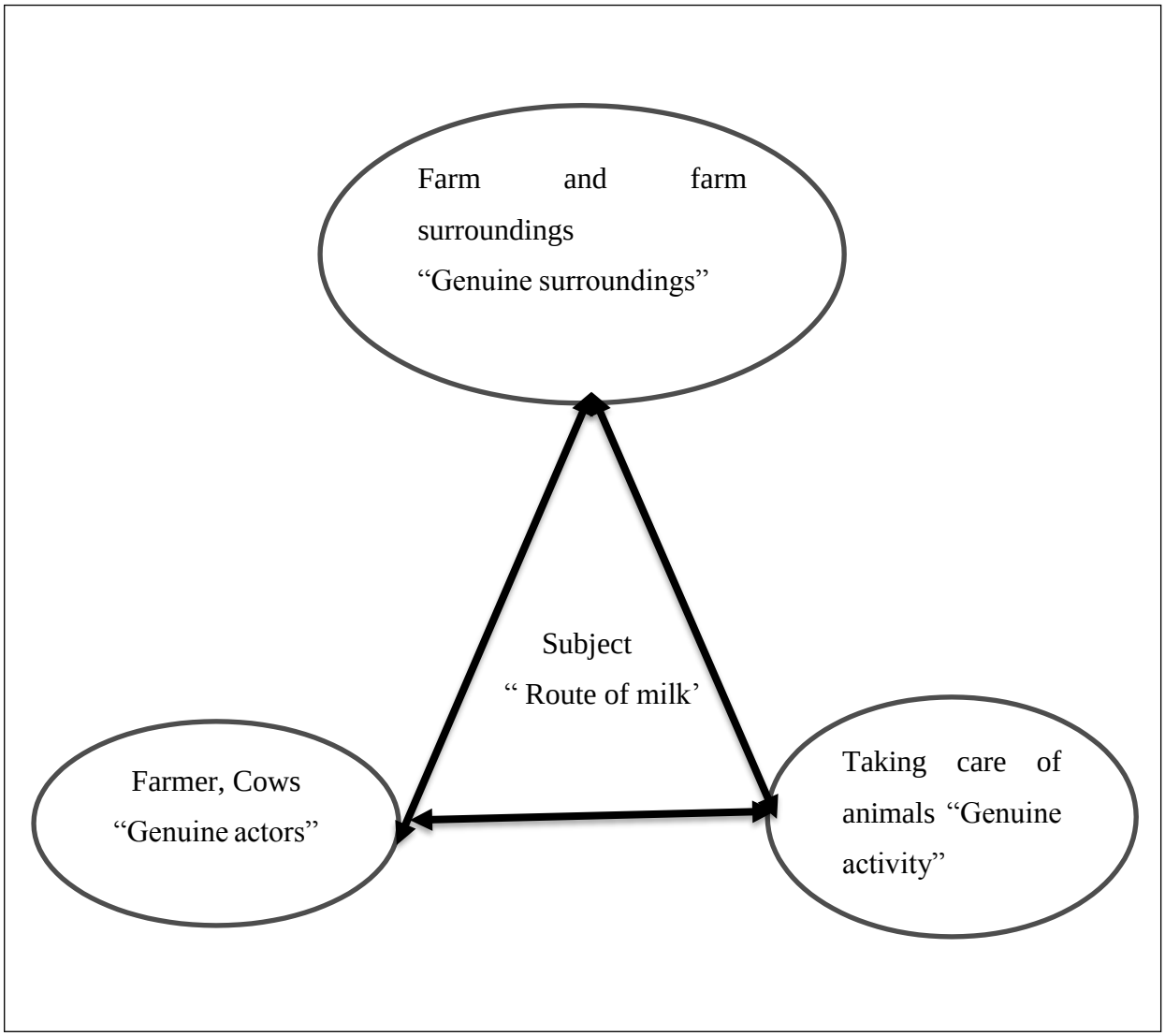
### 2.4.1 Use of the School Farm in Teaching Agriculture

The availability of diverse learning resources reduces learners' boredom and motivates both the teacher and the student during the teaching and learning process (Puspitarini & Hanif, 2019). Vocational subjects require learners to carry out projects and experiments both at school farms and laboratories to increase knowledge retention and help students acquire practical skills, develop a positive attitude towards learning and apply the skills learned in and out of schools (Moore, 2017).

Research conducted in Finland on learners' competencies in vocational subjects indicated that no matter how trained and competent a teacher is, learners cannot understand fully and apply skills and concepts learned without practicing them (Rissanen et al., 2019). Therefore, schools use farms in the practical teaching of vocational subjects since they make learning authentic. An ideal school farm should have plants and animals used to teach across all grades, a section for the museum, a demonstration, a commercial section, and a project section as depicted by Njura et al. (2020). A school farm that has no activities and projects meant for learning is a field and not a farm (Smeds et al., 2015). Poor student performance is a measure of neither the subject difficulty nor incompetency of a teacher but it is because of the resources available for instruction and the degree to which students interact with their environment. For example, teaching a pupil on the 'route of milk' on the farm, he/she may not understand unless there is comprehensive teaching on how to feed animals, create a conducive environment for the cow, and observe the milking process

**Figure 1**

*Use of school farm in ideal teaching of the "route of milk"*




Source: Smeds et al. (2015)

In Uganda, the teaching of agriculture using school farms/gardens started in 1925 when Phelps-Stokes Commission from New York recommended practical teaching of Agriculture since over 90% of the Ugandans relied on farming (Okiror et al., 2017). The practical teaching of agriculture was meant to help learners acquire practical skills, develop a positive attitude towards blue-collar jobs, be self-employed and develop self-motivation. In early 1925, this approach bore fruits since there was contact between school head-teachers, chiefs, and Extension officers which motivated farmers to adopt new Agro-forestry practices like row planting, and soil and water conservation. Farmers around the school were able to get farm inputs like vegetative materials which required less certification from schools at a cheaper price hence promoting the school (Bazilio, 2019). However, this did not succeed due

to teachers using the school farm for punishing late comers, errant behaviors students were to use the farm tools to weed the school compound. The use of the school farm and farm tools for punishing students is a rampant character by the Sub Sahara region teachers. Also, there were fewer instructional resources such as the lack of enough farm tools, and chemicals for carrying out experiments, and Agriculture lacked a laboratory since they depended on government funding.2014/2015 UNESCO report on Uganda education indicated that Chemistry, Biology, and Physics were given priority in funding, and Agriculture was abandoned despite it being a science (Nzarirwehi & Atuhumuze, 2019). This has made teachers not use the school farm in their practical teaching but has promoted theoretical teaching of agriculture a factor that has increased youth unemployment due to lack of technical skills (Okiror et al., 2017).

A school farm does not benefit only the students and teachers but also the community. However, in the 8-4-4 system in Kenya, the school farm and farm tools were used by agriculture teachers and other teaching staff as a discipline strategy by assigning learners to weed farms and trimming flowers. Therefore, these responses from teachers towards learners' behavior made students see no benefit from the school farm and agriculture-related practices (Igwe, 2015). Between1960-1969, the community around Chavakali School in Kenya adopted Agriculture as a profitable enterprise after they realized students' projects at school and at home were a source of food and income. However, a school farm does not work in isolation of the tractors, basic farm tools and equipment, and source of labor (Chepng & Boit, 2015).

The CBE in Kenya requires a grade four student to learn and apply competencies like communication, collaboration, critical thinking, and problem-solving. Strand 1 which addresses environmental conservation by collecting soil samples from their environment, and conducting experiments to observe the sizes of clay, sand, and loam soil particles and their water holding capacity aims at enabling learners to acquire communication, collaboration, and self-efficacy. Strand 3 requires a student to prepare a seedbed, and demonstrate appropriate use of jembes, containers, rakes, slasher, and tape measure in making composite manure. The above practices need a farm and laboratories since learners will not be digging all over the school compound (MoE, 2019). Learners are expected to acquire and demonstrate digital literacy, communication, and collaboration competencies in strand 2 by identifying domestic animals (cattle, sheep, goats, and poultry), distinguishing between males and females, and appreciating their importance by watching video simulations, using of charts and pictures or visiting the neighboring farms to explore. However, it is not clear what will be done if the

animals needed for study are not available. It is important to appreciate that the 100% percent transition in Kenya has achieved admitted many students to school and it may not be possible for the surrounding community to allow learners to visit their farms frequently. Therefore a school farm is important in ensuring learners acquire the practical skills needed (MoE, 2019). Learners will improve skills related to garden in strand 3 by preparing a seedbed, sowing seeds identifying and classifying cereal crops (MoE, 2019). This stand advocates for learners to acquire and apply critical thinking and problem-solving competencies by choosing appropriate garden tools, observing safety measures, and demonstrating an understanding of how to store the tools.

While research suggests that practical learning with diverse resources such as school farms and laboratories greatly benefit learners by reducing boredom and increasing motivation, many schools in Kenya lack these resources due to low level of institutional preparedness. Additionally, some schools misuse the available resources, such as using school farms for punishment rather than for teaching purposes as reported by Njura et al. (2020). This gap in resources and practical application hinders students from acquiring practical skills and competencies, leading to potential youth unemployment and limited opportunities for self-employment.

### 2.4.2 Use of Information Communication Technology Resources in Teaching Agriculture

Information Communication and Technology is a collection of resources that can generate, transmit, keep, control, communicate and manipulate information with the aid of skilled personnel and they include but are not limited to radio, television, internet, portfolios, projectors, and use of video simulations (Ondimu, 2018). Education in the 21$^{st}$ century has made a teacher not a source of knowledge but a facilitator, a mentor, and or an instructor. In this century, there is more emphasis on the student-centered learning approach, which requires the facilitator's flexibility, and use of varying approaches in his/her instruction (Akyildiz, 2019). Information communication technology is important in practical teaching. It helps to increase conceptualization and retention of knowledge in teaching vocational subjects since some of the animals and plants that are not at the student's disposal can be acquired through the use of tape slides, video recording, audio recording, simulations and still pictures of the actual object being discussed (Johnson et al., 2014).

Teachers' competencies and technological skills aid smooth transfers of knowledge during classroom instruction (King, 2017). Teachers' willingness, ability, and competencies to use ICT in instruction are dependent on the variety of ICT resources provided by the school since most ICT tools are expensive to be purchased by teachers (Ondimu, 2018). Apart from the school providing the ICT resources, conducting seminars, workshops and benchmarks have proven to have great input on teachers' skills. Research conducted in Kenya in 2014 on the utilization of ICT in Kenya secondary schools revealed that only 13.75% of Kenyan teachers had the competencies of using ICT in classrooms. This was because most secondary schools did not have ICT resources, (Ondimu, 2018).

The use of ICT increases learners' concentration, retention of knowledge, and skills in Agriculture subject. The current generation of students has a positive attitude and attraction to the use of technology and it's therefore important for the instructor to go an extra mile and prepare slides, and use E-cases and video simulation in teaching and assessing students (Tondeur et al., 2017). However, there are challenges and concerns raised by teachers on ICT utilization. Research done in Finland disclosed that despite the higher quality education and performance by students, teachers feared the use of ICT since some devices needed technical knowledge and more planning which teachers felt they lacked competency. ICT is not meant only for teaching but also it should enable a learner to develop skills on how to apply and even innovate technology-associated devices (Huhtala & Vesalainen, 2017).

In Kenya, 8-4-4 education system learners were not allowed to attend schools with any electronic devices both in primary and secondary schools since they were believed to influence students' behavior and performance negatively (Muia, 2016). However, strand 2, which deals with domestic animals, requires a grade four student to watch video simulations, and use digital devices with appropriate software to search for information. Individual students are required to make presentations on pictures (photos with dates) taken by their cameras and observe/watch video clips on various activities to enable learners to acquire, demonstrate and apply digital literacy competencies (MoE, 2019). Strand three aims to help learners acquire and apply communication and collaboration competencies in-group activities while classifying and identifying the vegetables after watching video clips with agriculture content. As learners work in groups, they will be sharing ideas by consulting and directing one another, leading to improving communication and collaboration skills.

The literature identifies institutional unpreparedness in the availability and utilization of Information Communication Technology (ICT) resources in education, particularly in

developing countries like Kenya. This includes a lack of access to ICT resources in schools, which affects teachers' competencies and skills in using ICT for instruction. Challenges such as lack of technical knowledge and planning influence teachers' competency in utilizing ICT effectively. However, with through CBE, the gap will be bridged as depicted by MoE (2019). Addressing this gap requires providing sufficient ICT resources, training, and support for teachers and learners to develop digital literacy competencies.

## 2.5 Sustainability Plans for Facilities and Resources in Teaching Agriculture

Resources used in teaching vocational subjects need repair storage, modification, and maintenance practices for continued utilization over some time (Rufai & Muhammad, 2013). For instance, the ICT tools requirements and their facility are different from the facility required in the storage of crop produce after harvest. The Kenya CBE expects a grade four to learn and acquire competencies in crop harvesting, to consistently clean tools and equipment after use, and practice maintenance of these tools. Therefore for a farm tool to be used for more than one cycle, it requires good maintenance, handling, and storage. However, some tools, equipment, and facilities sustainability require an extra resource person for increased durability. For example, the ICT tools require an expert who will be monitoring and controlling the use of the internet and computers. A grade four learner is expected to collaborate with an ICT resource person to guide him/her on methods of storing photos (MoE, 2019).

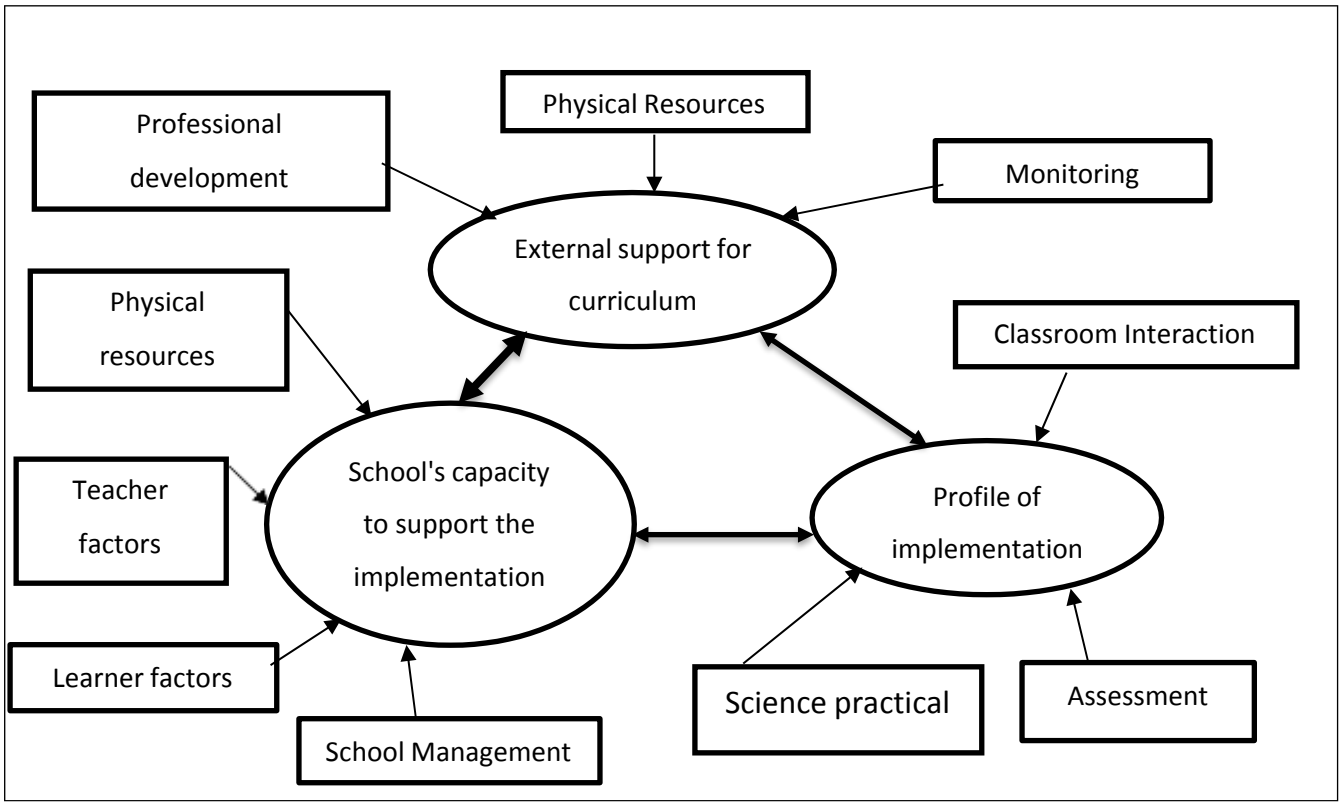
The Kenyan education system has gaps in repairing, storing, modifying and maintaining vocational resources, availability of subject-specific facilities, and expertise for resource-intensive subjects, and alignment between grade level expectations and resource requirements. These gaps may influence the effectiveness of vocational education, as resources deteriorate quickly, and learners may lack necessary support and guidance. Addressing these gaps is crucial for improving the quality of vocational education in Kenya.

## 2.6 Theoretical Framework

This study was based on Rogan and Aldous (2005) curriculum implementation as indicated by Figure 2. The theory revolve around the major variables of this study namely teacher training, adequacy of infrastructure and instructional resources and sustainability of instructional resources and infrastructure.

**Figure 2**

*The theoretical framework for curriculum implementation*




Rogan and Aldous (2005) creates a detailed collection of factors surrounding the curriculum implementation processes. It consists of three main parts called constructs, which include (i) the profile of implementation, (ii) the capacity to support implementation, and (iii) the external factors. The profile of implementation (figure 2) shows how the intentions expected in the curriculum are put into practice in the form of classroom interactions, science practical work, and assessment. The profile plays a major role in enabling teachers at school to identify their strengths by interacting with students through the sub-constructs of the profile. The diversity and adequacy of the resources will improve the intensity of sub-constructs of the profile implementation (Kurczewska et al., 2018). The school's capacity to support implementation is dependent on some factors not limited to the sub-constructs like

school management, learner factors, teacher factors, and physical resources. The school management cannot be ignored. School heads are expected to collaborate with subject teachers and students to identify inadequate resources and plan on how to provide them timely. Schools have different capacities in terms of resources and curriculum implementation will depend on the degree of innovation put into place by teachers and learners to utilize locally available resources (Nsengimana et al., 2020). Teacher factors like motivation, confidence, commitment to teaching, and subject matter are important in curriculum implementation and improvement. Inadequate mastery of the subject matter and lack of or inadequate pre-service, in-service, and seminars training, will become a long-term, ongoing hindrance in the implementation of the curriculum (Rogan & Aldous, 2005). Learner factors like home background may be a factor in curriculum implementation if the learner lack support from parents to practice learned skills at home. According to figure 2, external factors like monitoring, funding agencies, and community have a greater contribution to school curriculum improvement. Education is meant to satisfy the needs of the community and solve problems by ensuring learners acquire relevant education.

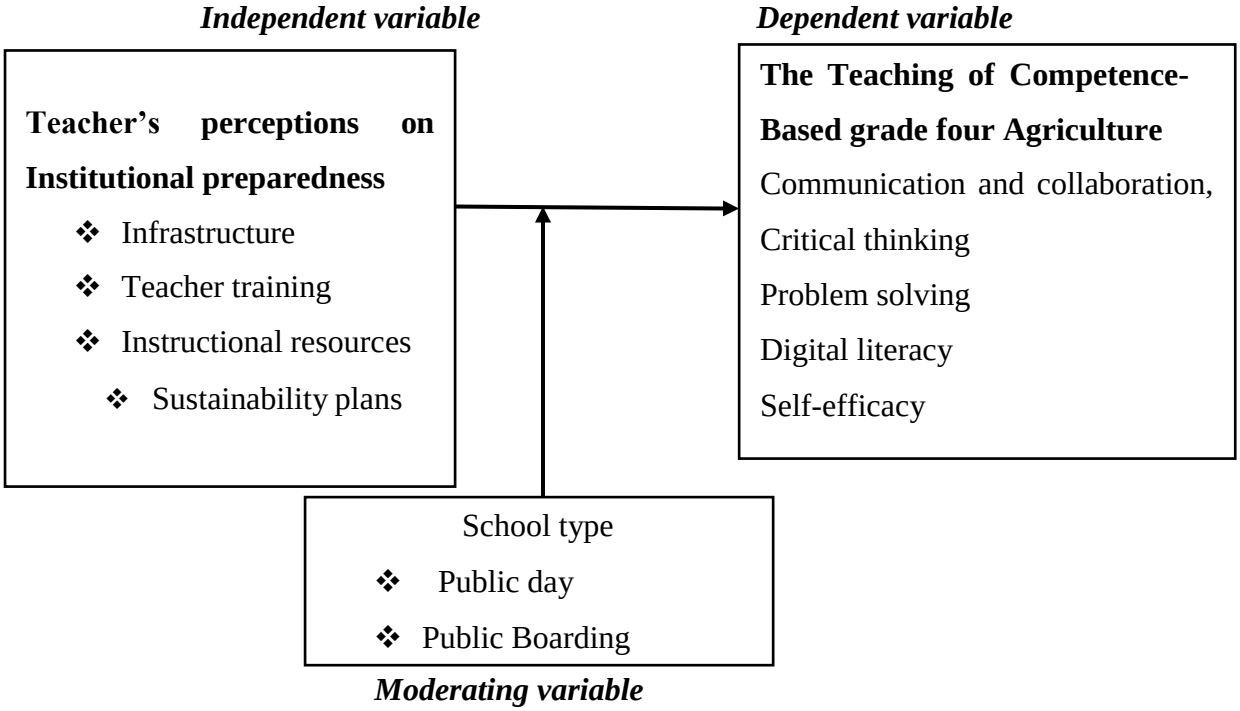
This theory was relevant to this study since institutional preparedness relies on the teacher training physical resources, which are infrastructural and instructional. According to the MoE (2019), learners are expected to visit the community farms for practical lessons to improve their competencies. This study also focused on sustainability plans for resources that needed to be put into place, maintained, and repaired. For sustainability to be achieved, the school management and subject teachers are expected to work as a team. The theory of Rogan and Aldous was more relevant since it depicted the connection between factors surrounding institutional preparedness in the curriculum implementation.

## 2.7 Conceptual Framework

Figure 3 shows independent, dependent, moderating variables and the study's output.

**Figure 3**

*Depicts the variables of the study and their relationship*




The independent variable was teachers' perception on institutional preparedness. Institutional preparedness was measured in terms of adequacy of infrastructures available for example availability of classrooms, farm stores, workshops, and laboratories. In addition, the adequacy of resources like agriculture room/laboratory, workshop, clean water supply, and bookstore and computer room informed the degree of infrastructural preparedness. Teacher training was measured in terms number of training, workshops, and seminar attended, the quality of training (practical or theory), and the relevance of the training the teachers got concerning teaching various strands in grade four. Instructional resources were measured in terms of frequency usage of ICT resources like tablets, internet, smartphones and internet, school farm, cameras, computers, video simulations, availability of domestic animals in school, and availability of practical resources like containers and boxes. Sustainability plans in the utilization of infrastructural and instructional resources were measured in terms of frequency of repair of damaged resources, replacement of worn out and lost instructional resources.

The dependent variable of the study was teaching Competence –Based grade four Agriculture. The dependent variable measured by the extent the competencies were inculcated. Communication and collaboration, self-efficacy, critical thinking, and problem solving competence were informed by teaching approaches used like question and answer, problem-solving, group work, discussions, and presentations. A single teaching approach promoted more than one competency. For instance, a teacher using group work in teaching may help learners acquire effective communication, collaboration and problem solving competency. Digital literacy was measured by the availability and frequency of use of various ICT resources, like cameras for taking photographs and the ability to store the pictures. The moderating variables influence the effects of independent and dependent variables. For this study, a moderating variable was school type and was controlled by focusing on public day schools because they tend to have few resources compared to public boarding schools. The moderator variable was likely to influence the study results if there were public boarding schools in the Sub-County. Within the Njoro Sub-County, all public primary schools were found to be day schools. The government is responsible for the resource endowment for all public schools not only in Njoro but also in the country. The learner's acquisition of the competencies indicated in conceptual framework greatly relies on the degree of institutional preparedness. The output of the study is to produce holistic individuals with competencies, values, knowledge, and skills necessary to succeed in a highly competitive WoW.

# CHAPTER THREE

# RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter presents the research design, location of the study, sample size, target population, and sampling procedures. Also included are the research instruments, validation of the instruments and reliability estimations, data collection, and data analysis procedures.

## 3.2 Research Design

The study used a descriptive survey which was informed by using a questionnaire. The design was appropriate for this study because the population was spread across the sub-county. The significance of the chosen research design (survey) is that it allows the researcher to answer the *when, why, and how* and not "*What"* questions in relation to the study objectives (Dulock, 1993). Therefore, the design was used to answer "*how"* teachers perceived training; how teachers perceived sustainability of teaching resources, how teachers perceived adequacy of infrastructure and instructional resources among public primary schools in Njoro Sub-county. In addition, survey was chosen because it's appropriate for educational fact-finding as it gives an information that is accurate and helps the researcher to establish clear information that the researcher intended to collect without manipulating the variables of the study (Johnson & Christensen, 2019).

## 3.3 Location of the study

The study was carried out in Njoro Sub-County of Nakuru County Kenya. Njoro is one of the eleven sub-counties of Nakuru County Kenya. Nakuru borders seven counties; Laikipia to the north East, Kericho to the west, Narok to the southwest, Kajiado to the south, Baringo to the north, Nyandarua to the east, and Bomet to the west (County Government of Nakuru, 2018). The county has a population of 2,162,202 and covers an area of 7,510 square kilometers(Kenya National Bureau of Statistics, 2020). The sub-county has 96 public primary schools. The Data was collected from six wards in the sub-county; Mau Narok, Mauche, Kihingo, Nesuit, Njoro and Lare to ensure that each ward was represented to avoid bias and generalization of data collected. According to the MoE (2019), teachers should expose learners beyond the school environment to practical lessons by visiting community farms and agricultural learning institutions if their schools do not have adequate instructional resources. Public primary schools in Njoro Sub-County are close to Rift Valley Institute of Science and

Technology and Egerton University, which offer agricultural related courses that will be used to expose grade four learners to the practical agricultural activities entailing livestock and crop production. In addition, Njoro Sub-County has many farming activities both small and large scales within the community which can be used for practical teaching. According to MoE (2019), schools that have inadequate resources for practical teaching of grade four agriculture to conduct a visit to the community to expose learners to various practical agricultural activities. Therefore, the location was ideal for the study.

### 3.4 Target Population

The target population is the population that the researcher wants to generalize the findings of the research (Rahi, 2017). The study targeted 96 public primary schools in Njoro Sub-County. According to the Njoro Sub-County Co-curricular activity remissions report (2018), the number of registered public primary schools in the Sub-County is ninety-six (96). Table 4 shows population distribution of the registered public primary schools across the six wards.

**Table 4**

*Population Distribution of Public primary Schools in Njoro Sub County*

| S/No. | Name of ward | Number of primary schools |
|---|---|---|
| 1 | Njoro | 19 |
| 2 | Lare | 17 |
| 3 | Nessuit | 8 |
| 4 | Mauche | 27 |
| 5 | Mau-Narok | 14 |
| 6 | Kihingo | 11 |
| Total | | 96 |

### 3.5 Sampling Procedure and Sample Size

Sampling is a process a researcher uses to select people, events, or objects to study. It is a process of selecting some individuals or objects from a population such that the selected group contains elements representative of the characteristics found in the entire population (Rahi, 2017). In this study the sampling units was public primary schools whose respondents

were teachers of grade four agriculture. Therefore, census was used to sample 96 public primary schools in Njoro Sub-County. One teacher of agriculture was selected to respond to the questionnaire. In cases where a school had more than one teacher of grade four agriculture, the teacher with more teaching experience under CBE training was selected. In the event that a school had many teachers with equal teaching experience under CBE, simple random sampling was utilized to select one teacher to respond to the questionnaire.

## 3.6 Instrumentation

The study employed the use of a survey questionnaire, which was developed by the researcher. The questionnaire labeled appendix, A captured dependent and independent variables. The questionnaire contained closed-ended items based on the objectives of the study. The questionnaire had five parts namely; part I (adequacy of infrastructure), part II (Teacher training), part III (Adequacy of instructional resources), part IV (sustainability plans) and part V (extent of inculcating the competencies). The five parts of the questionnaire collected the quantitative and qualitative data.

### 3.6.1. Validity

Aspects of the face and content validity of the research instrument were checked by experts from the Department of Agricultural Education and Extension. Content validity was determined by checking the questions in the questionnaire to ascertain the questions were in line with research objectives.

### 3.6.2 Reliability

The reliability of the items was determined by using Cronbach's alpha index, which helps in measuring the internal consistency of the items. A pilot study was conducted in Molo Sub- County, which has similar characteristics to that of the study area where a questionnaire was administered to a sample of 31 grade four teachers of agriculture. A reliability coefficient of 0.647 was obtained as depicted by Appendix G after a pilot study. However, after removing weak items a coefficient of 0.743 (Appendix C) was achieved and was considered acceptable as it was above 0.7 threshold recommended in social sciences (Taherdoost, 2016).

## 3.7 Data collection procedure

An introductory letter was obtained from Egerton University through the Board of Post- Graduate studies which enabled the researcher to obtain a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). After which, the

researcher visited the County Director of Education, (CDE), to inform about the intended research in the county. A visit was made to the Sub-County Education officer to notify and seek permission to conduct research in the sub-County. The schools were contacted and appointments were made for school visits. The agriculture teachers were contacted in their respective schools. Before the respondents started filling out the questionnaires, they were explained the purpose of the research to ensure they understood the intention of the study. Completed questionnaires were collected the same day to avoid any influence from other teachers and for referencing during data entry.

### 3.8 Data Analysis

The collected data was input into the Statistical Package for Social Science (SPSS) version 25-computer software. In survey, the data analysis is done after at least 80% of the questionnaires have been collected from the respondents (Harding, 2018). Data analysis was done after the respondents have filled all the questionnaires. The quantitative data was generated whereby data collected was analyzed. Descriptive statistical tools such as means, percentages, pie charts, and frequency were used for data analysis, interpretation, and conclusions on each of the research objective were made.

**Table 5**

*Data analysis Summary*

| Research questions | Independent variable | Dependent variable | Statistical tool |
|---|---|---|---|
| i. How do teachers perceive the adequacy of instructional resources | Teachers' perception on adequacy of instructional resources | Teaching of Competency-Based grade four Agriculture | Descriptive statistics |
| ii. How do teachers perceive the adequacy of institutional infrastructure in the implementation of CBC Grade Four Agriculture? | Teachers' perception on adequacy of infrastructure | Teaching of Competency-Based grade four Agriculture | Descriptive statistics |
| iii. How do teachers perceive the adequacy of in-service training for CBC implementation? | Teachers' perception on the adequacy of in-service training | Teaching of Competency-Based grade four Agriculture | Descriptive statistics |
| iv. How do teachers perceive the sustainability plan for infrastructure and instructional resources implementation? | Teachers' perception on Sustainability plans | Teaching of Competency-Based grade four Agriculture | Descriptive statistics |

## 3.9 Ethical Considerations

Adherence to ethical principles is critical for ensuring the safety, privacy, and respect of study respondent's (Seagle et al., 2020). Seeking an approval from graduate school, research permit from NACOSTI, paying a visit to county and Sub-County director of education were the ethical issues the researcher observed. In addition, during the data collection the researcher sought the respondents consent to participate in data collection. Respondents were informed not to write their physical address and personal contact on the questionnaire as a way of promoting privacy and anonymity.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1 Introduction

This chapter presents the results of the study. It contains the results of the analysis of data from the questionnaires from grade four teachers of agriculture. The data analyzed is presented in form of percentages, frequencies, means, bar charts, pie charts, and tables. This chapter presents results and discussions of the findings. The aspects analyzed and discussed include gender of respondents, teachers' perception on adequacy of institutional infrastructural resources, the extent of teacher training, adequacy of instructional resources, the extent to which competencies are inculcated, and sustainability plans for resources used for the teaching of competence-based grade four agriculture in public primary schools Njoro Sub-County. The response rate for this study was 100%. As all the respondents participated in the study and the returned the questionnaire to the researcher.

## 4.2 General characteristics of Grade four teachers of agriculture

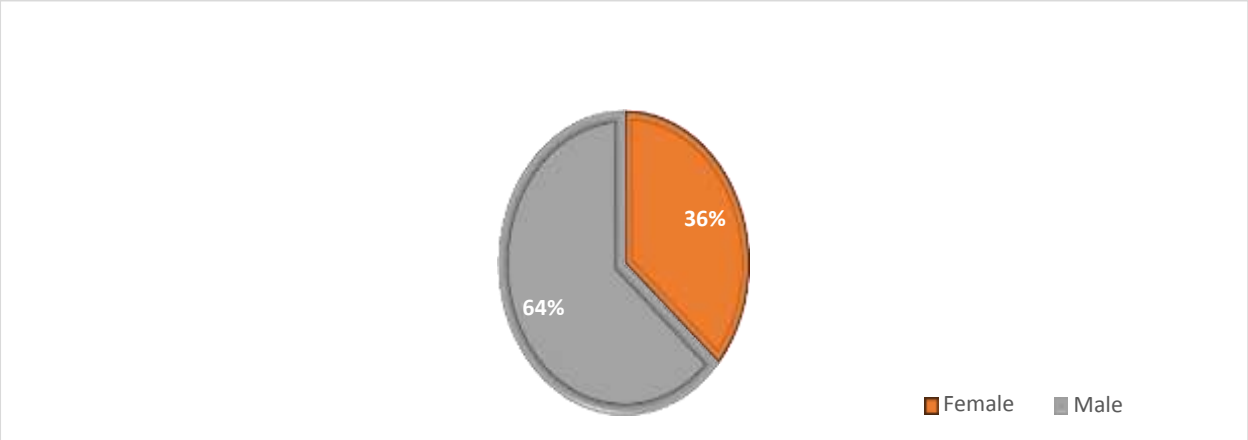
The study examined the characteristics of the grade four teachers of Agriculture who took part. The sets of the teachers' characteristics that were examined included gender, workload for grade four teachers per week, and level of education.

### 4.2.1 Gender of Respondents

There was a need to find out the gender of grade four teachers of agriculture and the results are shown in figure 4.

**Figure 4**

*Gender of grade four Agriculture teachers*



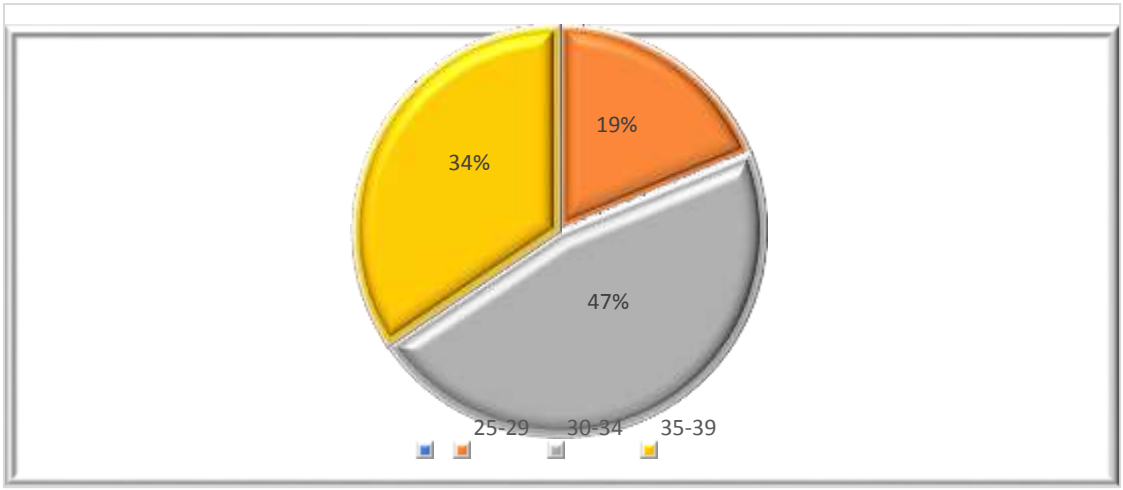
The majority of the grade four teachers of agriculture were male (64 %) while females were few with 36%. In a reflection on the ratio of females to males in the formal sector, there is a gender gap where males are the majority. The findings of this study tally with results recorded in a research conducted in Nigeria by Enfield (2019) evaluating gender roles and inequality in the Nigerian labor market, which cited that women were few. Another study conducted in examining the gender distribution in 10 tertiary institutions in Uganda and 158 fields revealed that the ratio of men to women was 8:2 with more males in science courses as females dominated in arts courses (Odaga, 2020). According to Makarova et al. (2019), a study conducted on primary school teachers on subject prevalence for male and female teachers revealed that male teachers preferred vocational subjects while female teachers opted for art-based subjects. The presence of few female teachers in agriculture could be a result of female teachers having more family responsibilities compared to men thus they opt to choose subjects that will allow them to manage home duties after school with less fatigue (Aalto, 2020).

### 4.2.2 Respondent's Workload

The workload per teacher of agriculture in a week was examined and the findings were as shown in Figure 5. This was necessary for determining if the other subjects had any negative effect on the teaching of agriculture subject.

**Figure 5**

*Total Workload per grade Four Teacher of Agriculture in a week*




According to Figure 5, many teachers ( 47%) had between 30-34 lessons per week, 34% of teachers had the highest number of lessons (35-39) while 19% of teachers had 25-29 lessons per week. Agriculture is a hands-on subject that requires teachers to create more time

for conducting both classroom instruction and psychomotor activities. For instance, teachers with 35- 39 lessons cited that they spent much time in class compared to carrying out practical activities at the farm due to inadequate time. In addition, the teachers with over 30 lessons confirmed that they had a challenge in managing time (35minutes per lesson) in conducting practical and project activities since many students took the teacher's time to make them settle before starting practical activities.

The findings of this study conform with the Ministry of Education guidelines (Ministry of Education, 2018) which indicates that the minimum number of lessons per primary school teacher in a week in public primary school should be 30. The schools where the teachers had alighter teaching load is an indicator of adequate staff while the ones where a teacher had 39 lessons is a case of understaffing. The findings are in tandem with a study conducted by Nyambura (2018) who found out that when teachers have more than 35 lessons per week as a result of teacher deficiency, teachers opted for theoretical teaching as opposed to a practical approach which negatively influenced the competencies acquired by students. Human resource is a challenge in Kenya's primary schools across the country where there is a deficit of fifty thousand teachers (Omariba, 2022).

### 4.2.3 Respondent's Education Level

The agriculture teachers were asked to indicate their education level and the findings were as recorded in Table 6.

**Table 6**

*Grade four Agriculture Teachers' Education Level*

| Education level | Frequency | Valid Percent |
|---|---|---|
| P1 | 27 | 28.1 |
| Degree | 34 | 35.4 |
| Diploma | 35 | 36.5 |
| Total | 96 | 100.0 |

Diploma holders were the majority with 36.5% and the P1 teachers were the minority with 28.1%. The high number of Diploma and Degree holders could be associated with Teachers Service Commission (TSC) guidelines that give priority to the employment of Diploma teachers to P1 teachers under CBE. The teacher's education achievement may influence the skills and competencies attained by a student. For instance, Diploma and Degree

holders in a subject tend to have more exposure and advanced skills in teaching a given subject. The P1 teacher tends to cover fewer units at Teachers Training College (TTC) where they learn basic units. A study by Obuhatsa (2020) revealed that some teacher factors like education level and teaching experience not only play a role in the skills acquired by the students but also affect teacher preparedness in the implementation of CBE.

The findings of this study are in agreement with TSC guidelines, which noted that the newly employed teachers under CBE were not competent enough. Therefore, the director of quality assurance recommended a 9-month training for P1 teachers to upgrade their studies not only to be CBE competent but also to get priority in TSC internships and employment (Nyaundi, 2021). Further Nyaundi (2021), indicated that the new TSC directive was to make at least 300,000 p1 teachers who are not employed register for a 9-month training. The high number of Diploma and degree teachers is an implication that the Government of Kenya is adjusting the human resource toward CBE requirements.

### 4.3 Teachers' Perception on Adequacy of Infrastructure Resources for Teaching Competency-Based Grade Four Agriculture

*The first objective of the study was to determine the teachers' perception on adequacy of institutional infrastructural resources for teaching competency-based grade four agriculture in Njoro sub-County*. The number of structures in schools meant for teaching and learning agriculture informed the adequacy of the infrastructural resources.

The findings were recorded in Table 7 where 0=absent/ not available. 1= (1/4 hectare for land,/one room buildings/ one tap for water). 2= (1/2 hectare for land/ two rooms for buildings/ two taps of water). 3= (one hectare of land /three rooms for buildings / three taps of water). 4= (more than 1-hectare piece of land,/More than 3 rooms/ more than three taps of water).

**Table 7**

*Infrastructural Resources for Teaching Competency-Based Grade Four Agriculture*

| | Percentage | | | | |
|---|---|---|---|---|---|
| **Resource** | 0 | 1 | 2 | 3 | 4 |
| Agriculture room/library | 94.8 | 5.2 | - | - | - |
| Workshop for repairing agriculture tools | 96.9 | 3.1 | - | - | - |
| School farm | 5.2 | 54.2 | 31.2 | 9.4 | |
| Computer/tablets room/store | 6.3 | 93.8 | - | - | - |
| Laboratory for carrying out practical | 100 | - | - | - | - |
| Number of Water taps (in carrying out agriculture-related practices) | - | 15.6 | 29.2 | 38.5 | 16.7 |
| Agriculture store | 83.3 | 16.7 | - | - | - |

In reference to Table 7, none of the schools had a laboratory for carrying agriculture-related practicals, 83.3% of schools had no store for agriculture, 96.9% of schools had no workshop for maintenance of farm tools and equipment, 94.8% of schools had no agriculture room/library. In addition, 5.2% and 6.3% of schools lacked school farms and computer stores respectively. The majority of the schools that had a school farm it was 1/4 a hectare. The possible reason for most schools missing infrastructure could be because inadequacy of some teaching and learning resources. For instance, some teachers of agriculture reported they relied upon farm tools from parents thus; they had no reason of having an agriculture store and workshop. Other teachers indicated that the school had financial challenges in establishing some infrastructures. Quality and sustainable education is one of the ways the Kenyan government projects to achieve industrialization by the year 2030 (Musyimi et al., 2018).

However, a study conducted by Nyambura (2018) on evaluating the underlying factors behind poor performance of science subject in Nairobi county revealed that more than half of the schools were missing science room for demonstrations or carrying experiments. In addition, none of the school had a lab equipment for conducting practical activities something that was observed to hinder realization of industrialization in Kenya as teachers opted for

theoretical teaching of vocational subjects. Inadequacy and absence of infrastructure has a negative influence on students' innovative and problem solving skills. In Finland, pupils of between ages of 3-6 are oriented in joining science clubs where their teacher guides them on various scientific activities they are expected to do in the laboratories. At this level, the students do not conduct any practical activity but they observe and make reports. However, between 10-20 years they are allowed to conduct lab experiments, practicals and write reports.

During school holidays, students camp for one week where they do lab practicals and experiments every day between 9 am to 3pm with varied hours per practical depending on the age and grade of the students as cited by Petäjistö and Putila (2016). The rigorous exposure to laboratory and library rooms for students has made students in Finland perform well in international exams and innovation programs (Afridi, 2021). Given that all schools had no laboratory for students to carry out some practical and experiment activities, the grade Four agriculture students may miss problem solving and critical thinking competencies since they are grounded on hands on activities. In Finland and Netherlands, primary school teachers have kept generating new technology, innovation and invention due to frequent interaction with laboratories where they do practicals and experiments in their teaching subjects (Niemi et al., 2016).

The study findings indicated that 96.9% of schools had no workshop/ room for repair of tools and equipment. The workshops are essential facilities for repair, maintenance and replacement of malfunctioning tools Qi et al. (2018). The absence of workshops is likely to make teachers shift from practical teaching to theoretical teaching due to inability of schools to repair hands on tools and equipment something that may compromise learner's competency. A study conducted in Netherlands on learning room management and associated challenges indicated that the presence of workshops and science rooms in school was not enough for practical instruction. It was observed that students felt uncomfortable during practical sessions in the workshops due to poor ventilation and noise pollution. However, a recommendation was made that every workshop to have student friendly headphones and proper ventilation (Bluyssen et al., 2020). This implies that for proper implementation of CBE in Kenya there is need to establish workshops, which are well ventilated and equipped with student friendly soundproof. In addition, lack of laboratory in schools may hinder scientific skills of the teachers since they will have no exposure to practicals, which enables them to generate new skills.

A study conducted by Fan et al.(2022) on use of ICT among Chinese and Singapore students indicated that a single computer room was sufficient in serving entire school when the lessons are well scheduled to avoid collision. in this study, 93.8% of schools had computer room/computer store. Existence of a single computer room per school indicates that there is safety of tablets and computers used for teaching and learning. The students whose schools had computer rooms were found to be more ICT competent in hardware and software utilization as opposed to their colleagues whose schools had no computer rooms/computer labs. In addition, students' whose schools had computer labs were found to be more active on mobile phones since their teachers used the mobile phones in sending assignments. Given that 6.3% of schools had no computer resource room, students from these schools may not compete favorably in the job industry in relation to utilization of ICT resources.

At least 40.6 % of schools had about ½ a hectare piece of land for carrying out agricultural activities. Additionally, about 52.4% of schools had ¼ a hectare piece of land. An ideal school farm should have four main sections namely commercial section, museum section, project section and demonstration (Aboelmakarem et al., 2021). Agriculture is a compulsory subject in Kenya' middle schools. Given that, most schools have inadequate land; students across the grades may not get an opportunity to learn practical agriculture in the four sections of the school farm since ¼ hectare is too small. However, the level of the teachers' creativity and innovation will make practical teaching of agriculture achievable. A study by Jeong et al. (2020) cited that in the situation where the schools inadequate school garden, the vertical gardening, use of old car tyres, containers and cultivation between buildings. The crop produce from the schools farms and the farm tools needs to be stored. However, 83.3% of schools did not have agriculture storage facilities. According to Saduak et al.(2019) practical teaching of agriculture is a challenge in most Kenyan schools due the lack of essential infrastructure as agriculture stores something that has made school incur many expenses in replacing lost tools and equipment due to improper storage. Therefore, lack of agriculture store poses a challenge to primary schools in Njoro because they may not be able to store farm produce and related farm tools.

The study observed that only 16.7% of schools had more than 3 functional water taps or tanks for carrying agricultural activities. Therefore, the water available may not sustain agricultural activities like students washing themselves after farm activities. The findings of this study coincide with study by Rob et al. (2021) on delivery of safe and clean water in Kenya's primary schools. The findings indicated that about 71% of schools stored water in

plastic water tanks and only 13% of schools could store water for more than 2 months as majority of schools shifted to vendors to supply water and other schools asked students to bring water to school. The implication of water inadequacy is that students may not conduct rigorous agriculture activities, which may require washing of farm tools and equipment. Therefore, lack of water may result to theoretical teaching of agriculture.

## 4.4 Teachers' perceptions on Extent Training for Teaching Competency-Based Grade Four Agriculture

*The second research objective of the study aimed to determine the teachers' perceptions on extent of training for teaching competence-based grade Four agriculture in the Njoro sub-County.*

### 4.4.1 The number of CBE training Sessions Attended between 2018-2022

Grade four teachers of agriculture were asked about the number of sessions they attended from 2018 to the year 2022. The findings were as indicated in Table 8.

**Table 8**

*Number of CBE training Sessions Attended between 2018-2022*

| Training Sessions | Frequency | Percentage |
|---|---|---|
| Single training | 6 | 6.3 |
| Two training sessions | 29 | 30.2 |
| Three training sessions | 45 | 46.9 |
| More than three sessions | 16 | 16.7 |
| Total | 96 | 100.0 |

As presented in Table 8, the entire grade four teachers of agriculture had attended CBE training whereby it was observed that 77.1% attended at least two sessions, 6.3% attended a single session and 16.7% attended more than three sessions. The 100% attendance in teacher training could be due to the teachers' interest to learn new concepts and approaches that were pertinent to teaching agriculture subject. Another possible reason for 100% attendance in teacher training sessions could be that the training was considered a mandatory exercise by the TSC. The findings of this study agree with a study done by Waweru (2018) who found that in the implementation of a new curriculum, it is a must that every teacher be retooled to internalize the duties which will enable a learner to acquire skills that will make their academic future bright.

The number of teacher training sessions are directly proportional to the level of competency a teacher will acquire. A study by Aziz (2022) on the impact of teacher training revealed that teacher who were exposed to many training sessions had higher level of classroom management, pedagogical skills and student's assessment skills as opposed to those with few or no training sessions. About 36.5% of teachers had attended at least one training session. If the training sessions do not meet the teacher's needs, they may not have a contribution towards improving teachers' skills. For instance, a study conducted by Ningtiyas and Jailani (2018) indicated the number of training sessions had nothing to do with the knowledge and skills acquired by teachers if the trainings were not in line to the subject area. According to Hafeez (2021) the number of training sessions are directly proportional to the teacher's professional experience. Therefore, the teachers who had attended more than three sessions of training were competent than those who had attended a single session.

A study by Lukindo (2016) on curriculum implementation in Tanzania revealed that despite teachers being aware of CBE, they maintained traditional teaching method of pen and paper. The teachers cited that they were applying the skills and knowledge learned in teachers college and not what they learned in seminars since the seminar's trainings were not subject specific. However, it was observed that continuous training of teachers with specification to teachers' subjects; it led to a shift from traditional teaching strategies to CBE requirements. Based on the foregoing literature, a combination of the relevant teacher training sessions and a teachers' professional experience will lead to an increase in the level of the teacher's competence.

### 4.4.2 Competence Level of the CBE Trainers

The study sought to find out the teacher's response on their perception towards the level of competency of the trainers on a five-point Likert scale and the results were tabulated in Table 9.

**Table 9**

*Competence Level of the Trainers During Teachers' CBE training*

| Level of competence | Frequency | Valid Percent |
|---|---|---|
| Not competent | 57 | 59.4 |
| Somehow competent | 7 | 7.3 |
| Competent | 18 | 18.8 |
| Very competent | 10 | 10.4 |
| Extremely competent | 4 | 4.2 |
| Total | 96 | 100.0 |

From the data in Table 9, the majority of the teachers (59.4%) said the trainers were not competent, 18.8 % said the trainers were competent, 7.3% said the trainers were somehow competent and 4.2% cited that the trainers were extremely competent. The 59.4% who said the trainers were not competent could be among the individuals who attended the theoretical sessions where they did not do any hands-on activities. Another possible reason for the trainers being incompetent could be that the workload for the trainers was a lot hence reducing the efficiency. This contention is in agreement with a study by Lukindo (2016) who found that when the period for teacher training was limited, the trainers seemed to rush through the content making the trainees unable to comprehend the training sessions making training less efficient. One of the teachers of agriculture reported that when there was the need for the trainer to clarify some concepts, the trainers told them, "Even us we did not understand everything when we were taught so try to apply at your schools what you think is applicable". For instance, in the use of ICT tools, the teachers were the ones helping the trainers in connecting and use some resources. Another teacher said that "some of us were more conversant and competent than the trainers." The findings of this study are in agreement with a study by Pale and Amukowa (2020) who found that during the CBE implementation, the trainers themselves were incompetent since they seemed to have not conceptualized and understood the rubrics thus they were not able to facilitate the training.

Teacher competence is dependent on the quality of training. A study conducted in the United States revealed that about 5% to 15% of the teachers exhibited poor classroom management and could not make good student-teacher relationship as a result of incompetent teacher training programs (Range et al., 2012). A few teachers (10.6%) cited that the trainers were very competent. The possible reasons for the teachers citing the trainers were very

competent, it could be that some grade four agriculture teachers are part of the panel that trains teachers. In this research, one agriculture teacher said, "I have attended more than 3 sessions as a trainee but currently I am among the panel that trains fellow teachers." Over 15 years, Finland has posted excellent academic results globally. A study conducted by Pollari et al. (2018) cited that teacher trainers in Finland are competent whereby many of them are PhD holders and they are subject specific on what to train teachers. Given that the trainers are competent, the trained teachers are given freedom to design pedagogical approaches and how to manage the classes without being supervised. Teacher training in Finland requires a primary school teacher to have a minimum of a Master degree that must be awarded from any of the 9 accredited universities for teacher training. Experienced and competent trainers conduct teacher training in Scotland.

A study by Bain and Gray (2018) revealed that quality teacher trainers are professionals whose main responsibility is to conduct research and evaluate the loopholes in the curriculum and develop a quality framework for teacher training. In united states of America and Britain, an individual must exhibit academic competence and professional in order to be acknowledged in teacher training programs (Zulfakar, 2020). The findings in Table 9 indicates 59.4% of the trainers being not competent. This implies that the level of competency the teachers acquired may not help them in becoming CBE compliant. Since curriculum implementation is a continuous process, there is need for teacher trainers to be re-tooled before they embark on conducting training sessions.

### 4.4.3 The mode of Instruction that was used for Teacher Training under CBE

The study sought to find the quality of training the grade four agriculture teachers received. The findings were recorded in table 10.

**Table 10**

*The mode of Instruction used for Teachers' Training under CBE*

| Mode of Instruction | Frequency | Valid Percent |
|---|---|---|
| Theoretical | 47 | 49.0 |
| Practical | 13 | 13.5 |
| Both practical and theoretical | 36 | 37.5 |
| Total | 96 | 100.0 |

The findings indicated that the majority of the grade four teachers of agriculture (49%) attended purely theoretical sessions, 13.5% indicated that they attended practical sessions

while 37.5% said that the training they attended was both theory and practical. The high number of teachers attending theoretical sessions was a result of trainer in competence as indicated in Table 9, which sought to establish the level of trainer competence. This contention is in tandem with previous studies by Koskei and Chepchumba (2020) which stated that the teachers were hurriedly trained whereby the period for teacher training was not enough for training the teachers on various CBE subjects and the trainers were not well prepared in inducting the teachers. The findings of this study are also in conformity to the study conducted in Zimbabwe on the curriculum implementation and associated challenges (Madondo, 2021). Additionally, curriculum implementation was done without consideration of quality teacher training and provision of quality teaching resources and the teachers cited that they were not able to conduct CBE teaching since they were not well trained. A study by Redjeki et al. (2021) cited that practical teacher training not only improved the level of the institution but also social, professional, personal and pedagogic competency. According to Ghorbani et al. (2018), teacher who learn through theoretical sessions, they exhibit limited competencies and skills in classroom management and taught their students theoretically compromising students' level of self-awareness, efficacy and problem solving skills. Thus, the competency of a teacher is greatly dependent on the quality of teacher training

A study by Cook and Pavey ( 2018) revealed that the Finish teachers and students spend less hours in class and yet they post excellent results due to the fact that teacher training sessions are hands on. A study conducted in Namibia on the influence of teacher training on the student competency cited that hands on subjects required practical teacher training in order to achieve sustainable teaching and learning since the students needed to apply learnt skills upon graduation. Therefore, theoretical teacher preparation had a negative impact on the future of school graduates (Anyolo et al., 2018). The findings on Table 10 indicates that 49% of teachers attended theoretical sessions. This implies that more efforts must be put to achieve quality teacher training. As per 2019, implementation of CBE in Kuwait had failed as a result of poor teacher training approaches (Sadeq et al., 2020). Tanzania introduced CBE in the year 2005 to ensure education solved the societal challenges. However, it was observed that by the year 2012 there was no change in students' assessment and teachers approach in content delivery. A study by Pale and Amukowa (2020) revealed that at least 80% of the teachers were not CBE compliant after attending a number of training sessions. The teachers cited that they were trained using pen and paper a traditional way that hindered them from adopting new CBE guidelines. Therefore, for effective CBE implementation, there is needed effort for

practical teacher training in order to perform better like Finland.

### 4.4.4 Teachers' Perception on Relevance of Training attained to Teaching Grade Four Agriculture

The study sought to find out if the CBE training sessions were relevant to the grade four agriculture strands and the findings were tabulated in Table 11

**Table 11**

*Relevance of Training attained to Teaching Grade four Agriculture*

| Learning areas | Not relevant | Somehow relevant | Relevant | More relevant | Extremely Relevant |
|---|---|---|---|---|---|
| Innovative Gardening Project | 30.5% | 23.8% | 29% | 13.5% | 3.1% |
| Water conservation in farming | 41.7% | 12.5% | 19.8% | 19.8% | 6.3% |
| Use of ICT (tablets, video simulation, photos, and pictures) in teaching environmental conservation, and water conservation) | 39.0% | 22.9% | 10.6% | 20.1% | 7.3% |
| Facilitating learning (gardening, making composite manure making) | 16% | 23.6% | 31.3% | 18.8% | 10.4% |
| Assessment of learner's competencies | 19.8% | 39.6% | 37.5% | 3.1% | - |
| Coordinating learners' activities in groups | 26% | 41.7% | 16.70% | 6.3% | 9.4% |
| Use of locally available materials in teaching | 17% | 2.8% | 9.4% | 47.9% | 22.9% |

Looking at Table 11, 41.7% of grade four agriculture teachers said the training they attended was not relevant to water conservation in farming, 39% said the training was not relevant to ICT usage and 30.5% said the training was not relevant to innovative gardening projects. A study by Samuel (2021) indicated that much of the CBE trading is not reflecting the academic needs but gives general guidelines thus making it difficult for teachers to handle some sections when teaching.

The study findings indicated that 41.7% of teachers said the CBE training they got was somehow relevant in coordinating learners' activities in groups and 39.6% reported that the training was somehow relevant in assessing learners' competencies. The findings of this study are in tandem with Reimers (2021) who found that most public primary schools in Kenya have many students per class against one teacher thus making it difficult for a teacher to plan and coordinate learning activities. At least 47.9% felt that the training was more relevant in using locally available materials in teaching grade four agriculture. The possible reason for teachers being able to utilize local materials could be that they are conversant with those materials thus; they needed no training over the same. Another possible reason could be that the resources used by teachers were readily available whenever the need arises. The findings of this study are in agreement with Amunge et al. (2021) who cited that in teaching science-related courses, learners were able to assemble required materials within the schools and obtain other materials from the community.

## 4.5 Teachers' Perception on Adequacy of Institutional Instructional Resources for Teaching Competence-Based Grade Four Agriculture

*The third objective sought to determine the teachers' Perception on adequacy of instructional resources for the teaching of competence-based grade four agriculture in the Njoro sub-County.*

The study sought to find out the adequacy of instructional resources. The adequacy of the resources was informed by the degree of usage, which was estimated on a five-point Likert scale and the findings were recorded in Table 12

**Table 12**

*Adequacy of Institutional Infrastructural Resources and Teaching Competency-Based Grade Four Agriculture in percentage*

| Materials/Resources | Not used | Rarely | Sometimes | Often | Very often |
|---|---|---|---|---|---|
| Camera | 92.7 | - | 4.2 | 3.1 | - |
| Charts | 3.1 | 6.3 | 28.1 | 46.9 | 15.6 |
| Farm tools | 10.4 | 37.1 | 32.3 | 3.1 | 16.7 |
| Tablets | 12.5 | 6.3 | 42.7 | 18.8 | 19.8 |
| Smartphones | - | - | 16 | 46.4 | 37.6 |
| Laptops | 37.5 | 29.2 | 17.7 | 12.5 | 3.1 |
| School farm | 7.3 | 10.3 | 18.8 | 38.4 | 25.3 |
| Drawings | 3.1 | 10.4 | 9.4 | 51 | 26 |
| Internet | 31.3 | 3.1 | 22.9 | 39.6 | 3.1 |
| Videos | 53.0 | 18.8 | 14.6 | 4.1 | 9.4 |
| Textbooks | - | - | 9.4 | 12.5 | 78.1 |
| Models | 26% | 7.3 | 31.3 | 19.8 | 15.6 |
| Pictures | 3.1% | - | 34.4 | 28.1 | 34.4 |
| Realia | 65.3% | 43.8 | - | - | - |

In reference to Table 12, it was observed that 92.7% of grade four teachers of agriculture never used a camera. The teachers cited that they did not use a camera since the MoE did not provide them. However, 7.3% of teachers reported having at least used a camera in taking pictures. The 7.3% of teachers said they were running photography as a business thus they had purchased the cameras. Other resources that were never used include realia (65.3%, videos (53.0%), internet (31%), laptops (37.5%), farm tools (10.4%) and school farm (7.3%). The possible reason for the resources being not used is that the school, parents, or agriculture teachers could not manage to purchase or access. A study conducted by Samuel (2021) in evaluating CBE implementation in Kakuma and Daadab refugee camps revealed that the MoE guidelines on some resources were not feasible since some teaching resources were not adequate thus teachers found it difficult to make use of them. Instead, teachers opted for theoretical teaching. In this context, resources like realia and camera were not utilized as an indicator of inadequacy. At the end of the grade four agriculture strand or sub-strand learners are expected to take pictures using cameras (MoE 2019). However, teachers indicated

they often used tablets and mobile phones since the schools were not supplied with cameras.

A study conducted in Rwanda revealed that teachers used some materials like charts and textbooks more often because they were readily available. However, the teachers did not use some resources like visual aids since they were not adequate thus; teachers opted to put learners in groups to share the available resources (Gilkinson, 2020). In the context of a school farm, some schools did not have a school farm thus agriculture students grew crops near the classrooms while other schools reduced the size of playgrounds. For instance one of the teachers said, “our school has a small compound, and teaching agriculture across the grades without a school farm was difficult thus we decided to uproot the hedges and make the small plot for agriculture students." Plate 1 shows an example of a school with limited land for agriculture. A study by Mucheru (2015) cited that utilization of teaching and learning resources was dependent on the adequacy of the given resource. For instance, most teachers used textbooks and pictures frequently while they did not make use of wall maps and school farm. This implies that when a school farm is small, there are limited activities carried out.

**Plate 1**

*An example of a school with inadequate school farm*

Some schools had school farms but they had no farm tools. For instance, 10.4% of teachers confirmed they never used farm tools. One teacher said, "I teach grade four, a class of 45 students, when students are sent for farm tools only about 15 students can comply. This contention is in tandem with findings from a study conducted by Ajuoga and Keta (2021)who cited that about 92% of parents were negative when their children were either sent for farm tools or clean market. Parents argued that in this country there are people who are paid to clean the streets and they saw no reason for children to be asked to do the same. In addition,

parents said they had paid the school fees thus the schools should buy farm tools rather than asking parents to provide them (Amunga et al., 2020).

The grade four curriculum requires that learners watch video simulations in groups after every sub-strand has been taught (MoE, 2019). However, 53% of teachers said they never taught using video simulations. The possible reason could be that some schools do not have an internet connection which may have limited the teachers from using videos in teaching. Textbooks were the most used resources, 78.1% of the teacher said they often-used books for teaching. The possible reason could be that the ratio of student to book is 1:1 thus there is no straining. The majority of the teachers (38.4%) confirmed they used the school farm often. There is a possibility that these teachers were from schools with a large piece of land that accommodated agriculture learners across the grades to utilize the farm, especially in rural areas. For instance, in reference to plate 2, one of the primary schools had a one-hectare piece of land for kale production.

**Plate 2**

*An example of a School with an Adequate Piece of land for Agriculture*

## 4.6 Teachers' Perception on Sustainability Plans for Infrastructural and Instructional Resources for Teaching Competence-Based Grade Four Agriculture

*This section presents the findings of the fourth research objective, which aimed at determining teachers' Perception on institutional sustainability plans for resources used for the teaching of competency-based grade four agriculture in Njoro Sub-County was achieved.*

### 4.6.1 Storage of the Instructional Resources used for Teaching of Agriculture

The study sought to determine how the institutions stored the resources used for teaching and learning agriculture subjects and the results were tabulated in Table 13.

**Table 13**

*Storage of the Instructional Resources used for Teaching of Agriculture*

| Resource | Pupils keep | Kept in class | special rooms | No keeping/storing |
|---|---|---|---|---|
| Charts | 13.5% | 62.5% | 24% | - |
| Farm tools | 63.5% | 9.4% | 22.9% | 4.2% |
| Tablets | - | - | 100% | - |
| Drawings | 18.8% | 66.7% | 11.5% | 3.1% |
| Flash disk | - | - | 100% | - |
| Laptops | - | - | 100% | - |
| Memory card | - | - | 100% | - |
| DVD | - | - | 100% | - |
| Textbooks | 70.8% | - | 29.2% | - |
| Models | 6.3% | 37.5% | 52.1% | - |
| Pictures | 16.7% | 59.4% | 24.0% | - |
| Realia | | 9.4% | 25% | 65.6% |

The results in Table 13, indicates all the entire grade four teachers of agriculture confirmed they kept tablets, laptops, flash disks, memory cards, and CDs/DVDs in the computer room/store. In the storage of farm tools, many teachers (63.5%) replied that students kept the farm tools at home, while 4.2% of teachers said they did not keep any farm tools. The majority of students kept farm tools because schools had inadequate resources and when the students were needed to carry out farm activities, they were required to report to school with the farm tools. Other schools had no agriculture store thus teachers of agriculture did not keep farm tools. Another possible reason for the 4.2% failing to store the farm tools was result of some schools lacking schools farm thus teachers of agriculture opted for theoretical teaching or they taught using video clips, internet, and tablets on how to carry out various farm activities.

For storage of drawings (66.7%), pictures (59.4%), and charts (62.5%) teachers of agriculture said they kept them in class. The drawings, pictures, and charts kept in class by

mounting them on the wall or folded and piled at the back of the class. Mounting all the teaching materials in class may become distractors or cause a conflict of interest since other teachers may also need to put some charts on the wall. In the storage of realia, 65.6% of teachers never kept them. The possible reason could be that the teachers were taught on using locally available materials during CBE training thus finding it easy to obtain realia whenever needed. Another possible reason could be that the teachers do not use realia in teaching and learning about agriculture.

### 4.6.2 Replacement Lost, Damaged or Malfunctioning resources

The study sought to find out how schools replaced teaching and learning resources that may be damaged, lost or malfunctioned, and the findings were tabulated as indicated in Table 14.

**Table 14**

*Replacement Lost, Damaged or Malfunctioning resources*

| Resource | I re-construct/re-draw/repair /buy | Parents buy | the school replace | KICD/ MoE | No replacement |
|---|---|---|---|---|---|
| Camera | 7.3% | - | - | - | 92.7% |
| Charts | 57.3% | 3.1% | 22.9% | 3.1% | 13.5% |
| Farm tools | - | 70.8% | 32.3% | | - |
| Tablets | - | - | 82.1% | 4.2% | 13.8% |
| Laptops | - | - | 37.5% | 62.5% | - |
| Smartphones | 100% | - | - | - | - |
| Drawings | 74% | 4.2% | 3.0% | - | 18.8% |
| Flash disk | 4.2% | - | - | - | 95.8% |
| Memory card | 3.8% | - | - | - | 96.2% |
| CD/DVD) | 11.5% | - | - | - | 88.5% |
| Textbooks | | 57.3% | 30.2% | 12.5% | |
| Models | 18.8% | - | 13.5% | 9.4 | 58.3% |
| Pictures | - | 3.1% | - | - | 96.9% |
| Realia | - | 3.1% | - | 13.5% | 83.3% |

The study found that all of the teachers used their smartphones in teaching despite having tablets at schools. The teachers said that in the event smartphones were lost or damaged while used in teaching learners, it was the responsibility of the teacher to purchase or repair them. In addition, since some resources like cameras, memory cards, CD/DVD, and realia were bought by teachers, in the event of damage or malfunctioning teachers said there was no replacement. For instance, 83.3% of teachers cited that they never replaced realia after teaching. The possible reason could be that teachers were able to use locally available material for teaching and learning.

At least 70.8% of teachers observed that parents took the responsibility of replacing lost farm tools since schools had inadequate resources. However, 32.3% of the teachers said the school replaced the farm tools. The possible reason could be that the schools that replaced lost farm tools had well-established school farms that needed continuous use of farm tools. 96.9% of teachers said that if pictures were lost they had no replacement means something that could be a result of teachers storing pictures on tablets and their smartphones which they have not been taught how to restore deleted pictures in the electronic devices.

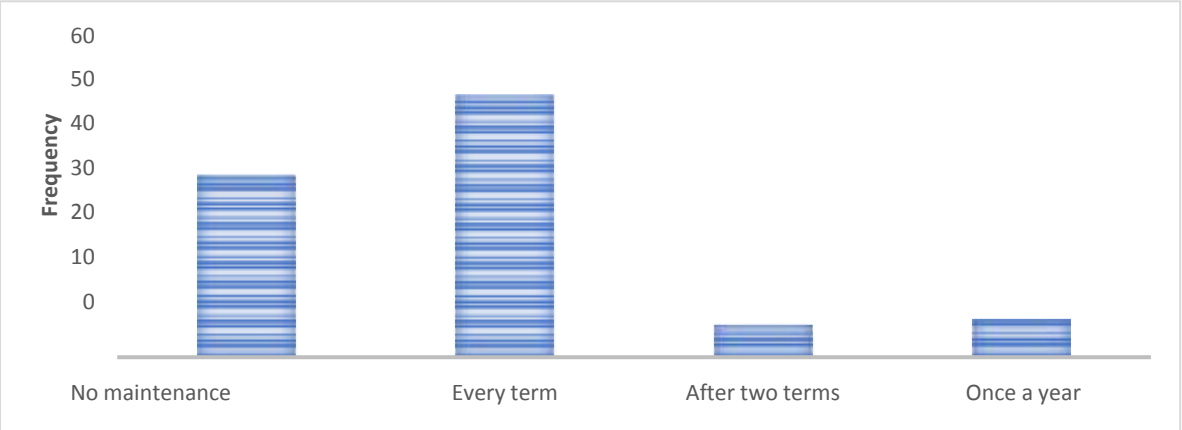
The laptops used by teachers were replaced by KICD/MoE. For instance, 62.5% of teachers confirmed that the KICD had the mandate to replace spoiled laptops. The possible reason could be that the laptops used in schools have been configured by KICD and the teachers may not get a replacement in ordinary shops. The schools had the mandate to replace some resources like charts (22.9%), farm tools (32.3%), tablets (82.1%), and textbooks (30.2%). The KICD/MoE collaborates with various stakeholders, such as teachers, educators, subject specialists, and curriculum developers, to ensure the resources are relevant, accurate, and aligned with the national curriculum. The institute also conducts research and evaluation to improve the quality of teaching and learning materials Government of Kenya (2019).

### 4.6.3 Teachers' Perception on Maintenance Schedule for the Resources used for Teaching Agriculture

The grade four agriculture teachers were asked about the maintenance schedule for instructional resources and the findings are as indicated in Figure 6.

**Figure 6**

*Maintenance Schedule for the Resources used for Teaching Agriculture*




The maintenance includes but is not limited to covering books, gluing, sharpening, oiling metal parts, and dusting. The maintenance schedule was every term, after two terms, once a year, and no maintenance. It was observed that 51% of teachers had a maintenance schedule every term, 6.3% had maintenance after every two terms, 7.3% had a schedule for maintenance after a year and 35.4% said they had no maintenance schedule. The possible reason for a maintenance program could be that the schools do not have resources that require frequent maintenance. Another reason why the grade four agriculture teacher had no maintenance program could be that some resources require a resource person to help repair the resources. For instance, in two out of ninety-six schools, the teachers reported that the tablets were spoiled but they had not repaired them since they had no idea where to take them for repair and the guidelines to be followed in repair. The finding of this study is in tandem with results obtained by Mucheru (2015) where it was confirmed that teaching and learning resources in primary schools lacked a proper maintenance schedule since the materials used were expensive and teachers could not afford them.

The 51% of the schools that had a maintenance program are likely to spend less resources as opposed to schools that had no maintenance or the ones that did maintenance program once a year. The findings of this study are in agreement with a study conducted by Uchendu et al.(2013) in Nigeria on resource maintenance for sustainable development. According to Uchendu et al. (2013) many schools in Nigeria were found to spend a lot of money in purchasing resources meant for teaching vocational subjects every year due to irregular maintenance schedule. However, the study recommended that the schools should develop workshops in schools to repair and replace worn out tools, development of an inventory book by every school to take record of resources that needs repair and have a clear

record showing resources repaired by who and the time.

A report by Melamchi (2019) recommends that maintenance program should be for infrastructure and instructional resources whereby the maintenance was categorized into corrective maintenance, emergency maintenance and periodic maintenance. Corrective maintenance focuses on repair and replacement, emergency is associated with failure of lab equipment while periodic refers to be monthly, per term or per year. In addition, the report indicated that schools should use posters guiding students on maintenance programs. A report by the United States Environmental Protection Agency (2019) indicated that lack of repair and maintenance for resources and facilities had a negative influence on student's health and academic achievement. The report cited that classrooms with irregular dusting and painting caused students serious respiratory diseases and breathing difficulties. The tools that did not undergo sharpening, repair and replacement caused students physical injuries during practical activities. The 35.4% of schools with no maintenance program are at risk of interrupting learning activities in the event a resource or a facility fails operations. Frequent repair and maintenance of resources gives an institution a predictive avenue on the status of its resources. A study by King (2022) cited that non repaired resources become destructors for learners during the learning process as their attention shifts towards the status of the resources thus reducing students concentration. In addition, the schools with no maintenance programs were subject to accidents, which interfered with the teaching process.

## 4.7 Teachers' Perception on Extent to which Competencies were inculcated in Teaching Competency-Based Grade Four Agriculture

*The dependent variable of this study was teaching Competence –Based Grade four Agriculture*. Effective communication, collaboration, critical thinking, problem-solving and digital literacy were informed by teaching approaches used like question and answer, problem- solving, group work, discussions, and presentations as tabulated in Table15.

**Table 15**

*The extent of inculcating Competencies in Teaching Competency-Based Grade Four Agriculture*

The competencies indicated in Table 15 were derived from Upper Primary Levels Designs Volume Three of 2019 as indicated in appendix H.

| Approach/device | Competence | How they were measured | Not used | Rarely | Sometimes | Mostly used | Very often |
|---|---|---|---|---|---|---|---|
| Question and answer | Effective communication, collaboration & self-efficacy | Determining organic wastes in soil, taking care of growing fruits, consulting on storage procedures, | - | - | 14.6% | 47.9% | 37.5% |
| Discussion | Collaboration, communication | Consulting on growing crops, handling animals and storage of crop produce | - | - | 30.2 | 59.4% | 10.4% |
| Group work | Collaboration and communication | Preparation of container gardens, developing container gardens | - | - | 25.0% | 54.2% | 20.8% |
| Role-play | Communication, critical thinking, problem solving and self-efficacy | Presentations on sale output from container garden project, Making scare crows, establishing income generating projects | 3.1% | 20.8% | 54.8% | 10.4% | 10.8% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Agriculture Field trip | Problem solving and critical thinking | Organizing filed visits in relation the three strands in agriculture | 28.1% | 19.8% | 38.5% | 9.4% | 4.2% |
| Problem-solving | Critical thinking, collaboration, communication | Participating in activities for own nutritional supplement, student contribution to crop production | 3.1% | (3.1% | 59.4% | 28.1% | 6.3% |
| Debating | Communication, collaboration, self-efficacy, critical Thinking and problem solving | Participating in activities for own nutritional supplement, Presentations on sale output from container garden project. | 8.9% | 43.2% | 37.5% | 7.3% | 3.1%) |
| Project | Problem solving, critical thinking and collaboration | Making scare crows, establishing income generating projects, producing own foods | 6.3% | 13.5 % | 33.3% | 37.5% | 9.4%) |
| Class Presentations | Self-efficacy, communication and collaboration | presentations using digital photo | 29.2% | 37.5 % | 24.0% | 3.1% | 6.3% |
| Practical | Problem solving, critical thinking, collaboration and communication | Conserving scarce water for irrigation, keep of small wild animals | 53.1% | 7.3% | 21.9% | 8.3% | 9.4% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tablets | Digital literacy, communication, collaboration, problem solving and critical thinking | Taking pictures, storing photos and presenting photos in classroom | 41.2% | 15.6% | 22.1% | 9.4% | 11.7% |
| Laptop | Digital literacy, communication, collaboration, problem solving and critical thinking | Searching information on innovative gardening, storing pictures of crops and animals | 61.6% | 12.5% | 13.1% | 9.7% | 3.1% |
| Smartphones | Digital literacy, communication, collaboration, problem solving and critical thinking | Searching information on innovative gardening, storing pictures of crops and animals | 9.3% | 10.4 % | 17.0% | 55.2% | 8.1% |
| Critical thinking | Problem solving | Identifying vegetable cereals, soils differentiation, developing appropriate container gardens to solve land problem | 3.1% | 41.7 % | 35.4% | 13.5% | 6.3% |

Table 15 indicates that the most used teaching approach used by grade four teachers of agriculture were question and answer (85.4%), discussion (69.8%, and group work (75%) which promotes effective communication, collaboration and networking. The possible reason for the three approaches being dominant could be that the teachers are CBE compliant whereby they are assigning grade four learners' assignments in groups where they discuss. A study by Lukindo (2016) that aimed at exploring teaching CBE in Tanzania revealed that teacher despite teacher being aware of CBE rubrics, they taught mostly by question and concessionary project and problem solving due to limited resources. Critical thinking and debating were rarely used. The possible reason could be that the learner's cognitive level has not developed to upper primary since they have transited from grade three. In addition, most schools could be having a single agriculture lesson that lasts 35 minutes thus making it difficult for a teacher to schedule a debate. A study conducted in South Africa indicated that teaching grade 3 learners by class presentations and role play was a challenge for many teachers due to the limited time per lesson (Phala & Hugo, 2022). This implies that, teachers shift the focus from practical teaching to theoretical teaching in order to cover the syllabus when they have less number of hours allocated per lesson.

Practicals were never conducted by at least (53.1%). This study found that much of the teacher training sessions were theoretical and the trainers were not competent. This implies that the teachers were not exposed to hands on activities something that may have made teachers conduct teaching without practical. In addition, (61.6%) and 41.2% of teachers never used laptops and tablets respectively. The findings of this study are in tandem with a study conducted on evaluating teachers' competence in utilization of ICT in classroom instruction by Omariba (2022). Information and communication technology (ICT) is a requirement of the curriculum implementation. Omariba (2022) cited that the lack of ICT skills is a challenge among primary school teachers whereby the majority of the teachers are unable to integrate ICT-related tools into classroom instruction due to theoretical training of teachers. In some schools, agriculture teachers said that the tablets had a low clarity and learners were straining use. However, at least 71% of teachers cited that they used their smartphones in teaching whereby they could take pictures and watch videos in the teaching of agriculture. The high usage of smartphones could be that teachers are more conversant with smartphones than tablets and laptops. A study by Kinyua (2021) on ICT integration in teaching and learning revealed despite availability of power and internet in schools, teachers opted to using their mobile phones as an innovative strategy since internet was limited to administration officers.

A study by Madondo (2021) in Zimbabwe revealed that most schools had a 1:79 teacher student ratio per class thus making use of tablets a challenge. Conducting projects, practicals and classroom presentations was also difficult since one teacher did not manage a population of 79 students. The teaching approach used by teachers in classroom instruction is greatly dependent on the way teachers were trained. For instance, CBE implementation in Kuwait has been found to be a challenge since teachers do not embrace learner-centered approach. Teachers were found to be inclined towards lecture and question-answer method since they were not exposed to more learner- centered approaches (Alajmi, 2021).

The MoE recommends that learners visit the communities for agriculture field trips if the school doesn't manage to organize field trips away from school (MoE, 2019). Grade four teachers of agriculture were asked if they exposed learners for agriculture field trips. At least 28.1% never took learners on agriculture field trips. A study by Sitali-Mubanga et al. (2018) on an evaluation why teachers do not conduct academic field trips cited that students of lower classes shift their attention from learning to playing thus interfering with the learning process. In addition, it was observed that conducting field trips was quite expensive. Inability of teachers to expose learners to field trips leads to reduced student's self-inspiration and making learning less concrete. Students who attend field trips are more exposed and creative since they connect abstract and concrete objects (Markowitz et al., 2018). Therefore, 12.6% of students who mostly attended field trips are more likely to be more competence in academics and be better problem solvers because of field trip exposure. Based on the findings, group work, discussion, question, and answer methods were commonly used across all schools. This implies that the students are likely to acquire collaboration, networking and effective communication competencies. In addition, critical thinking, problem solving and ICT utilization was limited this may limit the acquisition of innovation and digital literacy among grade Four learners.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

## 5.1 Introduction

This chapter provides a summary, conclusions, and recommendations of the study, and suggestions for future research.

## 5.2 Summary of Study Findings

Competency Based Education aims at producing school graduates who will be effective communicators, digital literate, and graduates who will be able to collaborate and solve problems by being innovative and critical thinkers. The status of institutional preparedness for Competency- Based Teaching of Agriculture in public primary Schools in Njoro Sub-County of Nakuru County, Kenya had been studied. Therefore, the purpose of this study was to determine the status of institutions in teaching grade four agriculture, which was limited to the adequacy of infrastructural resources, adequacy of instructional resources, the extent of teacher training, and sustainability plans for teaching and learning resources.

The study findings indicated that all the schools had no laboratory for carrying agriculture- related practicals, 83.3% of schools had no store for agriculture and 16.1% of schools had a single room for agriculture store, 96.9% of schools had no workshop for maintenance of farm tools and equipment, 94.8 of schools had no agriculture room/library. In addition, 5.2% and 6.3% of schools lacked school farms and computer stores respectively. The majority of the schools that had a school farm it was 1/4 a hectare. The possible reason for most schools missing infrastructure could be the inadequacy of some teaching and learning resources. At least 40.6% of schools had about ½ a hectare piece of land for carrying out agricultural activities. In addition, 5.2% of schools had one agriculture room/ library, 3.1% of schools had one room for a workshop, and 93.8% of schools had one room for a tablet store.

In relation to teacher training, the findings indicated the entire grade four agriculture teachers had attended CBE training whereby it was observed that 77.1% attended at least two sessions, 6.3% attended a single session and 16.7% had attended more than three sessions. In addition, the findings indicated that the majority of the grade four agriculture teachers (49%) attended purely theoretical sessions, 13,5% indicated that they attended practical sessions while 37.5% said that the training they attended was both theoretical and practical. Concerning the competence level of the trainers, the majority of the teachers (59.4%) perceived the trainers as not competent, 18.8 % perceived the trainers were competent, 7.3%

perceived as trainers somehow competent and 4.2% cited that the trainers were extremely competent.

In addition, the study observed that 92.7% of grade four agriculture teachers never used a camera. Other resources that were never used include realia (65.3%, videos (53.0%), internet (31%), laptops (37.5%), farm tools (10.4%) and school farm (7.3%). Some schools had school farms but they had no farm tools. For instance, 10.4% of teachers confirmed they never used farm tools. In addition, 53% of teachers said they never taught using video simulations. Textbooks were the most used resources, 78.1% of the teacher said they often used books for teaching. The majority of the teachers (38.4%) confirmed they used the school farm often.

Pertaining the teachers; perception on sustainability plans of agricultural resources, the results indicated that 100% of grade four agriculture teachers kept tablets, laptops, flash disks, memory cards, and CDs/DVDs in the computer room/store. In the storage of farm tools, many teachers (63.5%) replied that students kept the farm tools at home, while 4.2% of teachers said they did not keep any farm tools. For storage of drawings (66.7%), pictures (59.4%), and charts (62.5%) of agriculture teachers said they kept them in class. In the storage of realia, 65.6% of teachers never kept them.

The study sought to find out how schools replaced resources that may be damaged lost or malfunction and the findings found that 100% of the teachers were responsible to replace smart phones. 83.3% of teachers cited that they never replaced realia after teaching, and 70.8% of teachers observed that parents took the responsibility of replacing lost farm tools since schools had inadequate resources. However, 32.3% of the teachers said the school replaced the farm tools, and 96.9% of teachers said that if pictures got lost they had no replacement means 62.5% of teachers confirmed that the KICD/MoE had the mandate to replace spoiled laptops. The schools had the mandate to replace some resources like charts (22.9%), farm tools (32.3%), tablets (82.1%), and textbooks (30.2%).

The study observed that 51% of teachers had a maintenance schedule every month, 6.3% had maintenance after every two terms, 7.3% had a schedule for maintenance after a year and 35.4% said they had no maintenance schedule.

## 5.3 Conclusions

The main conclusions of this study are as follows;

i. The study findings indicated that 83.3% of schools had inadequate infrastructural resources for teaching agriculture.

ii. There was low extent of teacher training to undertake CBE responsibilities.

iii. Most schools had adequate textbooks but inadequate cameras, realia, video simulations, internet connectivity, laptops, farm tools, and school farm.

iv. Majority of the schools did not have sustainability plans for the resources meant for teaching and learning agriculture it was a collective responsibility for parents, students, schools, and teachers.

## 5.4 Recommendations

Based on the results attained from this study, the following recommendations are made;

i. The Government of Kenya through the MoE should enhance the infrastructure for teaching CBE grade 4 Agriculture by allocating more funds to construct agriculture workshops, agriculture stores and agriculture rooms to facilitate the practical teaching of agriculture subjects in order to promote competence acquisition.

ii. The Ministry of Education should design practical training sessions than theoretical learning.

iii. The Ministry of Education should facilitate schools to meet adequacy of instructional resources. Adequacy of the resources will ensure practical teaching of agriculture, which in turn will make the learners CBE compliant.

iv. The Kenyan Government through MoE and KICD should develop guidelines on the sustainability of resources that will foresee proper, storage, repair and replacement of malfunctioning resources.

## 5.5 Suggestions for Further Research

Strategies for Sustainable Resource Management in Agricultural Education: Future research could explore sustainable approaches for managing and maintaining teaching resources in grade four agriculture.

i. This could involve investigating innovative practices for resource storage, replacement, and maintenance.

ii. Exploring collaborative efforts between schools, parents, and education authorities to ensure long-term availability and sustainability of resources could be an important area of study

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## Introduction

My name is **Alex Karani.** I am a student taking MSC agricultural Education from **Egerton University.** I am carrying a research on determining teachers' Perception on institutional preparedness in teaching of Grade Four Agriculture Subject in public primary schools. I would like to request your time to provide me with the following information. The questions will take approximately 30 minutes of your time; your response to them will help in evaluating the topic of study. All the information you will provide will be used only for the purpose of this study and treated confidentially. Therefore, do not write your name on this instrument.

## Appendix A: Questionnaire

### PART I: INFRASTRUCTURAL RESOURCES

**1.** For the resources in the table below, indicate the adequacy each resource where 0=absent/ not available. 1= (1/4 hectare for land,/one room buildings/ one tap for water). 2= (1/2 hectare for land/ two rooms for buildings/ two taps of water). 3= (one hectare of land /three rooms for buildings / three taps of water). 4= ( more than 1 hectare piece of land,/More than 3 rooms/ more than three taps of water)

| **Resource** | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Agriculture room/library | | | | | |
| School Farm | | | | | |
| Workshop for repairing agriculture tools | | | | | |
| Computer room/store | | | | | |
| Laboratory for carrying out practicals | | | | | |
| Number of Water taps (in carrying out agriculture related practices) | | | | | |
| Agriculture store | | | | | |

### PART II: TEACHER TRAINING PREPAREDNESS

1. Gender: Male ( ) Female ( )
2. a) How many agriculture lessons do you have in grade four per week?
3. What is your total workload of lessons in a week?
4. What is your highest level of education? Tick appropriately.

| **Level** | Untrained | P1 | Diploma | Degree | MSC; PhD; any other(specify)Above |
|---|---|---|---|---|---|
| | | | | | |

5. In the table below indicate the number of CBE training sessions you attended between 2018-2022

| 0 | 1 | 2 | 3 | More than 3 |
|---|---|---|---|---|
| | | | | |

6. What was the mode of instruction that was used for teacher training during CBE training?
   i. Theoretical
   ii. Hands on (practical)
   iii. Both practical and theory

7. In a rating scale of 1-5, how can you rate the competence of the trainer during CBE training?

| Not competent | Somehow competent | Competent | More competent | Extremely competent |
|---|---|---|---|---|
| | | | | |

**8.** In a rating of a scale of 1-5, how can you rate relevance of the kind of trainings you got in teaching of Competence Based Education in grade Four agriculture in the following areas? **1=not relevant, 2= somehow relevant, 3= relevant, 4=more relevant 5= extremely relevant**

| **Learning areas** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Innovative Gardening Project | | | | | |
| Water conservation in farming | | | | | |
| Use of ICT (computers, video simulation, photos and pictures) in teaching environmental conservation, water conservation) | | | | | |
| Facilitating learning (gardening, making composite manure making) | | | | | |
| Assessment of learner's competencies | | | | | |
| Coordinating learners' activities in groups | | | | | |
| Use of locally available materials in teaching | | | | | |

**PART III: INSTRUCTIONAL RESOURCES / MATERIALS**

1. In a scale of 1-5, indicate the adequacy of use of the following teaching and learning resources. **Note (1=Not used, 2=rarely, 3=sometimes, 4=often, 5=very often)**

| **Materials/Resources** | **Not used** | **Rarely** | **Sometimes** | **Often** | **Very often** |
|---|---|---|---|---|---|
| Camera | | | | | |
| Charts | | | | | |
| Farm tools | | | | | |
| tablets | | | | | |
| Smart phones | | | | | |
| laptops | | | | | |
| School farm | | | | | |
| Drawings | | | | | |
| Internet | | | | | |
| Videos | | | | | |
| Text books | | | | | |
| Models | | | | | |
| Pictures | | | | | |
| Realia | | | | | |

**PART IV: SUSTAINABILITY PLANS**

**1.** For continued use of teaching and instructional resources in, how do you ensure proper storage of the following resources?

| **Resource** | **Pupils keep** | **Hang in class wall** | **special rooms** | **No keeping** |
|---|---|---|---|---|
| Camera | | | | |
| Charts | | | | |
| Farm tools | | | | |
| Computers | | | | |
| Drawings | | | | |
| Flash disk | | | | |
| Memory card | | | | |
| DVD | | | | |
| Text books | | | | |
| Models | | | | |
| Pictures | | | | |
| Realia | | | | |

**2.** How do you ensure replacement of any lost, damaged or malfunctioning resources

| Resource | I re-construct/re-draw/repair them | Parents buy | the school replace | KICD/ MoE | No replacement |
|---|---|---|---|---|---|
| Camera | | | | | |
| Charts | | | | | |
| Farm tools | | | | | |
| Tablets | | | | | |
| Laptops | | | | | |
| Smart phones | | | | | |
| Drawings | | | | | |
| Flash disk | | | | | |
| Memory card | | | | | |
| DVD) | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Text books | | | | | |
| Models | | | | | |
| Pictures | | | | | |
| Realia | | | | | |

**3.** What is the maintenance schedule for the resources you use for teaching agriculture?

| No maintenance | Every term | After two terms | Once a year | More than a year(specify) |
|---|---|---|---|---|
| | | | | |

**PART V: Extent to which Competencies are inculcated COLLABORATION, COMMUNICATION & PROBLEM SOLVING**.

1. The list provided below shows teaching approaches in a scale of 1-5 where 1=not used, 2= rarely, 3=sometimes, 4=mostly used & 5=very often, select the extent to which the approach is used in facilitating learning of agriculture subject.

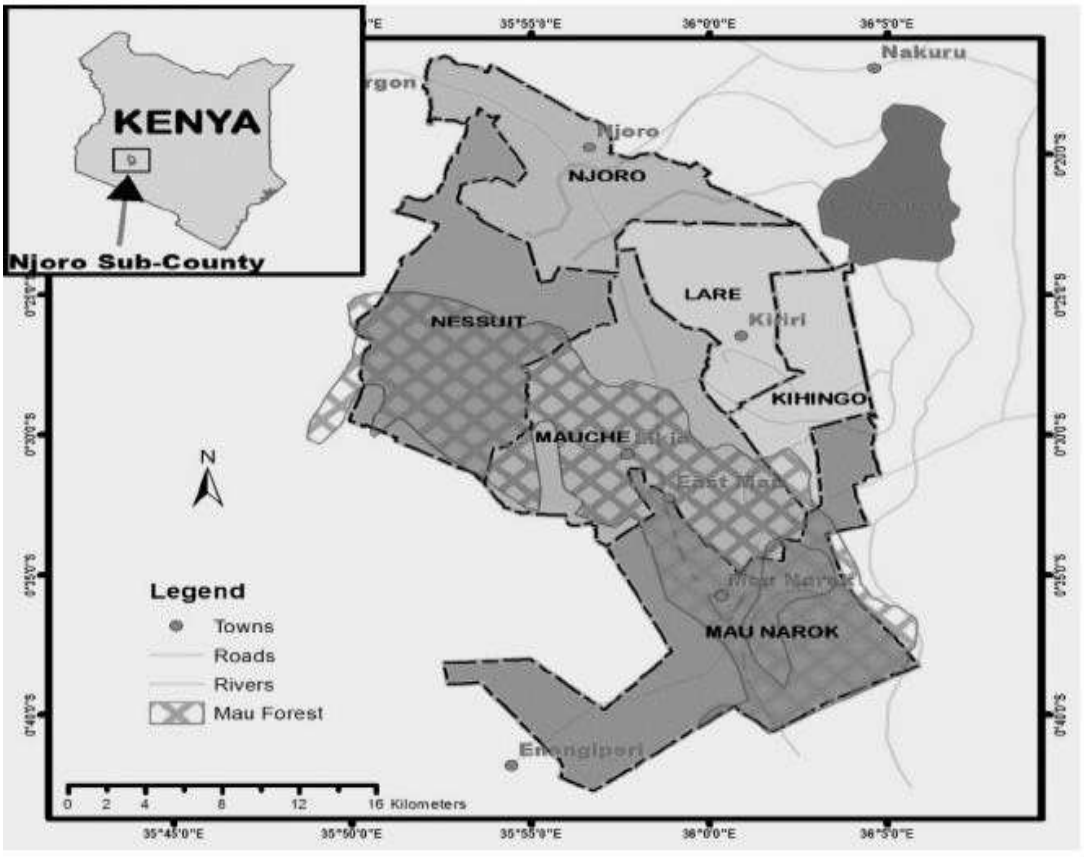
| **Approach/device** | **Not used** | **Rarely** | **Sometimes** | **Mostly used** | **Very often** |
|---|---|---|---|---|---|
| Question and answer | | | | | |
| Discussion | | | | | |
| Group work | | | | | |
| Role play | | | | | |
| Agriculture Field trip | | | | | |
| Problem solving | | | | | |
| Debating | | | | | |
| Project | | | | | |
| Class room Presentations | | | | | |
| Practical | | | | | |
| Tablets | | | | | |
| Laptop | | | | | |
| Smart phones | | | | | |
| Critical thinking | | | | | |

**END**

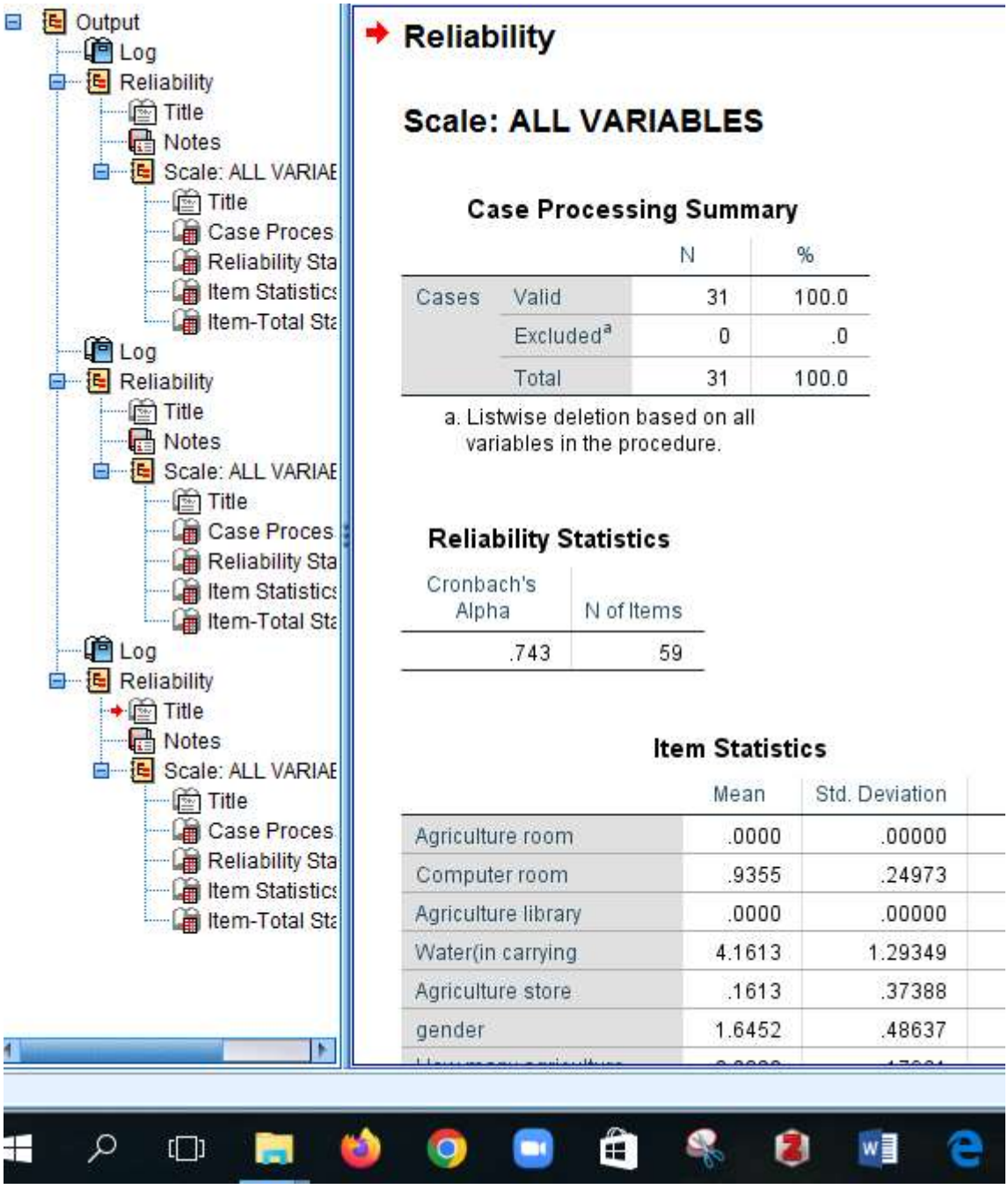
## Appendix B: Map of the Study Area

**Figure 7**

*Map of the Study Area*



## Appendix C: Reliability Test Results



## Appendix D: Research License

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## Appendix E: First Publication

Available online at **globets.org/journal**
International Journal of Education, Technology and Science
1(1) (2021) 14–30

IJETS
International Journal of Education Technology and Science

# TEACHING COMPETENCE-BASED AGRICULTURE SUBJECT IN PRIMARY SCHOOLS IN KENYA: A REVIEW OF INSTITUTIONAL PREPAREDNESS

Ongaki A. Karani[a] *, Kyule N. Miriam[b], John Mironga[c]

[a,b,c] *Egerton University, Dept. of Agricultural Education and Extension, Egerton, Kenya*

**Abstract**

Lack of the critical competencies for employability and self-reliance have contributed to high levels of youth unemployment. Introduction of Competence Based Education (CBE) system is to ensure learners acquire communication, collaboration, critical thinking, problem solving, self-efficacy and digital literacy. *This article reviewed the literature related to institutional preparedness for instruction of agriculture. This study was grounded on desktop design that reviewed, relevant reports by several education commissions and peer reviewed journals with a focus on instructional, infrastructural resources, teacher training and sustainability plans for resources*. The result show that institutional preparedness is key in curricula changes. However, practical instruction to equip learners with competencies in vocational subjects has remained a challenge. This literature review findings indicated that for any curriculum implementation institutional preparedness is pertinent and failure to which schools end up producing learners who get it difficult to solve societal problems in agricultural education. This study is useful to stakeholders in education and practitioners to better understand research results in the field of agricultural education. Despite many articles having addressed need to promote practical teaching of vocational subjects in Kenya, less literature is available on institutional preparedness.

***Keywords:*** **Institutional Preparedness, Teaching, Competence Based Education, Primary school Agriculture**

**Appendix F: Second Publication**

Available online at **globets.org/journal**
International Journal of Education, Technology, and Science
2(3) (2022) 399–414

IJETS
International Journal of Education Technology and Science

# HOW ARE TEACHERS TRAINED FOR TEACHING COMPETENCE-BASED GRADE FOUR AGRICULTURE? A CASE OF PUBLIC PRIMARY SCHOOLS IN NJORO SUB-COUNTY IN NAKURU COUNTY

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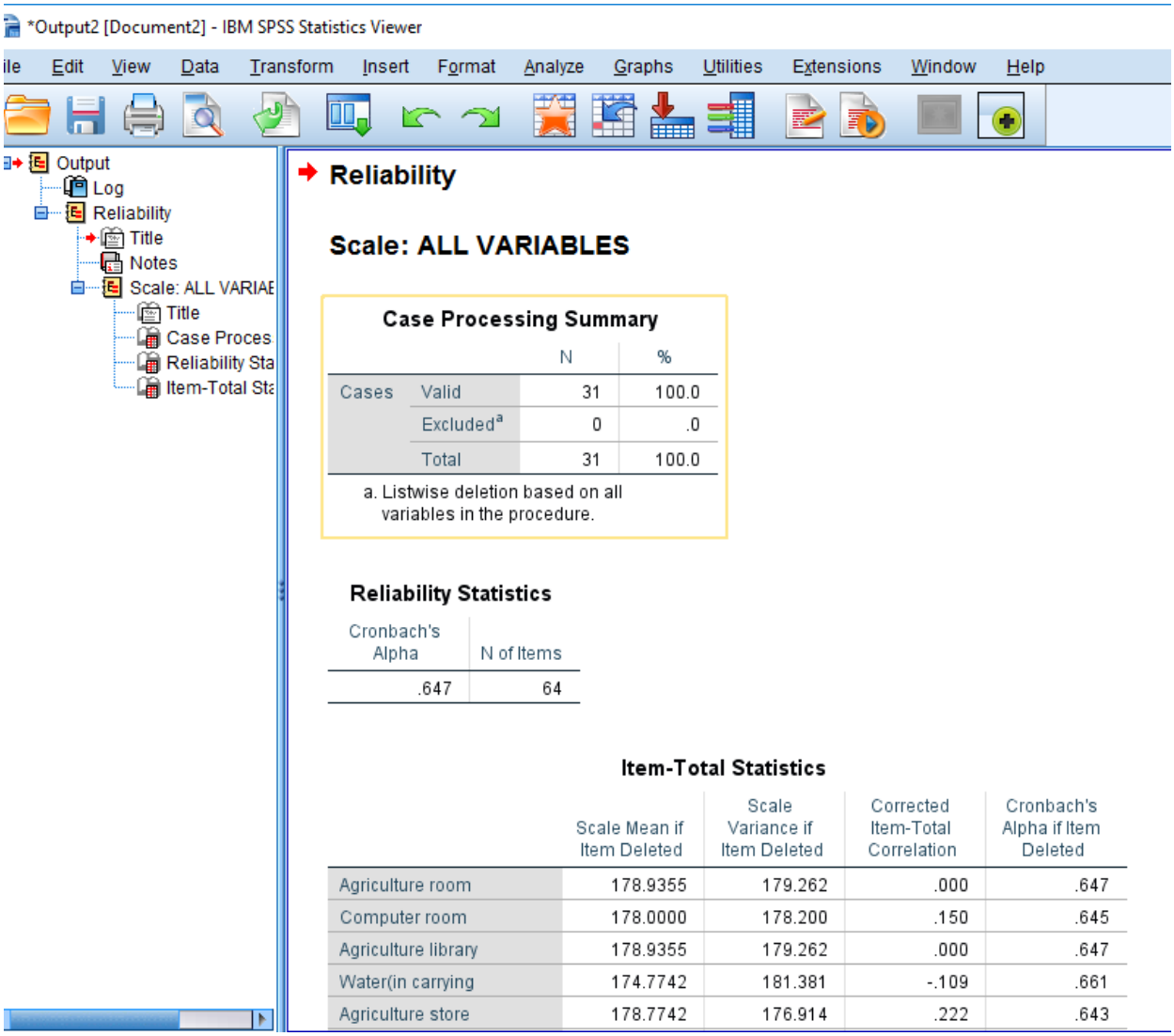
Received: 08. 07. 2022 Revised version received: 29.08.2022 Accepted: 30.08.2022

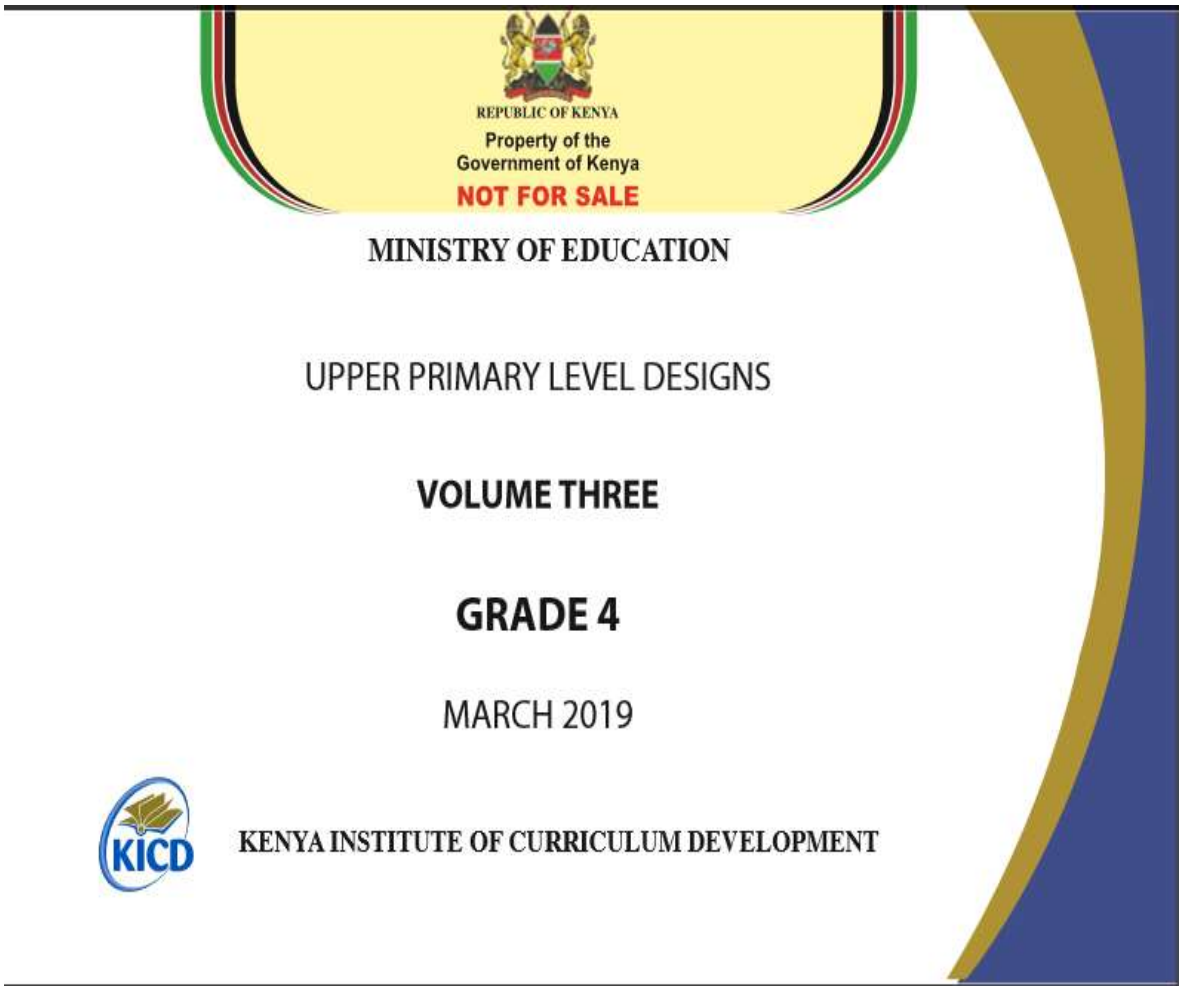
**Abstract**
One of the major aims of vision 2030 is to ensure Kenya becomes a middle-income economy through industrialization. In the year 2017, Competence-Based Education (CBE) was introduced to produce school graduates with self-efficacy, self-reliance, effective communication, problem-solving, innovation, and digital literacy competencies. However, for students to acquire the competencies, quality teacher training is significant. This study sought to determine how teachers are trained for teaching CBE Grade Four Agriculture in the Njoro sub-County. A descriptive research design was used employing a cross-sectional survey method that generated quantitative data. A sample size of 96 teachers of agriculture was obtained from the 96 public primary schools in the six wards of Njoro Sub-County. Descriptive statistics were used for data analysis using Statistical Package for Social Sciences (SPSS) version 25. The findings of this study indicated that all of the grade four teachers of agriculture had attended CBE training but the majority of them (49%) attended purely theoretical sessions, 59.4% of the teachers cited the teacher-trainers were not competent. In addition, at least 16% of the teachers indicated that the training sessions were not relevant to teaching Agriculture subject. This study recommended that the Ministry of Education develop a framework for practical teacher training. Teacher trainers should be re-trained and training sessions should be aligned towards specific subjects, teacher needs, and students 'needs to increase relevance.

***Keywords:*** *Teacher training; Agriculture; Competence-Based Teaching; Education*

## Appendix G: Cronbach's reliability, Report before removal of some Items



**Appendix H: Grade Four Agriculture Competencies Across the Three Strands**



| Strand | Sub strand | Competencies | Curriculum Design Page (Volume Three March , 2019) |
|---|---|---|---|
| 1.0 Conserving our environment | Soil | Communication and collaboration through group activities; critical thinking and problem solving in determining organic wastes and using it to solve soil fertility problems | 81 |
| | water | Communication and collaboration during group work in irrigation activities, problem solving in using scarce water resources | 83 |
| | Living better with wild animals | Digital literacy in searching information on small wildlife and scarecrows; self-efficacy in making presentation using small digital photo album; creativity and imagination in making scarecrows. | 85 |
| | Growing fruit trees | Communication and collaboration in consulting on tasks of growing fruits; self-efficacy while conducting selected activities like earning income from sale of fruits | 88 |
| | Conservation project (Edible crop gardening) | Communication and collaboration while taking care of growing fruits; self-efficacy by being able to produce on food (fruits); critical thinking and problem solving in participation of nutritional supplement activities. | 90 |
| 2.0 Domestic Animals | Domestic animal and their uses | Digital literacy in searching and storing of photos and information on domestic animals; Communication and collaboration while consulting on storage process; self-efficacy while presenting digital information | 93 |

| | | | |
|---|---|---|---|
| 3.0 Gardening practices | Crops for gardening | Communication and collaboration while classifying and identifying vegetables; Critical thinking and problem solving by practicing activities related to own nutritional supplement | 95 |
| | Selected gardening practices | Communication and collaboration while doing gardening activities; critical thinking and problem solving by participating activities for own nutritional supplement; self-efficacy in own crop production | 97 |
| | Innovative gardening project | Digital literacy in searching and storing photos and information on innovative gardening; Communication and collaboration while doing container garden projects; critical thinking and problem solving land shortage problem; self-efficacy in presentations | 101 |

(Source: MoE, 2019).