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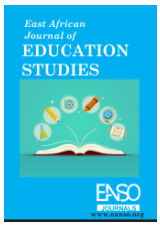

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Original Article

Infrastructure Availability and the Effective Implementation of Competence-Based Curriculum in Public Primary Schools in North Horr Ward, Marsabit County, Kenya

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Infrastructure, Competence-Based Curriculum, Effective Implementation, learner-centred, Digital Infrastructure.

ABSTRACT

This study examined the relationship between infrastructure availability and the effective implementation of the Competency-Based Curriculum (CBC) in public primary schools in North Horr Ward, Marsabit County, Kenya. Anchored in Bertalanffy's General Systems Theory, the research adopted a mixed-methods approach, integrating both descriptive survey and case study designs. The target population comprised teachers, headteachers, sub-county education officials, and Grade 5 and 6 pupils from ten public primary schools. Census, stratified, and simple random sampling techniques were employed to ensure comprehensive representation across stakeholder groups. Data were collected using a combination of questionnaires, interview guides, focus group discussions, observation checklists, and document analysis. Quantitative data were analysed using descriptive statistics and Pearson's Product-Moment Correlation Coefficient, while qualitative data were analysed thematically. The findings revealed severe deficiencies in essential infrastructure—such as laboratories, ICT rooms, libraries, sanitation, and boarding facilities—which significantly impeded the implementation of learner-centred, practical, and digitally-supported CBC instruction. A strong, positive, and statistically significant correlation was established between infrastructure availability and effective CBC implementation ($r = .623$, $p < .01$). The study concludes that infrastructural inadequacies undermine the realisation of CBC objectives and recommends a coordinated, multi-stakeholder investment strategy to enhance educational infrastructure and equity in marginalised regions of Kenya.

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INTRODUCTION

In 2017, Kenya officially adopted the Competency-Based Curriculum (CBC), marking a significant transformation in its educational landscape. This reform was introduced in response to the increasing demand for a more holistic approach to education—one that moves beyond rote memorisation and instead emphasises the development of practical skills, critical thinking, and creativity (Kenya Institute of Curriculum Development [KICD], 2017). The CBC is designed to promote learner-centred, activity-based education that equips students with competencies essential for success in the 21st century. This approach fosters active participation, collaboration, and problem-solving, ensuring that learners emerge not only knowledgeable but also skilled, adaptable, and innovative (Muchira, Ndung'u, & Mwaura, 2023). However, for the CBC to be implemented effectively, adequate infrastructure is vital to support the curriculum's interactive and hands-on orientation.

Despite its progressive aims, the implementation of CBC has encountered considerable challenges, particularly in rural and marginalised areas of Kenya, such as North Horr Ward in Marsabit County. One of the most significant barriers to CBC implementation is the acute shortage of infrastructure in public primary schools (Hussein, 2023). Essential facilities such as classrooms, desks, digital devices, sanitation units, and electricity are often unavailable or grossly inadequate, making it difficult to create learning environments that align with the curriculum's interactive and exploratory nature. Studies indicate that many schools in arid and semi-arid lands (ASALs), including those in Marsabit County, continue to face critical infrastructural deficiencies (Atiya, 2022). For example, the Kenya National Commission for UNESCO (2018) reported that classrooms in some regions are overcrowded and lack the basic teaching and learning resources required to support CBC. In North Horr Ward specifically, the situation is exacerbated by the use of temporary structures, inadequate furniture, and lack of clean water, further impeding curriculum delivery.

The importance of infrastructure in the effective implementation of CBC cannot be overstated. For the curriculum to achieve its intended goals, it must be underpinned by an enabling environment that promotes creativity, practical learning, and digital literacy. In North Horr Ward, schools face compounded challenges due to nomadic pastoralist lifestyles and harsh climatic conditions, including frequent droughts. Without the necessary infrastructure, teachers are unable to deliver activity-based lessons, and learners are deprived of experiential learning opportunities. This undermines the CBC's core objective of developing learners' competencies and values (Thiruaine, Nduku, & Wambiya, 2024). As such, strengthening infrastructure in public primary schools across the ward is essential not only for improving education quality but also for ensuring the equitable realisation of CBC outcomes in one of Kenya's most underserved regions.

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Marsabit County, located in the arid and semi-arid lands (ASALs) of northern Kenya, is characterised by chronic underdevelopment and a poverty rate of 66% (Kenya National Bureau of Statistics [KNBS], 2022). North Horr Ward, primarily inhabited by nomadic pastoralist communities reliant on livestock for their livelihoods, faces further challenges due to frequent migration in search of water and pasture. This mobile lifestyle, coupled with the impact of recurrent droughts—such as the prolonged drought from 2021 to 2023 that decimated livestock populations—has intensified poverty and severely disrupted education continuity. The underdeveloped infrastructure in public primary schools, including a lack of digital tools, inadequate sanitation facilities, and unreliable water access, severely impairs the implementation of CBC, which relies on well-resourced, participatory learning environments. These socio-economic and environmental realities hinder the full achievement of CBC objectives. Therefore, this study aimed to examine the availability of infrastructure and its influence on the effective implementation of the Competency-Based Curriculum in public primary schools within North Horr Ward, Marsabit County.

Statement of the Problem

The effective implementation of the Competency-Based Curriculum in Kenya is contingent upon the availability of adequate infrastructure to support interactive, activity-based, and learner-centred instruction. However, in the North Horr Ward of Marsabit County—an arid and semi-arid region characterized by widespread poverty and underdevelopment—public primary schools face critical infrastructural deficits. These include insufficient classrooms, inadequate learning materials, lack of digital devices, poor sanitation, and unreliable access to water and electricity. Such infrastructural inadequacies create significant barriers to delivering the CBC as envisioned, particularly in facilitating practical and experiential learning that is central to the curriculum. Additionally, the nomadic lifestyle of the pastoralist communities in the ward disrupts school attendance, posing further obstacles to consistent teaching and learning.

Compounding these issues is the region's heightened vulnerability to environmental stressors, notably the prolonged drought between 2021 and 2023, which decimated livestock—the primary livelihood of the local population—and further strained household incomes. As families struggle to meet basic needs, education becomes a secondary priority, leading to irregular attendance and diminished investment in schooling. In such contexts, the absence of adequate infrastructure not only hinders curriculum delivery but also deepens educational inequalities, making it difficult for learners to attain the competencies envisioned by CBC. Consequently, this study sought to examine the availability of infrastructure and assess its influence on the implementation of CBC in public primary schools in North Horr Ward, with a view to informing context-specific interventions aimed at improving education outcomes in marginalized settings.

Research Question

1. What is the status of infrastructure availability for the implementation of CBC in the ward?

2. How does the availability of infrastructure in public primary schools in North Horr Ward affect the implementation of the Competency-Based Curriculum?

Hypotheses

H_0: There is no significant relationship between the availability of infrastructure and the effective implementation of the Competency-Based Curriculum in the ward.

H_1: There is a significant relationship between the availability of infrastructure and the effective implementation of the Competency-Based Curriculum in the ward.

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Theoretical Framework

The study was guided by the General Systems Theory, originally developed by Ludwig von Bertalanffy in 1968. The theory posits that a system is a set of interconnected components working synergistically to achieve common goals, emphasizing holism—the notion that "the whole is greater than the sum of its parts" (Bertalanffy, 1968). Central to this theory is the input-throughput-output model, where inputs such as infrastructure and resources are transformed through internal processes like teaching and learning to generate desired outputs, including learner competencies. The theory also underscores the importance of feedback mechanisms and the system's interaction with external environments for continuous adaptation and improvement (Strauss, 2005). This conceptualization aligns with contemporary educational models that emphasize systemic coordination among resources, policies, and pedagogical strategies to improve learning outcomes.

General Systems Theory was particularly relevant to this study, which examined the availability of infrastructure and its impact on the implementation of the Competency-Based Curriculum (CBC) in North Horr Ward, Marsabit County. The theory provided a comprehensive framework for analyzing how socio-economic and environmental factors—such as poverty, nomadic lifestyles, and recurrent drought—affect the education system's functioning. These contextual realities were viewed as external variables interacting with the system's internal elements (such as school infrastructure and teacher preparedness), ultimately influencing the effectiveness of CBC delivery. As Assche, Valentinov, and Verschraegen (2019) explain, systems theory is especially valuable for analyzing the complexity of governance and institutional adaptation in marginalized contexts. By applying this theory, the study was able to map out interdependencies among educational inputs, processes, and outcomes, thereby offering a holistic understanding of the systemic barriers and opportunities for CBC implementation in resource-constrained settings.

LITERATURE REVIEW

Coelho and Romão (2016) stated that without providing a conducive environment that mainly involves providing the right physical facilities for education, students may fail to reach their maximum academic potential since it will add to their stress. School infrastructure is a key base for learning in schools and includes classrooms, laboratories for science practicals, the halls and open fields for games, games equipment, dormitories, sanitation facilities and others (Hawa, 2018). The Government of Kenya through the National Education Strategic Sector Plan (2018-2022) identified key infrastructure challenges in the Kenyan education sector which included overcrowded classrooms due to the concept of free primary education and a 100% transition policy. Kenya Primary Education Equity in Learning (PEEL) Program (2022-2023) in the needs assessment for CBC at the primary level report, found that inadequate infrastructure with high teacher-learner ratios hindered the effective delivery of the CBC (World Bank, 2022).

Ruhyana and Aeni (2019) conducted a study in Sumedang, Indonesia, to investigate the effects of infrastructure and educational facilities on learning outcomes in primary schools. Adopting a quantitative approach and a causal-comparative research design, the study examined the relationship between school infrastructure (independent variable) and student academic achievement (dependent variable). The study involved a population of 599 primary schools from the Sumedang Dapodik District, and data were analyzed using logistic regression techniques. The findings revealed that classroom infrastructure significantly influenced student learning outcomes. Based on these results, the researchers recommended improvements in classroom facilities and other educational resources to enhance learning

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quality and reduce student dropout and repetition rates.

While the study by Ruhyana and Aeni (2019) contributes valuable empirical evidence on the importance of infrastructure in academic performance, it presents both contextual and methodological gaps in relation to the current study. Their research was situated in an urban Indonesian setting and focused exclusively on student academic outcomes, utilizing a purely quantitative design. By contrast, the current study was conducted in North Horr Ward, a remote and marginalized area in Marsabit County, Kenya, where infrastructural challenges are compounded by poverty, nomadic lifestyles, and environmental shocks such as recurrent droughts. Furthermore, this study adopted a Mixed Methods Research (MMR) design, which allowed for the integration of quantitative data and qualitative insights from key stakeholders to examine how infrastructure availability affects the implementation of the Competency-Based Curriculum. This comprehensive approach addressed not only the statistical dimensions of the problem but also the contextual and lived realities of those impacted. Therefore, the current study fills a notable research gap by focusing on curriculum implementation rather than academic performance and by applying a methodological framework better suited to capturing the complexity of marginalized educational environments.

Siddique et al, (2019) conducted a study on the role of infrastructure in improving both the quantity and quality of school education in the Sindh Province of Pakistan. The study employed an exploratory research design, relying primarily on secondary data sources, including a review of existing literature, informal discussions, and in-depth projective methods. The findings revealed a highly dismal state of school infrastructure in Sindh. Of the 42,383 schools in the province, 23,235 lacked electricity, 15,478 lacked washrooms, 18,128 had no access to drinking water, 5,000 were operating under trees, and 16,359 were without boundary walls. These statistics underscored the significant infrastructural challenges affecting the delivery of quality education in the region.

While Siddique et al.'s (2019) study offers critical insights into the infrastructural deficiencies affecting school education, it presents notable methodological and contextual gaps when compared to the present study. First, their research was primarily desk-based, drawing on secondary data and informal qualitative discussions, without empirical validation through primary data collection. Second, the study was conducted in Pakistan—a context with distinct socio-political, economic, and geographical conditions—therefore limiting its applicability to the Kenyan context. In contrast, the current study focused on the availability of infrastructure and its impact on the implementation of the Competency-Based Curriculum (CBC) in North Horr Ward, Marsabit County, Kenya. By employing a Mixed Methods Research (MMR) design, the present study integrated both quantitative and qualitative primary data to explore not only the status of infrastructure but also its influence on curriculum delivery in a marginalized, arid, and semi-arid region. Thus, this research addressed the geographical, methodological, and empirical gaps left by Siddique et al.'s work.

Nteziyaremye and Opiyo (2021) conducted a study on the relationship between school physical infrastructure and pupils' enrolment rates in nursery schools in Ngororero District, Rwanda. The study adopted a correlational research design and utilized a sample comprising 62 teachers, 10 head teachers, and 92 parents. Data were collected through questionnaires and guided interviews, and stratified sampling was employed to select participants. Data analysis was performed using SPSS Version 21. The findings indicated that 71.7% of parents disagreed with the statement that classrooms were adequate in nursery schools, while 76.1% disagreed that playgrounds were available in the schools. These results pointed to significant infrastructural

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deficiencies within the sampled nursery schools, which were perceived to negatively influence enrolment rates. Despite its valuable contribution, the study by Nteziyaremye and Opiyo (2021) presents several gaps that the current research aims to address. First, the study was limited to nursery schools, whereas the present study focuses on public primary schools, which are the core implementation centres for the Competency-Based Curriculum (CBC) in Kenya. Second, the research design was purely correlational and relied on a relatively small and narrowly focused sample, which included only a limited range of stakeholders. Additionally, the study employed only two data collection instruments, which may not have provided comprehensive verification of infrastructure availability and its systemic implications. The present study bridged these methodological and contextual gaps by employing a Mixed Methods Research (MMR) design, encompassing broader stakeholder participation and focusing on the infrastructural factors affecting CBC implementation in North Horr Ward, Marsabit County—a marginalized region within the arid and semi-arid lands (ASALs) of Kenya.

Mgimba and Mwila (2022) conducted a study to investigate the influence of infrastructural challenges on students' academic performance in rural public secondary schools in Iringa District, Tanzania. The study adopted a convergent parallel mixed methods design and was grounded in Maslow's Hierarchy of Needs Theory. The sample consisted of 48 teachers, 97 students, five school heads, and one District Education Officer, selected using both simple random and purposive sampling techniques. Data collection instruments included questionnaires, interviews, and direct observations. Quantitative data were analyzed using descriptive statistics with the aid of SPSS Version 21, while qualitative data were analyzed thematically. The study found that inadequate infrastructure—such as classrooms, desks, chairs, libraries, laboratories, laboratory equipment, dormitories, and instructional materials—contributed to poor academic performance among students in rural public secondary schools. Although the study applied a robust mixed methods design similar to the one used in the current research, several methodological and contextual gaps remain. First, the research was conducted in rural secondary schools in Iringa District, Tanzania, a setting with different policy, geographical, and socio-economic conditions compared to Kenya's arid and semi-arid regions. Second, the study was anchored on Maslow's theory, which focuses on individual needs rather than the systemic dynamics emphasized by the General Systems Theory adopted in the current study. Additionally, while the researchers employed observation as a tool to assess infrastructure, they did not incorporate document analysis, which could have enhanced the validation of data on infrastructure availability. Finally, the SPSS version used (Version 21) was outdated, potentially limiting the application of newer statistical features available in recent software versions. The present study addressed these gaps by focusing on the implementation of the Competency-Based Curriculum (CBC) in public primary schools in North Horr Ward, Marsabit County, using a more current version of SPSS, integrating document analysis, and employing a systems-based theoretical lens to understand the complex interrelations between infrastructure and curriculum implementation.

Kibet (2023) conducted a study to examine the influence of primary school infrastructure on the implementation of the Competency-Based Curriculum (CBC) in Bomet Central Sub-County, Kenya. The study targeted teachers, members of the Board of Management (BoM), and curriculum support officers, with a total sample size of 95 respondents. A descriptive survey design was adopted, and data were collected through questionnaires and interviews. Quantitative data were analyzed using descriptive statistics, including frequencies and percentages, while qualitative data were examined through thematic and sub-thematic content analysis. The findings revealed that 53.7%

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of schools had adequate classrooms, but 86.3% lacked ICT laboratories and access to digital facilities. Furthermore, 82.1% of schools did not have functional libraries, and although 70.5% had playgrounds, these lacked essential play materials and equipment for learners. While Kibet's (2023) study provides useful insights into infrastructure-related challenges affecting CBC implementation, it presents several methodological and contextual gaps that the current research sought to address. First, the study was conducted in Bomet Central, a relatively better-resourced region compared to North Horr Ward in Marsabit County, an arid and marginalized area with more pronounced infrastructural constraints. Second, although the study used both questionnaires and interviews, it employed a predominantly quantitative approach and did not utilize document analysis or observational methods to verify the actual availability and condition of infrastructure in schools. Additionally, the study sampled a limited number of stakeholders, potentially narrowing the scope of perspectives considered. The current study addressed these gaps by employing a Mixed Methods Research (MMR) design, incorporating document analysis and direct observations, and engaging a broader range of participants to capture a more comprehensive picture of infrastructure availability and its influence on CBC implementation in a resource-constrained context.

Isaboke et al. (2021) investigated the challenges faced by teachers in implementing the Competency-Based Curriculum (CBC) in public pre-primary schools in Nairobi City County. The study was anchored on the Concern-Based Adoption Model developed by Hall, Hord, and Rutherford (2006). Data were collected using a questionnaire and an interview schedule administered to a sample of 45 centre managers and 90 pre-primary school teachers. The findings revealed that teachers encountered considerable challenges due to the lack of adequate learning facilities, including classrooms, chairs, and tables. In some schools, two learners were reported to share a single chair, while others lacked tables altogether, making it difficult for learners to write. Additionally, one centre manager reported that, due to classroom shortages, PP1 and PP2 learners were occasionally combined in a single learning space, which undermined age-appropriate instruction and curriculum delivery. While the study by Isaboke et al. (2021) provides important insights into infrastructural challenges affecting CBC implementation in urban pre-primary settings, it presents notable gaps that the current study sought to address. First, the study was conducted in an urban context (Nairobi City County), which differs significantly from the rural and marginalized context of North Horr Ward in Marsabit County—an arid region with more acute infrastructural limitations. Second, the study focused solely on pre-primary education, whereas the current research examined public primary schools where CBC implementation is more extensive and complex. Methodologically, Isaboke et al.'s study used only two data collection instruments and involved a limited range of stakeholders—centre managers and teachers—excluding other critical voices such as curriculum support officers, quality assurance officers, and parents. The present study addressed these limitations by employing a Mixed Methods Research (MMR) design, incorporating diverse data sources and a broader range of respondents to provide a more comprehensive understanding of how infrastructure influences CBC implementation in a resource-constrained environment.

Ireri, et al (2022) conducted a study to examine the influence of infrastructural facilities and staffing on academic performance in national examinations in emerging national secondary schools located in Samburu, Marsabit, and Isiolo counties, Kenya. The study adopted a correlational research design and sampled five school principals, 60 teachers, three examination officers, and three staffing officers. The findings revealed that a significant majority of respondents—90.9% (n=50)—reported that infrastructural facilities were inadequate. The study further confirmed the acceptance of the alternative

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hypothesis, indicating that infrastructural facilities had a statistically significant influence on academic performance in national examinations in the sampled counties. While the study by Ireri et al. (2022) provides important insights into the relationship between infrastructure and student performance, several contextual and methodological gaps necessitated the current study. First, although the study was conducted in the same geographical region—covering Marsabit County—it focused on secondary schools operating under the 8-4-4 curriculum, rather than on the Competency-Based Curriculum (CBC) currently being implemented in primary schools. Second, the study employed a purely quantitative research design and utilized a limited set of data collection tools, which constrained the exploration of stakeholder experiences and contextual dynamics. In contrast, the present study addressed these gaps by focusing on CBC implementation in public primary schools in North Horr Ward, Marsabit County, using a Mixed Methods Research (MMR) approach. This approach integrated both quantitative and qualitative data sources to provide a more comprehensive understanding of how infrastructure affects curriculum delivery in a marginalized, arid, and semi-arid educational context.

RESEARCH DESIGN AND METHODOLOGY

The study adopted a mixed methods approach, integrating both quantitative and qualitative research designs to provide a comprehensive understanding of the availability of infrastructure and the implementation of the Competency-Based Curriculum (CBC) in North Horr Ward (Creswell, 2018). For the quantitative component, a descriptive survey design was employed to collect measurable data such as the number of classrooms, desks, offices, laboratories, workshops, home science and creative arts rooms, boarding facilities, and toilets. This data helped assess the extent of infrastructural availability across the schools. The descriptive survey design was appropriate as it enabled the researcher to systematically describe and quantify prevailing conditions within a broad population. For the qualitative component, a case study design was used to explore in-depth the lived experiences, perceptions, and challenges of key stakeholders—namely teachers, learners, head teachers, and education officers—particularly regarding the availability of infrastructure and its effect on CBC implementation. The case study approach was suitable as it allowed for a detailed, contextually grounded understanding of CBC implementation within real-life settings. By combining these two research designs, the study achieved a holistic perspective, capturing both statistical patterns and rich, contextual insights that were critical for generating well-informed conclusions and actionable recommendations.

Target Population

The target population comprised 10 public primary schools, 86 teachers, 10 headteachers, 4 education officials at the sub-county level, and 480 pupils in Grades 5 and 6 (Sub-County Director North Horr, 2025). This population was strategically selected to ensure a comprehensive representation of key stakeholders involved in the delivery and oversight of primary education. By incorporating participants from administrative, instructional, and learner categories, the study was able to capture diverse and relevant perspectives. This was essential for gaining a holistic understanding of the availability of infrastructure and its influence on the effective implementation of the Competency-Based Curriculum in public primary schools within North Horr Ward, Marsabit County**.**

Sample and Sampling Techniques

According to Lakens (2022), a researcher may choose to study an entire population when the group exhibiting the specific characteristics of interest is relatively small, as was the case in this study. Accordingly, the research encompassed all locations within North Horr Ward and included all public primary schools, together with the entire population of headteachers, teachers, Sub-County

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Directors, Quality Assurance and Standards Officers, and Curriculum Support Officers. For the pupil component, learners in Grades 5 and 6 (N = 480) were stratified by grade and sex. A random sampling technique was employed to select a sample of 80 pupils—eight from each of the ten schools—equally distributed between Grades 5 and 6, and between boys and girls. This comprehensive sampling approach ensured that the study captured a representative and diverse set of perspectives from all key stakeholders involved in the implementation of the Competency-Based Curriculum (CBC) in the region. In qualitative research, there are no fixed rules regarding sample size; rather, the emphasis lies on the richness, depth, and contextual relevance of the data collected from selected participants (Creswell & Creswell, 2018). Given the distinctive infrastructural and socio-economic challenges faced by schools in North Horr Ward, the inclusion of all relevant stakeholders enhanced the study's credibility, dependability, and overall validity. This inclusive approach allowed for a more holistic and nuanced understanding of the dynamics affecting CBC implementation and provided valuable insights for informing curriculum reform in similarly marginalised and resource-constrained educational contexts.

Data Collection Tools

The data collection tools employed in the study comprised a variety of instruments designed to ensure methodological rigour and facilitate comprehensive data triangulation. Questionnaires were administered to teachers and headteachers to obtain structured and quantifiable data on infrastructural availability and its influence on Competency-Based Curriculum implementation. Interview guides were used with sub-county education officials to elicit in-depth, narrative responses regarding policy enforcement, resource allocation, and administrative challenges. Observation checklists were utilised to systematically assess the physical infrastructure and learning environments across schools. Additionally, document analysis was conducted to review existing school records, thereby strengthening the validity of findings through secondary data. Focus group discussions (FGDs) were held with learners in Grades 5 and 6 to capture their perceptions and experiences, offering valuable insights from the pupil's perspective. The use of multiple data sources ensured triangulation, enhanced the credibility of the findings, and provided a well-rounded understanding of the research problem.

Data Analysis

The study employed both quantitative and qualitative data analysis techniques to ensure a comprehensive interpretation of the findings. Quantitative data, collected primarily through questionnaires, were analysed using descriptive statistics such as percentages, frequencies, and means to summarise general trends and characteristics within the target population. Furthermore, inferential statistics—specifically the Pearson Product-Moment Correlation Coefficient—were employed to determine the strength and direction of relationships between key variables. Conversely, qualitative data obtained through interviews, focus group discussions, and document analysis were subjected to thematic analysis, which enabled the identification of recurring patterns, emerging insights, and underlying challenges relevant to the research objectives. This mixed-methods approach allowed for a more nuanced and robust understanding of the research problem by integrating numerical data with in-depth contextual perspectives.

RESULTS AND FINDINGS

Availability of the Infrastructure for the Implementation of CBC

Headteachers and teachers were asked to assess the availability of infrastructure in their respective schools to support the implementation of the Competency-Based Curriculum (CBC). The assessment was based on a three-point Likert scale, with the following response options: Not Available

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(NA = 1), Available but Not Adequate (ABNA = 2), and Available and Adequate (AA = 3). This scale was designed to capture both the presence and sufficiency of infrastructural resources relevant to CBC implementation. The findings are summarised in Table 1.

Table 1: **Availability of Infrastructure**

	Not Available				**Available but not adequate**				**Available and Adequate**			
	HTs		**TRCHs**		**HTs**		**TRCHs**		**HTs**		**TRCHs**	
	F	%	F	%	F	%	F	%	F.	%	F	%
Classrooms	0	0	1	1	9	90	66	83	1	10	13	16
Desks/Tables and Chairs	0	0	0	0	9	90	66	83	1	10	14	18
Office and staffroom	1	10	11	14	8	80	67	84	1	10	2	3
Kitchen and Dining Hall	0	0	11	14	6	60	55	69	4	40	14	18
Dormitory and Bathroom	3	30	17	21	5	50	53	66	2	20	10	13
Pupils Latrines	0	0	2	3	9	90	69	86	1	10	9	11
Teachers Latrines	1	10	5	6	7	70	56	70	2	20	19	24
Tap Water	3	30	16	20	5	50	43	54	2	20	21	26
Sports Fields and Equipment	1	10	3	4	6	60	62	78	3	30	15	19
Electricity	3	30	22	28	5	50	46	58	2	20	12	15
Laboratory	10	100	79	99	0	0	1	1	0	0	0	0
W/ shop and H/Science rooms	10	100	79	99	0	0	1	1	0	0	0	0
ICT Rooms	5	50	49	61	5	50	31	39	0	0	0	0
Library	4	40	42	53	5	50	30	38	1	10	8	10
Stores	2	20	22	28	6	60	42	53	2	20	16	20

From the findings presented in Table 1, the majority of headteachers (90%) and teachers (83%) reported that classrooms, desks or tables, and chairs were available in their schools but were not adequate. Similarly, 80% of headteachers and 84% of teachers indicated that offices and staffrooms were available, although insufficient to meet the schools' needs. These findings were corroborated during focus group discussions (FGDs) with pupils, who also expressed concern regarding the inadequacy of classroom space and furniture. One pupil remarked:

Our classrooms are very few such that one stream of Grade 6 learn in the dining hall and we use the DH tables. The tables are very high and we have to stand up when writing our notes and also when doing assignments. Our learning is also interrupted by noise from the kitchen" (FGD, Grade 6 pupil, 2024).

This pupil testimony highlights the extent to which infrastructural limitations disrupt effective teaching and learning under the Competency-Based Curriculum. This information was corroborated during interviews with education officials, as well as through direct observation and document analysis. Both observation and document analysis confirmed that while classrooms, desks or tables, and chairs were available, they were not adequate to meet the demands of Competency-Based Curriculum (CBC) implementation. In several schools, alternative spaces such as dining halls, libraries, and dormitories were being used as classrooms. In two cases, the headteacher's office also served as a staffroom and simultaneously functioned as a food and book store. These findings align with those of Cheruiyot (2024), whose study in Kenya revealed that infrastructural deficits further complicate the CBC implementation landscape in junior schools. According to Cheruiyot, "inadequate classroom space, poor internet connectivity, and insufficient sanitation facilities are among the critical infrastructural

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challenges faced by many schools, particularly in rural and underserved areas" (p. 117). These deficiencies not only impede the delivery of quality education but also undermine the holistic development objectives that CBC seeks to achieve.

According to the findings, 60% of headteachers and 69% of teachers reported that kitchen and dining hall facilities were available but not adequate. Similarly, 50% of headteachers and 66% of teachers indicated that dormitories and bathrooms existed but were insufficient to meet the needs of the learners. A significant majority—90% of headteachers and 86% of teachers—confirmed that pupils' latrines were available but inadequate. Additionally, both groups noted at a rate of 70% that teachers' latrines were also insufficient. Regarding water access, 50% of headteachers and 54% of teachers stated that tap water was available but not adequate.

The inadequacy of boarding facilities and sanitation infrastructure was further confirmed through document analysis and physical observation. During school visits, it was noted that three schools either lacked boarding facilities entirely or had non-functional ones. As a result, pupils were compelled to travel more than five kilometres to and from school daily, often through bushland inhabited by wild animals, which posed serious safety risks. These challenges were also highlighted during focus group discussions (FGDs) with learners. One pupil narrated: During the interviews, education officials confirmed the acute shortage of boarding facilities and the long distances pupils must walk to and from school each day. In one of the schools, the researcher observed that there was only a single latrine, partitioned into two sections and used by both boys and girls. This arrangement not only disregarded hygiene and privacy but also contravened basic school safety and child protection protocols. Additionally, two schools lacked latrines for teachers altogether. These inadequacies were further emphasised during focus group discussions with pupils. One girl expressed:

We get so embarrassed as girls to use a latrine adjacent to the boys. It is the only latrine and we have to queue to use the latrine which wastes a lot of our class time. Sometimes boys molest us by knocking on the latrine from their side to scare us. Our teachers are good; they have now devised a separate time to be used by both boys and girls to visit the latrine during breaks" (FGD, Grade 6 pupil, 2024).

These findings are consistent with those of Hassan and Wario (2023), whose study in Garissa County, an ASAL region, revealed that the absence of adequate sanitation infrastructure significantly affects learners' participation and attendance, especially among girls. They noted that poor toilet-to-pupil ratios and lack of gender-segregated facilities contribute to discomfort, absenteeism, and safety concerns. The authors concluded that improving sanitation is not merely a health concern but a fundamental requirement for inclusive, equitable, and effective education delivery.

Most headteachers (60%) and teachers (78%) reported that sports fields and equipment were available in their schools but not adequate. Similarly, 50% of headteachers and 58% of teachers stated that electricity was available but insufficient, while 30% and 28%, respectively, indicated that electricity was completely unavailable in their schools. Concerning specialised learning spaces, 100% of headteachers and 99% of teachers responded that science laboratories, workshops, and home science rooms were not available. Regarding ICT rooms, 50% of headteachers and 61% of teachers reported that they were unavailable. In terms of library access, 40% of headteachers and 53% of teachers indicated that their schools lacked libraries. Although 60% of headteachers and 53% of teachers stated that stores were available, they were considered inadequate to meet institutional needs.

These findings were corroborated through interviews with education officials, document analysis, and direct observation. It was observed that none of the sampled schools had functioning

Article DOI: https://doi.org/10.37284/eajes.8.2.3038

laboratories, workshops, or home science rooms. The ICT rooms reported as "available" were, in reality, small storage spaces where non-functional tablets were kept. No school had an operational ICT room equipped with working digital devices. Furthermore, only three schools had designated library buildings, two of which were repurposed as classrooms due to space shortages. Only one school had a functioning library, though it housed a limited number of outdated revision books and was too small to accommodate even a single stream of learners.

These findings are consistent with Chepkilot, Kipkoech, and Keter (2024), whose study in Baringo County—an arid and semi-arid region—found that "an overwhelming majority of respondents indicated dissatisfaction with the adequacy of infrastructure, including classrooms and laboratories, necessary for effective implementation of CBC" (p. 52). Similarly, Thiruaine, Nduku, and Wambiya (2024) observed that in Catholic private primary schools within the Catholic Diocese of Homa Bay, key facilities such as classrooms, laboratories, projectors, and learning equipment were "insufficient and inadequate to facilitate the implementation of CBC" (p. 41). These findings reinforce the argument that insufficient educational infrastructure remains a major barrier to the effective roll-out of CBC, particularly in marginalised and resource-constrained settings.

Infrastructure Availability and Their Effect on the Implementation of Some Aspects of CBC Implementation

The study also sought to examine the perspectives of headteachers and teachers regarding the relationship between the availability of infrastructure and the effective implementation of the Competency-Based Curriculum (CBC). To achieve this, respondents were presented with a set of statements measured on a three-point Likert scale, designed to assess the perceived availability of key infrastructural components and their influence on various aspects of CBC implementation. The headteachers and teachers were required to indicate the extent to which they agreed with each statement, reflecting their experiences and observations. The analysis of the responses is presented in Table 2.

Table 2: Infrastructure Availability and Their Effect on the Implementation of Some Aspects of CBC Implementation

	Disagree				Undecided				Agree			
	HTs		TRCHs		HTs		TRCHs		HTs		TRCHs	
	F	%	F	%	F.	%	F	%	F.	%	F	%
The infrastructure in the school is adequate to support all learners' comfort and effective learning	3	30	38	48	1	10	0	0	6	60	42	52
Infrastructure in the school enables the use of digital devices and ICT in teaching and learning	8	80	67	84	1	10	2	3	1	10	11	14
Infrastructure in the school supports learner-centred and practical activities for effective teaching and learning	8	80	62	78	0	0	1	1	2	20	18	20
Infrastructure in the school supports games, sports and recreational activities	7	70	53	66	0	0	3	4	3	30	23	29
Infrastructure in the school supports the development of core	8	80	62	78	0	0	2	3	2	20	15	19

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competencies and values and the infusion of Pertinent and Contemporary Issues (PCIs)

As shown in Table 2, 30% of headteachers and 48% of teachers disagreed with the statement that infrastructure in their schools is adequate to support learners' comfort and effective learning. Conversely, 60% of headteachers and 52% of teachers agreed with this statement. These findings were corroborated by document analysis and the observation checklist, which indicated that although classrooms and desks were generally available, they were not adequate to meet the demands of all learners. In terms of digital infrastructure, 80% of headteachers and 84% of teachers disagreed that the infrastructure in their schools enables the use of digital devices and ICT in teaching and learning. Additionally, only 10% of headteachers and 14% of teachers agreed that the infrastructure supports active learning and learner-centred activities. These findings were confirmed through document analysis and field observations. Most of the digital devices supplied by the government were found to be non-functional. Only two schools had operational laptops—each with only one device. Although three schools had projectors, only one was in working condition, and just one school had access to Wi-Fi. During interviews, education officials reported that many schools lacked digital devices and reliable electricity connections. One official stated:

“In some of our schools, there is no electricity connection, the network is so poor that parents and teachers do not own smartphones because there is no internet connectivity. Most of our teachers are not trained to use computers and ICT devices like projectors and audio-visual equipment. There is very little use of technology in teaching and learning. The MoE needs to seriously consider training teachers in the use of technology in teaching and learning in the ward” (Education Official, personal communication, 2024).

These findings align with those of Kibet (2023), whose study in Bomet Central Sub-County revealed that schools lacked ICT laboratories and had no access to ICT facilities necessary for developing digital literacy skills. The study also reported the absence of functional libraries and adequate play materials, both of which hindered effective CBC implementation. Similarly, a report by the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA, 2023) found that many teachers in public schools lack the pedagogical competence to integrate ICT into teaching and learning processes, particularly in marginalised areas.

A majority of headteachers (80%) and teachers (78%) disagreed that the available infrastructure in their schools supports learner-centred and practical activities essential for effective teaching and learning. This was further confirmed during the observation schedule and focus group discussions (FGDs), where it was noted that no school in the ward had a science laboratory, workshop, functioning ICT laboratory, or a fully equipped library. Since the Competency-Based Curriculum (CBC) is fundamentally learner-centred and activity-oriented, the absence of such facilities significantly hampers its meaningful implementation. These findings are consistent with those of Donkoh and Amoakwah (2024), who observed that in their application of learner-centred instructional strategies, teachers reported substantial challenges, including inadequate infrastructure and teaching-learning resources, weak teacher capacity in learner-centred methods, and large class sizes.

Similarly, 70% of headteachers and 66% of teachers disagreed that infrastructure in their schools supports sports and recreational activities. Only 30% of headteachers and 29% of teachers agreed

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that the infrastructure was supportive in this regard. Document analysis and observation confirmed that although nearly all schools had a basic sports field and a few balls, none had athletics equipment or recreational facilities such as swings, see-saws, or slides. FGDs held across the schools revealed similar concerns from pupils. In most schools, learners reported that they primarily engaged in football and volleyball, with no access to other games or recreational resources. One pupil expressed:

In our school, we only have football and volleyball fields. We play football and volleyball every evening. We don't have swings, balances, slides and jumping castles like schools in town. In our school, we also don't have TV to watch the news like in some schools. We need some of these equipment to learn better and play" (FGD, Grade 6 pupil, 2024).

These observations are corroborated by the findings of Hassan and Wario (2023), who reported that in many public schools across ASAL regions, limited sports and recreational infrastructure not only restricts learners' physical development and social engagement but also undermines the CBC's goal of holistic education. Similarly, a study by Mwangi and Gathogo (2023) in Kiambu County—a non-ASAL region—revealed that although urban schools generally had access to sports grounds, most lacked adequate recreational equipment, and existing infrastructure was underutilised due to overcrowding and limited space. The study concluded that without deliberate investment in inclusive and well-equipped recreational infrastructure, the goals of CBC in promoting creativity, collaboration, and physical well-being among learners may remain unattainable.

During interviews, education officials confirmed that ball games and sports fields are available in most schools within the ward. However, they identified a significant lack of athletics equipment and recreational facilities as a major constraint. One Quality Assurance and Standards Officer (QASO) noted:

We have ball games in all the schools and as a ward, we have interschool games competitions. The challenge we have is that only one school has two athletics equipment, thus shot putt and javelin. The acute shortage of athletics equipment hampers the ward from having athletics competitions. The schools lack recreation facilities for learners especially boarders during the weekends" (QASO, personal communication, 2024).

These findings are supported by Odhiambo, Okwemba, and Okoti (2020), whose study in Kenya revealed a general attitude of indifference towards physical education (PE) and sports in schools. They reported that PE receives minimal priority and that many PE departments suffer from inadequate funding and a deficiency of essential resources. Similarly, a recent study by Wario and Abdullahi (2023) conducted in Wajir County, an ASAL region, found that the lack of recreational and co-curricular infrastructure in public primary schools undermines the holistic development aims of the Competency-Based Curriculum (CBC), especially among learners in boarding schools.

A majority of headteachers (80%) and teachers (78%) disagreed with the statement that infrastructure in their schools supports the development of core competencies, values, and the infusion of pertinent and contemporary issues (PCIs) as required under the Competency-Based Curriculum (CBC). Only 20% of headteachers and a similar proportion of teachers agreed that existing infrastructure was supportive in this regard. These findings suggest that in many schools, the infrastructural environment remains inadequate for fostering critical components of the CBC, such as collaboration, communication, creativity, citizenship, and digital literacy.

The qualitative data obtained from focus group discussions (FGDs) with learners further confirmed these findings. Pupils indicated that, apart from their participation in the Presidential Music Contest (PMC), no formal clubs had been introduced in their schools. They reported that co-curricular activities

Article DOI: https://doi.org/10.37284/eajes.8.2.3038

such as debates and drama were largely absent, and the only structured activity they participated in was tree planting. Furthermore, they had engaged in very few community service-learning activities, which are essential in developing civic responsibility and social values among learners. One pupil noted:

We have planted trees and cleaned the compound sometimes. But we don't have clubs like debating or drama in our school. We don't do much for the community, and we have not gone for any activities outside the school" (FGD, Grade 6 pupil, 2024).

These findings are supported by Abdullahi and Wako (2023), whose study in Isiolo County, an ASAL region, revealed that most public primary schools lacked the facilities and structured programmes necessary for promoting core competencies and value-based education under CBC. Their study found that co-curricular activities were minimal and poorly supported due to infrastructural constraints, limited staffing, and a lack of teacher training in facilitating values and PCIs through experiential learning.

Hypothesis Testing on the Relationship between Availability of Infrastructure and Some Aspects of Effective Implementation of CBC

The study also tested the null hypothesis to determine the relationship between infrastructure availability and the effective implementation of the Competency-Based Curriculum (CBC) using the Pearson Product-Moment Correlation Coefficient. The hypothesis was stated as follows: **H_{01}**: *There is no significant relationship between infrastructure availability and the effective implementation of CBC in public primary schools in the ward.*
The results of the correlation analysis are presented in Table 3.

Table 3: Hypotheses Testing
Correlations

		Effectiveness of Implementation of CBC
Infrastructure Availability	Pearson Correlation	.623**
	Sig. (2-tailed)	.000
	N	90

**. Correlation is significant at the 0.01 level (2-tailed).

From Table 3, the Pearson correlation coefficient (r = 0.623) indicates a strong positive relationship between infrastructure availability and the effectiveness of CBC implementation. This suggests that as the availability of infrastructure improves, the effectiveness of implementing the Competency-Based Curriculum is also likely to increase. The correlation coefficient of 0.623 reflects a statistically significant and positive linear association between the two variables. The corresponding p-value is 0.000, which is well below the conventional significance thresholds of 0.01 and 0.05. This outcome confirms that the relationship is not due to chance. Therefore, the null hypothesis (H_{01}: There is no significant relationship between infrastructure availability and effective implementation of CBC) is rejected, as the p-value (0.000) is less than the critical value of 0.05, signifying a statistically significant relationship.

These findings are supported by a recent study conducted by Cheruiyot, Mutai, and Langat (2023) in public primary schools in Kericho County, Kenya. Their study reported a Pearson correlation coefficient of r = 0.601 and a p-value of 0.002 between infrastructure adequacy and the implementation of CBC, indicating a similarly strong and statistically significant positive relationship. The researchers concluded that schools with more developed infrastructure were more

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likely to engage learners in activity-based, practical, and competency-driven learning experiences, thereby enhancing the overall effectiveness of CBC delivery. These consistent findings reinforce the importance of adequate school infrastructure as a foundational enabler of successful curriculum reform, particularly in the context of CBC.

CONCLUSION

The study concludes that the availability of infrastructure is a critical determinant in the effective implementation of the Competency-Based Curriculum (CBC) in public primary schools within North Horr Ward. Quantitative and qualitative data consistently revealed significant deficiencies in classrooms, furniture, laboratories, libraries, ICT facilities, sanitation infrastructure, and recreational amenities. These inadequacies were shown to limit the integration of learner-centred and practical activities, hinder the development of core competencies and values, and constrain co-curricular engagement and digital literacy. The hypothesis testing confirmed a strong and statistically significant positive relationship between infrastructure availability and the effectiveness of CBC implementation ($r = .623$, $p < .001$), affirming that well-resourced schools are better positioned to facilitate the holistic, skill-based learning approach envisaged under CBC. These findings align with recent national and regional studies, reinforcing the argument that without adequate infrastructure, the successful delivery of CBC—particularly in marginalised and arid regions—remains severely compromised.

Recommendations.

To ensure adequate infrastructure and the effective implementation of the Competency-Based Curriculum across all public primary schools in the ward, a comprehensive, multi-sectoral approach should be adopted, involving the Ministry of Education, parents, NG-CDF, NGOs, religious organizations, and the local community. Priority should be given to constructing additional classrooms, latrines, desks, and chairs, alongside modern laboratories, workshops, home science rooms, and ICT infrastructure. In rural and underserved locations such as Malabot and Qorqa, where long distances to school discourage enrolment and regular attendance, it is imperative to construct feeder schools and establish well-equipped boarding wings beginning from Grade 4 to accommodate learners from distant areas. A two-in-one school model should also be considered in these pastoralist regions to allow learners to balance education with herding responsibilities. Additionally, in North Horr, where five schools are located within close proximity, a shared, centralized facility comprising a laboratory, ICT well-equipped room, library, and workshop should be established to serve all learners and enhance practical learning. The government is also urged to harness the region's abundant solar energy by installing off-grid solar power solutions in all schools. Furthermore, the construction of a well-equipped CBC Resource and Excellence Centre in the ward should be prioritized to provide teaching and learning materials, act as a model for best practices, and facilitate teacher and pupil visits for educational enrichment. The centre, supported by NGOs, faith-based groups, the NG-CDF, parents, and the wider community, would serve as a hub for borrowing and sharing CBC teaching/ learning resources across the schools. Simultaneously, in-service training for teachers on ICT integration and learner-centred methodologies should be scaled up, while sports and recreational infrastructure should be developed to support holistic learning. Ultimately, these coordinated efforts will not only bridge the infrastructural gap but also promote inclusive, equitable, and effective CBC implementation in the ward.

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