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Influence of Headteachers' Information Communication Technology Infrastructure Facilitation on Implementation of Competency-Based Education in Junior Secondary Schools in Voi Sub-County, Kenya

Rachael Nose Maleko & Mary Mugwe Chui
School of Education, Mount Kenya University
Email: rachaelmaleko@gmail.com

Abstract: The Purpose of this research was to assess influence of Headteachers' Information Communication Technology Infrastructure Facilitation on implementation of Competency-Based Education in Junior secondary schools in Voi Sub-County, Kenya. Empirical review of literature was anchored on psychological theory of supervision, Goal setting theory and Diffusions of Innovations Theory. A mixed methods and descriptive survey design was used targeting 30 Headteachers, 3 Curriculum Support Officers, 4,512 Junior school students, 118 teachers and 1,200 parents. Using Yamane's formulae, a sample of 16 headteachers, 3 Curriculum Support Officers, 60 teachers, 220 Junior secondary students and 74 parents were selected totalling to 373 respondents. Questionnaires, interview guides and focus group discussion guides were used to collect data. Validity of tools was examined through expert judgement while reliability was measured through application of Cronbach's Alpha formulae where an alpha value of 0.76 was obtained. Data analysis was carried out descriptively, inferentially using Karl Pearson correlation Coefficient with aid of SPSS Version 30 and thematically. Quantitative data was presented in frequency tables, column graphs and pie charts while qualitative data was presented in narration based on various themes. Findings revealed that provision of Information Communication Technology infrastructure is not just merely availing hardware materials, but it is all about developing a sustainable digital superhighway within Junior high schools. Recommendations were however made for government through Ministry of Education to increase funding of Information Communication Technology infrastructure within schools to ensure equitable distribution of such devices.

Keywords: *Headteachers, Information Communication Technology, Facilitation, Implementation, Competency-Based Education.*

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1. Introduction

According to Akala (2021), any economic, social or political development of a nation is highly linked to education of its citizens. This is suggestive that rate of development of a country to a large extent is influenced by its citizens education. Therefore, it is important to ensure proper acquisition of 21st century competencies to all learners in Junior high schools. Changing markets demands in the world has called for a change of content-based education system to education system that looks at learners' competencies to fill the demands in market. However, educational reforms are widespread across the globe. For instance, Competency Based Learning began in USA way back in 1970s. Therefore, CBE in USA has placed a lot of emphasis on individualized learning where every learner is given a chance to develop skilfully to areas of competencies (Harris, Hobart & Lundberg, 2019).

Successful implementation of Competency Based Learning is greatly catalysed by availability of digital

tools for assessment of learners. These observations are in support of Ependja and Mba (2021) that investment in education infrastructure facilitates implementation of curriculum. Gross (2017) in United Kingdom implied that increasing rates of youths' unemployment created concern for change of system of education to CBL so that to equip Junior school learners with competencies that facilitates them to become self-reliant. Consequently, Gross (2017) adds that CBE in UK has made a great stride in reducing rates of unemployment as a result of equipping learners with skills. This is in agreement with recent educational developments that emphasize on 21st century skills inclusion in the curriculum such as creative thinking and problem-solving skills, digital literacy, learning to learn among other competencies that learners ought to acquire (OECD, 2016).

In Finland's, CBE has aimed at individualizing learning facilitating individual developments in terms of digital competencies to adhere to demands of curriculum (Rajandiran, 2021). This is because the main aim of education is to offer a personalized curriculum that caters for each and every individual. Establishment of Competency Based Learning in Scotland's was achieved in the year 2010 to 2011, whereby in order to solve curriculum challenges experienced on content-based learning was resolved by having alignment of learners' competencies through CBE and digital literacy as well as global citizenship being integrated into CBE curriculum (Scottish Government, 2023). Therefore, what this means is that Competency Based Curriculum aims at bringing relevance by improving standards of education (Kariki et al., 2023).

In African region, Akpan and Salihu (2023) in Nigeria, carried out a study on role of infrastructure availability on implementation of CBE curriculum. It was observed that inadequacy of teaching learning resources, overcrowded classrooms, lack of adequate laboratories for science subjects as well as adequate staffing were the leading hinderances to effective CBE implementation among Nigerian schools. Therefore, it is suggestive that educational stakeholders ought to develop mechanisms of enhancing provision of resources such as physical resources including building of classrooms as well as coming up with programs for teacher training and professional development to prepare teachers more adequately for the curriculum.

Nsubuga and Mulindwa (2023) in Uganda carried out an investigation on factors limiting implementation of CBE in Ugandan schools. It was discovered that lack of adequate classrooms, inadequacy of teacher training, lack of adequate teaching learning resources as well as inadequate laboratories as some of the factors hindering effective implementation of CBE. Nsubuga and Mulindwa (2023) observed that in schools that were better equipped with physical facilities such as classrooms, well equipped laboratories as well as access to facilities such as electricity, CBE curriculum was better implemented. Therefore, this indicates that for successful implementation of CBE in Junior secondary schools calls for collaborative efforts from Ministry of Education and other educational stakeholders in provision of adequate resources to facilitate successful implementation of curriculum in Junior high schools. According to Mulenga and Kabombwe (2019) suggested that for any implementation of curriculum to be effective provision of resources such as text books, digital resources such as computers as well as human resources where teachers are well trained on CBE curriculum facilitates effective CBE implementation in Junior high schools.

Within East African Community specifically Kenya, The Presidential Working Party carried out an investigation on recommendations concerning educational reforms and reported that poor physical infrastructure such as classrooms and inadequate ICT tools was identified as some of the leading causes of ineffective implementation of CBE in Kenyan Junior secondary schools (Mugambi & Ndegwa, 2022). These observations support the findings by Wanjiku, (2023) that adequacy of teacher training and availability in secondary Junior schools, availability of classrooms, adequacy of digital tools as well as well-equipped laboratories are some of the conditions that favour successful implementation of Competency Based Curriculum in Junior high schools in Kenya.

In Voi Sub-County, Taita Taveta County, Ochieng and Omondi (2023) identified poor management practices of headteachers as one of the hindrances to successful delivery of Competency Based Curriculum in Voi Sub-County. This is because headteachers' management practices such as parental involvement in guidance and counselling was established to be rarely practiced and there existed poor digital infrastructure that hindered acquisition of digital skills which is one of the competencies under CBE consequently affecting effectiveness of implementation of the curriculum. Therefore, these calls for an urgent need for investment in upgrading delivery of curriculum in Junior secondary schools by looking at how management practices such as provision of physical infrastructure to support implementation of CBE in JSS (Kariuki et al, 2023). Therefore, it is on these bases this study sought to examine how Headteachers' ICT infrastructure facilitation influence on implementation of CBE in public Junior secondary schools in Voi Sub-County, Taita Taveta County, Kenya.

1.1 Statement of the problem

Implementation of Competency Based Education in Kenya has raised several concerns among various educational stakeholders. For instance, Teachers' unions have demonstrated their concerns on level of unpreparedness of schools to implement CBE curriculum (Uwezo, 2021). Lack of adequate resources such as

classrooms, adequacy of qualified teachers and inadequacy of reference materials for instance text books were identified as some of the major leading causes hindering effective CBE implementation in Junior high schools in Kenya (Uwezo, 2021). According to Wanjiku (2023) challenge is further worsened by unreliable electricity supply making integration of ICT in learning a little more difficult. However, Ochieng and Omondi (2023) observed that in Voi Sub-County, effectiveness of delivery of CBE Curriculum is majorly hindered by inadequate infrastructural resources such as lack of adequate classrooms, ICT resources, adequately trained teachers as well as teaching learning resources being limited.

Therefore, this calls for a need for a solution through research because failing to address this issue may lead to a compromised education system in Junior secondary due to inadequate teacher training, lower competencies for learners as well as general unpreparedness for new CBE curriculum. This study intends to establish how Headteachers' ICT infrastructure facilitation in Junior secondary schools can be applied so that to attain effective CBE delivery in Voi Sub-County, Taita Taveta County, Kenya because headteachers are responsible for the management of all activities in Junior secondary schools and the role played by headteachers has a significant influence on curriculum delivery.

1.2 Research Objective

The study aimed to assess influence of Headteachers' ICT infrastructure facilitation on implementation of CBE in public Junior secondary schools in Voi Sub-County, Taita Taveta County, Kenya.

1.3 Research Question

To what extent does headteachers' ICT infrastructure facilitation influence implementation of CBE in public Junior secondary schools in Voi Sub-County, Taita Taveta County?

2. Literature Review

Headteachers' Provision of ICT infrastructure and Successful Implementation of CBE

In keeping with global perspectives, Lomis et al., (2021) carried out an investigation in Switzerland, concerning use of digital resources and students' academic performance in science subjects. Findings revealed that there was a positive effect of performance of science subjects and use of ICT tools in classroom learning. It was suggested that secondary schools should modernize ICT integration in learning for successful curriculum delivery. Aino et al., (2021) investigated on how cognitive learning is influenced by use of ICT tools in Finland. Results indicated that a weak negative relationship exists between use of digital tools in students with higher ICT skills compared to those with a lower ICT skill on cognitive learning outcomes in Finland. This can be elaborated by task switching or overload of working memory when using digital tools.

Findings suggested that although ICT skilled students are found to be well conversant at mechanical application of technologies, they may lack self-directed or goal-oriented integration of the digital tools aimed at promoting their leaning. A study conducted by Agnello et al., (2019) in Japan explored how sporting facilities impacts development of students in secondary schools. Research outcomes indicated that secondary schools that are well equipped with sporting activities facilitated social, cognitive as well as physical development of students which are necessary development in holistic growth and development of students under CBE curriculum. Additionally, sporting activities enhance students' collaboration with peers, fosters team work spirit and consequently enables curriculum delivery among learners in secondary schools (Agnello et al., 2019). Therefore, authors above implied that use of digital facilities for learning or even sporting activities have a positive impact on growth and development of the student but a need exist to understand how digital infrastructure can influence CBE delivery in Junior high schools.

In Africa, Necochea et al., (2020) carried out an investigation in Malawi to examine effects of computer labs on acquisition of digital competencies among secondary school students in Malawi. Findings illustrated that secondary schools that lacked computers or computers available were outdated suffered on effectiveness of implementation of digital competencies among secondary school students in Malawi which is one of the competent areas in CBE curriculum. Najjuma (2024) carried out an investigation in Uganda to establish impact of digitalization of facilities such as swimming pools in secondary schools in Uganda. It was established that well digitalized facilities such as swimming pools enabled learners to gather competent skills that are core for CBE effective implementation (Najjuma, 2024). In addition, it was discovered that learners were able to get skills on water safety and on the other hand digitalization of such facilities ensured students are safe when learning.

Kenya just like other situation in other African countries has developed urgency of inclusion of ICT facilities in students' learning due to change of education system from 8-4-4 system that was content based to CBE curriculum that is competency based, (Mariga et al., 2018; Voithofer & Nelson, 2021). Although scarcity exist on studies concerning ICT integration effectiveness in CBE in Kenya, as it is outlined in Kenya National Education Sector Plan 2013–2018 add weight on how ICT tools can be incorporated in students' learning in JSS schools to meet demands of 21st century on digital economy. This is done following blue print of education

quality and provision of vision 20230, (Voithofer & Nelson, 2021).

Muthuri (2023) in Meru County investigated on role of school library digitalization on learners' academic performance. The outcomes of the study demonstrated that in secondary schools that had a well-equipped library students had an opportunity to access to learning resources that facilitated their academic performance (Muthuri, 2023). Research by Muthuri, (2023) recommended that headteachers in Junior secondary schools should work on improving or creating a library facility that is equipped with ICT facilities to facilitate effective implementation of CBE curriculum.

A study by Granados & Jaramillo (2019) on adequacy of ICT facilities in Kenyan schools found that there is an acute shortage of ICT facilities among Kenyan secondary schools that hinders effective implementation of digital competencies among students. Voithofer & Nelson (2021) posits that there is limited use of computers in Kenyan primary schools. Therefore, on this basis, literature reviewed identifies methodological gap as several studies focusses on senior secondary schools or primary schools but current study in order to fill identified gap focus on Junior high schools where limited investigations have been conducted. Therefore, this study sought to examine influence of headteachers ICT infrastructure facilitation on successful CBE implementation in Junior high schools in Voi Sub-County in Taita Taveta County, Kenya.

2.1 Theories

2.1.1 Psychological Theory of Supervision

Kibin (2025) Psychological theory is one of the theories guiding investigation. In keeping with Kibin (2025) theory, within an organization there is one leader whose responsibility is to supervise the others. In such an organization the supervisor directs activities within the organization or sometimes can even delegate responsibilities. The supervisor employs various philosophies including essentialism, experimentalism as well as existentialism with aim of attaining the goal of the organization.

Essentialist as far as supervision is concerned brings about the aspect of direct control of teachers implement curriculum through tested methods. On the other hand, experimentalism is linked to human experiences. This aspect helps headteachers to motivate teachers not to be satisfied with traditional knowledge and experiences but venture into new knowledge and experiences. The suitability of the theory to this study is that headteachers normally uses supervisory practices to improve on teacher performance in students' learning activities in Junior high schools. However, the theory primarily focuses on individual behavioural processes and does not fully account for systemic factors such as institutional resources or policy constraints affecting CBE implementation.

This theory is highly attached to setting of targets and working towards achieving them which is one of the vital processes in CBC delivery in public junior high schools namely supervisory strategies, head teachers' parental involvement strategies, availing of guidance and counselling services and availing of ICT infrastructure as independent variables that impact on CBE successful implementation in public junior high schools as the dependent variable.

2.1.2 Goal Setting Theory

Locke and Latham (1990) goal setting theory formed second theory that directed this study. The theory posits that an organization can come from weak positions, set goals and attain them resulting into a strong organization. The management practices in the study include supervisory strategies, head teachers' parental involvement strategies, availing of guidance and counselling services and provision of ICT infrastructure. The theory encourages management by setting of objectives to accomplish which is one of the strategies in human resource management in effective organizations.

Locke and Latham (1990) posit that for an organization to be effective individual goals set has to be worked on to attain the objective of the organization. Therefore, school managers normally set attainable objectives for the workers to achieve then motivates them towards that set goal. However, in order for school managers to attain the set objectives workers normally gets involved in goal setting to facilitate engagement and collaboration as well as team spirit among members of the organization.
In addition, during the process, managers have to provide immediate feedback to act as a motivation for employees to work harder towards achievements of the set goals. Therefore, the theory operates under the principle that in order to enhance academic abilities of learners, the headteacher formulates goals for achievements and teachers, students and parents come together to help students achieve set goals consequently helping students in Junior high schools attain educational success through effective curriculum delivery.

2.1.3 Diffusion of Innovations Theory

The diffusion of innovations theory was developed by Rogers (2003), a theorist at the University of New Mexico, in 1962. The theory talks about the passage of a new idea through stages of adoption by different people who begin using the new idea. The main people in the diffusion of innovations theory are those who are open to risks and the first to try new ideas, people who follow the early majority into adopting the innovation as part of their daily life and are part of the general population and people who lag behind the general population in adopting new ideas. The new ideas in the diffusion of innovations

theory can be things like CBE which has recently been adopted in Kenya.

External agents, such as NGOs and the government often introduce innovations. Their role in the diffusion process is to act as change agents, helping facilitate the communication and adoption of new conservation practices. The DOI framework highlights the importance of these external agents in providing training, resources, and support. The Diffusion of Innovations theory helps in understanding the adoption and implementation of CBE practices. Understanding the dynamics of innovation diffusion can significantly improve the effectiveness of CBC interventions, ensuring that conservation efforts are sustainable and widely adopted across countries.

3. Methodology

Mixed methods research was adopted because according to Mugenda & Mugenda (2019) mixed methods investigation facilitates gathering of both quantitative as well as qualitative data together bringing more objectivity of findings unlike when applying only one method. Therefore, strengths of using qualitative research as well as quantitative research are capitalized (Mugenda & Mugenda, 2019).

Descriptive survey design was used which facilitated separate data analysis separately for qualitative data and quantitative data but for conclusions data was merged to draw conclusions on subject matter. However, rationale for use of descriptive design was that it allows accurate comprehensive description of population while identifying trends and patterns that is crucial when less is known about a topic or as a background for in-depth investigations (Shrutica, 2023). The descriptive design was appropriate because it enabled researcher to collect and describe information on how headteachers' management strategies influence CBE implementation without manipulating variables.

Target respondents comprised, 30 headteachers, 118 JSS teachers, 4,512 students, 1200 JSS parents, 3 Curriculum Support Officers making up a total population of 5864 participants as demonstrated on below table.

Table 1: Target Population

Category of Respondent	Population Targeted
Headteachers	30
Curriculum Support Officers	4
Teachers	118
JSS students	4512
JSS Parents	1200
Total	**5864**

Source: Voi Sub County Director of Education (2026)

So that investigation can realize an adequate sample size Yamane's formula was applied as illustrated below;

$$n = \frac{N}{1 + N(e^2)}$$

where:
n=Sample size
N=The population size
e=the margin of error set at 0.05

Therefore, $n = \frac{5864}{1+ 5864(0.05^2)}$

n =373.4572158

$n = \mathbf{374}$

Therefore, by applying above formulae a total sample size of 374 participants was realized that comprised of 200 JSS learners, 80 JSS teachers, 74 parents who have learners in JSS, 16 Headteachers, as well as 4 Curriculum Support Officers as presented below.

Table 2: Sample Size

Category	Target Population	Sample size	Technique for sampling
Headteachers	30	16	Purposive sampling
Curriculum Support Officers	4	4	Census sampling
Teachers	118	80	Simple random
JSS students	4512	200	Simple random
JSS Parents	1200	74	Simple random
Total	**5863**	**374**	

Source: Voi Sub County Director of Education (2026)

To come up with appropriate strata, stratified sampling was used to divide Voi Sub-County into four zones; Kasigau, Mbololo and Voi zones. Consequently, in every zone, 4 Headteachers, 1 Curriculum Support Officer, 20 JSS teachers, 50 JSS students, 18 JSS Parents for Kasigau and Mbololo zones and 19 JSS parents for Voi zone totalling to 374 participants. Purposive sampling was used to select headteachers due to their specific administrative roles, while simple random sampling

ensured representativeness among teachers, students, and parents.

To begin gathering of participants information researcher began by ethical approval by university Ethical Review Committee then research got licensed by NACOSTI after which authorization letters from appropriate offices such as office of County Director of Education. In addition, researcher drafted a Self-introduction letter explaining on individual identities of researcher, purpose of research and duration of time it would take to obtain information from respondents. Moreover, researcher presented Introduction letter from Mount Kenya University as well as informed consent form. Subsequently, qualitative data were assembled by use of interviews from Headteachers, as well as Curriculum Support Officers and focus group for parents whereas qualitative data were assembled by use of questionnaires from JSS teachers as well as JSS students.

Data analysis was achieved by having each and every qualitative data thematically explained according to objectives of investigation whereas quantitative data were analysed descriptively then presentation made in form of tables bar graphs or pie charts. For inferential statistics collected information was interpreted using Karl Pearson Correlation to examine existence of relationship among frequencies of adopting management strategies of headteachers on successful CBE delivery in public Junior high schools. Statistical Packages for Social Sciences Version 30 (SPSS-Version 30) assisted in data analysis. Rationale of using mixed methods analysis was to take cognizant of strengths of both qualitative as well as quantitative approaches while minimizing chances of errors likely to be experienced when only applying one approach.

Consequently, range of value of r was taken at 0.05 Significance level as -1 to +1 where if r value is close to 1 it was an expression that there is a strong positive or negative association but if close to zero an existence of a weak association that could be either positive or negative. Ethical Considerations included voluntary participation where participants were advised that involvement in research was willingly and no course of action could be taken for failure to participate. Respondents were issued with informed consent form as well as informed that research is academic hence participation cannot benefit any individual in any way. Researcher ensured that tools lack sections for participants writing personal data as well as reminded respondents that they should not indicate any form of information that can identify them nor their institutions. Each and every set of data gathered was handled with a lot of privacy and confidentiality to assure that there was no bridge of information to unauthorized persons. Any single information obtained from participants was highly protected by having physical forms being locked under key only accessible to researcher and for digital information obtained encrypted with passwords only known by researcher.

4. Results and Discussion

Research instruments governed among participants in this research yielded a response rate of 352 (94.12%) participants. This was further broken down into specific categories whereby it was noted that Headteachers in Junior high schools had a response rate of 87.50% (14), all CSOs targeted by research hence a response rate of 100% (4), JSS Teachers who responded contributed for 93.75% (75), JSS Students were at 97.50% (195) while parents who have students in Junior high schools those sampled had a response rate of 86.49% (64) as displayed in table 3.

Table 3: Response Rate

Category	Sampled Participants	Response	Response Rate
Headteachers	16	14	87.50%
CSOs	4	4	100%
JSS Teachers	80	75	93.75%
JSS Students	200	195	97.50%
JSS Parents	74	64	86.49
Total	**374**	**352**	**94.12%**

Source: Researcher, 2026

This investigation attained a response rate of 94.12% (352) which is considered an adequate rate of response in social science. According to Babbie, (2020), a response rate of 50% of sampled respondents is enough to draw conclusions in social sciences, 60 % is fair but 70% of even higher is very good for drawing conclusions. Additionally, the total of 352 participants who responded also surpasses minimum sample size requirements of 196 as established using Krejcie and Morgan's (1970) sampling table promoting statistical validity of findings.

4.1 Report on General Characteristics of Respondents

Demographic traits of respondents on gender, highest level of education attainment as well as age of students were traits that were considered for this research.

4.1.1 Participants Gender

Information concerning gender distribution of participants on whether being male or female was captured by research whereby results indicated that for headteachers 64.29% (9) were male while female headteachers were 35.71% (5). For Curriculum Support Officers (CSOs) 50.00% (2) were male while 50.00% (2) were females. Junior high school teachers who took part in investigation had a fair representation of both genders of teachers whereby 56.00% (42) were male teachers while 44.00% (33) were female teachers. Junior high school students' participation also demonstrated a fair representation in terms of gender as out of 195 students who responded 51.79% (101) were male students while female students were 48.21%. Parents who have students in Junior high schools also their data was captured whereby results revealed that there was a higher number of female parents who took part in research at 68.75% (44) while male parents contributed for 31.25% (20) as displayed below.

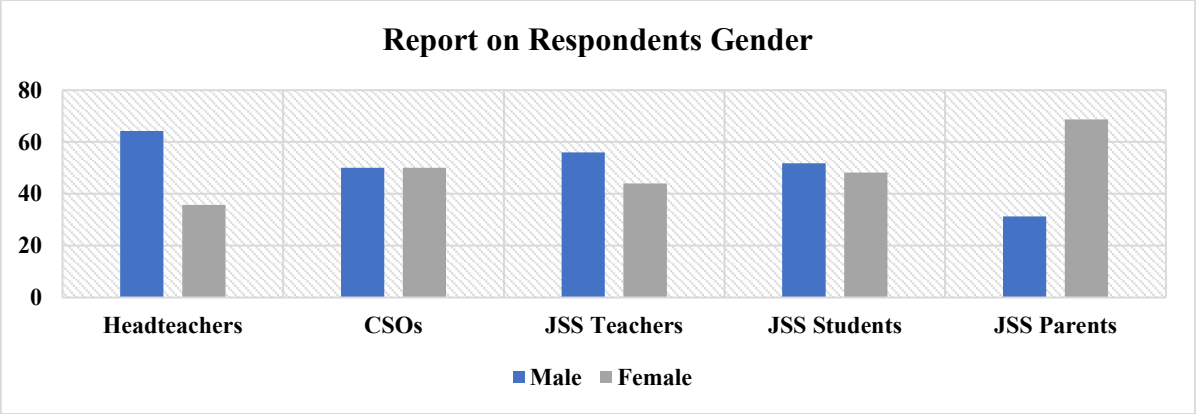

Figure 1: *Report on Respondents Gender*

This information suggests that apart from parents where there was a higher range in difference in participation other respondents demonstrated gender equity in representation. This is also suggestive that more female parents are more engaged in educational matters of students in Junior high schools in comparison to male parents' engagements.

4.1.2 Participants Level of Education

Curriculum Support Officers, Headteachers, Junior High school teachers together with Junior high school parents their Level of Education was captured by instruments for gathering information. Findings revealed that only 1 (25.00%) CSO had a post graduate qualification, 2 (50.00%) CSOs had a degree while only one had a diploma qualification. For Junior high school headteachers 14.29% (2) had a post graduate qualification, 35.71% (5) had a degree while a majority at 50.00% (7) had a diploma as highest level of education attainment but for P1 certificate there were none of headteachers who had this qualification. Junior high school teacher's minority at 2.67% (2) had a post graduate qualification but a majority of JSS teachers had a degree at 73.33% (55) whereas those teachers who had a diploma contributed for 24.00% (18) and there were no JSS Teachers with a certificate. For Junior High school parents there were 4.69% (3) of parents who had a post graduate qualification, degree as highest level of qualifications was 26.56% (17), Diploma, 15.63% (10) while the rest at 53.13% (34) had a certificate as displayed in figure 3.

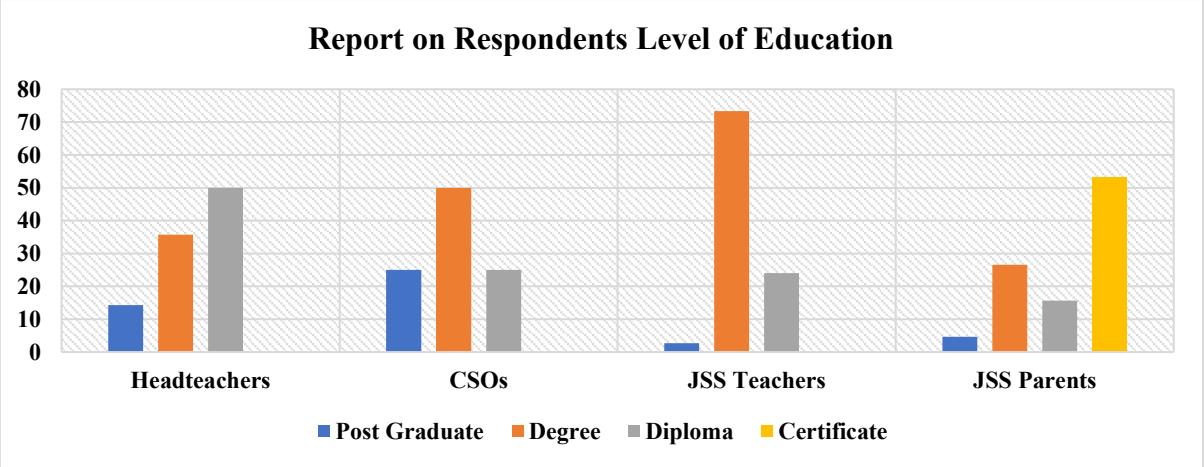

Figure 1: *Report on Respondents Level of Education*

4.1.3 Age of students

Age of Junior high school students were captured by instruments where corrected data revealed that majority of students were of 14 years to 15 years at 60.00% (117), which was more than half of students who participated. This was followed by number of students who had 13 years or below at 34.87% (68) whereas minority of students were of 16 years or above at only 5.13% (10) as displayed in figure 4.

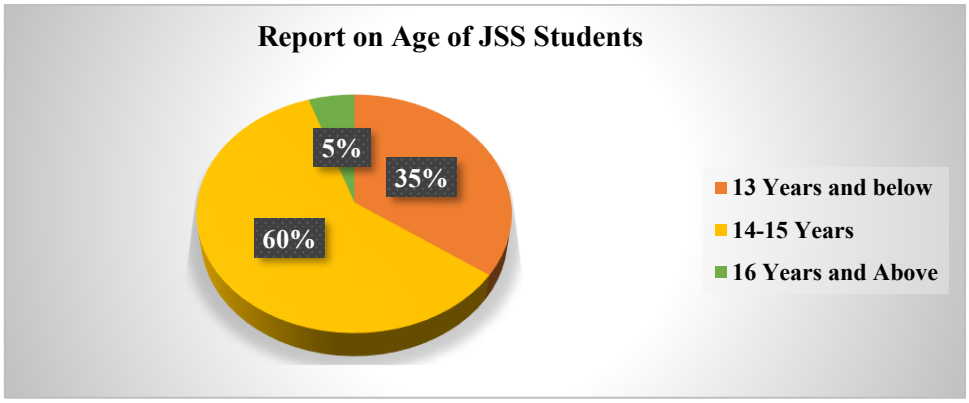

Figure 2: *Report on Age of JSS Students*

4.2 Report on Influence of Headteachers Provision of ICT Infrastructure on Implementation of CBE

Quantitative data was also collected among Junior high school teachers on impact of Headteachers provision of ICT infrastructure on implementation of Competency Based Education among learners in Junior high schools. information gathered from teachers' questionnaires on this area was recorded on table 4.

Table 4: Report on JSS Teachers Questionnaire on Headteachers Provision of ICT Infrastructure and Implementation of CBE

SD: Strongly Disagree -1; **D**: Disagree-2; **N:** Neutral- 3; **A:** Agree-4; **SA:** Strongly Agree-5, F-Frequency, %-Percentage

Provision of ICT Infrastructure		**SD 1**	**D 2**	**N 3**	**A 4**	**SA 5**
My school headteacher has facilitated adequacy of digital tools for integration during the lesson that has enabled improved learners of learning outcomes in test scores	F	20	18	3	17	17
	%	26.67	24.00	4.00	22.66	22.66
There is a reliable internet connectivity in my schools that has enabled utilization of internet as a resource for learning	F	24	15	4	18	14
	%	32.00	20.00	5.33	24.00	18.67
In my school availability of computer lab has facilitated students' development of key competencies such as communication	F	35	20	3	10	7
	%	46.67	26.67	4.00	13.33	9.33

My school availability of internet and computers has facilitated learning making more students to come to school hence increased rate of attendance	F	38	24	5	4	4
	%	50.67	32.00	6.67	5.33	5.33
What is your level of agreement that headteachers ICT infrastructures provision influences implementation of CBE in Junior secondary	F	5	8	4	40	18
	%	6.67	10.67	5.33	53.33	24.00

Source: Researcher, 2026

Teachers in JSS gave their views on statement that headteacher facilitate adequacy of digital tools for integration during lesson that has enabled improved learners' outcomes in test scores whereby 26.67% (20) strongly disagreed, 24.00% (18) disagreed, 4.00% (3) remained neutral, 22.66% (17) agreed whereas number of teachers who strongly agreed contributed for 22.66% (17). Concerning statement on availability of internet connectivity enabling use of internet resources for learning 32.00% (24) of teachers strongly disagreed, 20.00% (15) disagreed, 5.33% (4) remained neutral, 24.00% (18) agreed while 18.67% (14) strongly agreed.

Another question that JSS teachers participated in was on availability of computer labs facilitating students' development of key competencies such as communication whereby 46.67% (35) strongly disagreed, 26.67% (20) disagreed, 4.00% (3) remained neutral, number of teachers who agreed were 13.33% (100 while 9.33% (7) strongly agreed. On availability of computers and internet creating an environment that encourages learners to attend school improving on attendance rate half of teachers at 50.67% (38) strongly disagreed, 32.00% (24) disagreed, 6.67% (5) remained neutral while 5.33% (4) agreed and 5.33% (4) strongly agreed.

Junior high school teachers were subjected to a general question that availability of ICT infrastructure promotes implementation of CBE curriculum whereby only a small portion of teachers at 6.67% (5) strongly disagreed, 10.67% (8) disagreed, 5.33% (4) remained neutral, slightly more than half of teachers who participated in research at 53.33% (40) agreed whereas 24.00% (18) strongly agreed. JSS students were also subjected to questionnaire to gain insights on impact of ICT infrastructure on implementation of Competency Based Education in Junior high schools whereby responses were recorded as in table 5.

Table 5: Report on JSS Students Questionnaire on Influence of Headteachers Provision of ICT Infrastructure on Implementation of CBE

SD: Strongly Disagree -1; **D**: Disagree-2; **N:** Neutral- 3; **A:** Agree-4; **SA:** Strongly Agree-5, F-Frequency, %-Percentage

Provision of ICT infrastructure strategies		**SD 1**	**D 2**	**N 3**	**A 4**	**SA 5**
My school headteacher has facilitated adequacy of digital tools for integration during lesson that has enabled improved learners of learning outcomes in test scores	F	70	65	12	28	20
	%	35.90	33.33	6.15	14.36	10.26
There is a reliable internet connectivity in my schools that has enabled utilization of internet as a resource for learning	F	74	60	8	30	23
	%	37.95	30.77	4.10	15.38	11.79
In my school availability of computer lab has facilitated students' development of key competencies such as communication	F	76	62	8	29	20
	%	38.97	31.79	4.10	14.87	10.26
My school availability of internet and computers has facilitated learning making more students to come to school hence increased rate of attendance	F	80	67	5	19	24
	%	41.03	34.36	2.56	9.74	12.31
What is your level of agreement that headteachers ICT infrastructures provision influences implementation of CBE in Junior secondary	F	20	18	4	74	79
	%	10.26	9.23	2.05	37.95	40.51

Source: Researcher, 2026

Junior high school students participated in a questionnaire to bring insights unto their views on how ICT infrastructure impacts on implementation of curriculum in Junior high school. Concerning question on whether headteacher has facilitated adequacy of digital tools for integration during lesson time to promote improvement of learners' outcomes in test scores 35.90% (70) of JSS learners strongly disagreed, 33.33% (65) disagreed, 6.15% (12) remained neutral, 14.36% (28) agreed while number of learners who strongly agreed contributed for only 10.26% (20). Concerning availability of a reliable internet connectivity that enables utilization of internet as a learning resource 37.95% (74) of JSS learners strongly disagreed, 30.77% (60)

disagreed, 4.10% (8) remained neutral, 15.38% (30) agreed while learners who strongly agreed contributed for 11.79% (23).

Computer lab availability of computer lab in Junior high school that promotes acquisition of digital competencies such as communication attracted a high number of learners at 38.97% (76) to strongly disagree that computer labs are available, 31.79% (62) disagreed, 4.10% (8) remained neutral, 14.87% (29) agreed whereas number of learners who strongly agreed contributed for 10.26% (20). Internet availability together with availability of computers in schools providing an environment that is welcoming to learners encouraging their attendance attracted 41.03% (80) of learners in JSS to strongly disagree, 34.36% (67) disagreed, 2.56% (5) were neutral, 9.74% (19) agreed while 12.31% (24) strongly agreed.

Junior high school learners were also given a general question to provide their views on influence of headteachers provision of ICT infrastructure on implementation of CBE curriculum in Junior high school whereby 10.26% (20) of learners strongly disagreed, 9.23% (18) disagreed, 2.05% (4) remained neutral, 37.95% (74) agreed while number of JSS learners who strongly agreed were a simple majority of participants at 40.51% (79). Quantitative findings a general view demonstrates that there is inadequacy of ICT infrastructure among Junior high schools where facilities such as computer labs being very limited despite of their critical significance on implementation of Competency Based Education Curriculum in Junior high schools. However, both teachers as well as JSS learners appreciated role of ICT infrastructure in facilitating implementation of CBE curriculum being of much significance.

4.3 Report on Inferential Findings on Influence of Headteachers Provision of ICT Infrastructure on Implementation of CBE

To get insights on inferential findings of this investigation frequencies of Junior high school teachers as well as learners on adoption of ICT infrastructure were analysed as displayed on table 18 for analysis using Karl Pearson test statistics for correlation to establish existence of any kind of association.

Table 6: Report on Analysis Frequencies on Headteachers Provision of ICT Infrastructure Influence on Implementation of CBE

Frequencies	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
JSS Teachers' (X)	5	8	4	40	18
JSS Students (Y)	20	18	4	74	79

S*ource*: Researcher, 2026

Karl Pearson Statistics for correlation between ICT infrastructure influence on implementation of CBE was established at $\alpha = 0.05$ and range of values of r taken as $-1\ to + 1$ whereby if value of r calculated if close to 1 it signifies existence of a strong association between these two variables. However, if value calculated lies close to zero then an indication of a weak association between these two variables. Results for Karl Pearson was tabulated in table 7.

Table 7: Report on Analysis of Karl Pearson Correlation Co-efficient on Frequencies of Adopting ICT infrastructure Influence on Implementation of CBE

Variable	$\sum X$ / $\sum Y$	$\sum X^2$ / $\sum Y^2$	N	$\sum XY$	r	Decision
Teachers (X)	75	2029	5	4642	0.82	High Positive Correlation
Parents (Y)	195	12457				

Source: Researcher, 2026

Results of this calculation demonstrated that there is a high positive relationship between headteachers provision of ICT infrastructure and implementation of CBE of $r = 0.82$.

4.4 Report on Thematic Analysis on Influence of Headteachers Provision of ICT Infrastructure on Implementation of CBE

Qualitative findings were also solicited among respondents to gain insights on influence of provision of ICT infrastructure on implementation of CBE curriculum whereby Headteachers in Junior high schools through interviews together with Curriculum Support Officers gave their views but for Parents in Junior high schools participated in a focus group discussion guided by researcher. During interviews with headteachers, Headteacher B observed that:

> *"In our school just three months ago we were able to procure few laptops and a projector for use by teachers and learners in our schools but still demand for these tools remains as number of learners in our school is higher compared to available devices*" (Headteacher B)

According to this respondent inadequacy of ICT infrastructures such as laptops is among barriers hindering effective implementation of digital skills among learners in Junior high schools. This observation was also made by Headteacher C who added that:

> *"Within this institution we only have 15 computers whereby some of them are too old and their maintenance has not been to the standard due to lack of readily available personnel to carry out maintenance practices on such computers and those available sometimes are too expensive for our school to afford. This normally forces our learners to share among themselves available devices which slower down digital competencies development among our learners"* (Headteacher C)

CSO_1 during an interview also noted inadequacies of ICT infrastructure within Junior high schools thou had noted some degree of improvements on schools where ICT infrastructure was put into place. This is because CSO_1 observed that:

"Schools where ICT infrastructure has been put into place such as electricity, internet connectivity as well as availability of digital devices such as projectors such schools have been able to realize improve learners' competencies" (CSO_1)

Parent Y also noted that:

> *"When students report back home, they normally come asking for our smartphones to make use of them to carry out their assignments given from school as computers available in schools are inadequate for everyone in class*" (Parent Y).

These observations made by various respondents agrees with a study done by Njoroge and Mugambi (2023) who revealed that a large number of schools lack important digital devices needed for curriculum delivery leading to reduced learner exposure to ICT knowledge and skills despite of ICT resources being very central in implementation of CBE curriculum.

Internet connectivity was highlighted as a barrier to effective implementation of CBE among Junior high school learners. For instance:
Headteacher G reported that:

> *"In our Junior high school there lacks a stable internet connectivity to serve learners together with their teachers during learning activities in school. This has made it difficult for teachers as well as learners in accessing digital content for use in classroom learning"* (Headteacher G)

CSO_2 during an interview reported that:

> *"Junior high schools that are well connected to reliable internet services, teachers in these schools are able to upload projects for learners in good times to online platforms provided by Ministry of Education, aligning with assessments methods provided for Competency Based Education"* (CSO_2)

Parent X during a focus group discussion with parents reported that:

> *"Learners are always asked to research for certain contents online which is a requirement for the CBE curriculum but because schools lack WI-FI, such burdens are taken to parents back at home to facilitate their children learning. These is likely to cause disparities in accesses of online materials as some parents may not be able to assist their learners due to lack of knowledge or ignorance whereas some parents may lack even smartphones that can be used for online searching"* (Parent X)

All respondents agreed that Junior high schools to a large extent are facing barriers of reliable internet connectivity which is a major barrier in accessing online resources. This challenge was also noted to lead to disparities in acquisition of knowledge and skills among learners due to parental social economic status affecting achievement Sustainable Development Goal 4 on equity in provision of education (SDG4). According to Oduor and Chepkorir (2022), availability of reliable internet connectivity in Junior high school has a direct impact on implementation of CBE curriculum. These is because, online resources or digital assessments tools are not likely to be fully put into good use without a stable internet connectivity.

In regard to teacher training on use of ICT and digital pedagogy, Headteacher D reported that:

> *"In our school we have few computers and projectors but quite a number of our teachers lack confident on their use due to lack of digital skills in use of computers"* (Headteacher D)

Observations made by Headteacher D were supported by report by CSO_3 together with parent Z. For instance, CSO_3 during an interview reported that:

> *"In Junior high schools where headteachers prioritize training of teachers in ICT are able to develop a smoother integration of ICT tools in lessons"* (CSO_3)

During focus group discussion with parents Parent Z reported that:

> *"We have noted that some of the teachers in our school are still giving learners home works in traditional ways because such teachers lack needed ICT knowledge"* (Parent Z)

Report of observations from headteacher D, CSO_3 and parent Z all agree on need of teacher training in ICT to equip teachers with necessary skills or competencies in ICT. These is in support of Cherotich et al., (2023) findings that teacher's level of preparedness in ICT has an impact on how well CBE is implemented.

5. Conclusion and Recommendations

5.1 Conclusions

ICT infrastructure provision is not just merely on availing hardware materials, but it is all about developing a sustainable digital super highway within Junior high schools. Also, Headteachers in Junior high schools who have a strategic investment on ICT infrastructure resources, in-service training of Junior high school teachers while promoting maintenance practices of digital devices within a school provide an enabling school environment for implementation of CBE. Also there exist a high positive association of $r = 0.82$ on Headteachers provision of ICT infrastructure and implementation of CBE.

5.2 Recommendations

1. Government through Ministry of Education can increase funding of ICT within schools ensuring equitable distribution of ICT devices among Junior high schools.
2. Junior high school headteachers can create a maintenance plan for ICT devices in a school while prioritizing on teacher capacity building.
3. Curriculum Support Officers can intensely monitor of ICT integration in schools while providing opportunities for teachers' capacity building.
4. Educational stakeholders can sensitize parents on need for supporting learners at home while collaborating with schools to reduce access gaps on ICT resources.
5. Policy makers in education sector may develop ICT policies that expand internet connectivity to all basic learning institutions under Digital Literacy Program that is funded by government.

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