Projection model of teacher requirements for the implementation of CBC in senior schools in Vihiga County, Kenya, in 2026

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ABSTRACT

The purpose of this study was to model projection of teacher requirements for the implementation of the Competency Based Curriculum (CBC) in Senior Schools in Kenya in 2026. The CBC system of 2-6-3-3-3 was launched in 2017 and it faces out the 8-4-4 system. The study was guided by the rational comprehensive (Synoptic) planning theory which allows for the evaluation that consists of procedures such as cost benefit analysis, systems analysis, and forecasting (projection) research. The study adopted a predictive research design. The sample consisted of all 161 principals and all 457 head teachers adopted using a census approach. The population of the study was, MoE County Director of Education from the sampled county, 457 head teachers and 161 principals of the sampled schools. Collection of data was done by means of questionnaires, document analysis. For teacher projections, the Ministry of Education (MoE) Pupil-Teacher Ratio of 45:1 was used. The study followed Thonstad's Grade Transition Model for projecting the CBC enrolment trends of the 2017 Grade one cohort to Junior and eventually Senior School. The study analyzed enrollment statistics from the years 2017 to 2021. The results of this study demonstrated a steady rise in CBC enrollment up until the year 2026. The estimated enrollment in senior high school is expected to rise from 24,361 in 2026 to 26,198 in 2028 in Vihiga County. The results suggest a rise in enrolment which further results in a corresponding increase in the need for teachers. The analysis determined that there will be a deficit of teachers and anticipated insufficiency of necessary facilities as a result of the expected rise in student enrollment at the Senior Secondary level by 2026. The study therefore recommended the need to expand the physical infrastructure, the need for Teachers Service Commission (TSC) to roll out a plan to employ more teachers by 2028. With the findings of this study, the MOE, and TSC may be guided to consider adequate employment of teachers who are CBC compliant. The results of this study would also provide valuable information to policy makers, such as the TSC and Ministry of Education, to develop effective policy reforms that would improve the delivery of high-quality education in Vihiga County.

Keywords: Competency Based Curriculum, Model, Projection, Senior Schools, Teacher Requirements, Vihiga County

I. INTRODUCTION

Education is vital to autonomy, gender equality, economic growth (Gillis et al.., 2001). In Kenya, the development of the education system of colonial 7-4-2-3 to 8-4-4 system around the year 1985 aimed at imparting on the learners self-employment skills. Nevertheless, inefficiencies found during the curriculum reviews of the 90s and early 2000s included content overloading, duplication of subjects and an overwhelming focus on impractical learning (Bwire et al., 2009).

Curriculum rationalization was an effort to curtail workloads and included real life skills, i.e., business education, environmental studies, and civic education. Nevertheless, these reforms failed to help the education system become job-market friendly as it focused more on academic material examinable at the expense of the practical skills. It caused a discongruence between education performance and national development demands (Kenya institute of curriculum Development [KICD], 2017).

The new demands involve globalization and the integration of technology, need of innovation and entrepreneurship, which is being introduced in the 21st century. However, research indicates that Kenyas 8-4-4-curriculum did not impart any technical competence, ICT literate, creativity, and vocational skills in the learners (KICD, 2017). Consequently, high percentages of both secondary school leavers and college graduates are unable to get employment as they lack employable skills to help in economic development.

As a counter measure, Kenya launched the Competency-Based Curriculum (CBC) in the year 2017 as part of the 2-6-3-3-3 system. CBC was set to transform the knowledge conveyed through rote learning, to the use of competencies that deal with the specific needs of learners and supports life-long learning and occurs in line with the global trends in education reform (Amutabi, 2019). The model focuses on flexibility, student-centered practice, and making students develop skills pertinent to the workplace and the society.

In Kenya, implementation of CBC has not been easy even though it has held a lot of promise. Research indicates that there is a lack of proper teacher training among other difficulties to do with an apprehension of pedagogical practice, the lack of resources, and poor infrastructure (Sifuna & Obonyo, 2019). Big classes, lack of access to modern facilities and inadequate teaching material have only further made it difficult to deliver the curriculum effectively especially in the government schools.

Teaching as the key factor in success in curriculum is not ready to implement CBC. We are being told that a small portion of teachers were trained correctly, and numerous educators continue to have issues with the integration of CBC methods in the classrooms. Furthermore, it is predicted that by the time CBC has reached the level of senior secondary school in 2026, the lack of qualified teachers in Kenya might become critical, which endangers both the persistence and the quality of education change.

Consequently, the most burning issue is the gap between the intended aims of CBC and effective practice in its implementation. Although the goal of CBC is to equip learners with self-improvement skills, competence in acquiring and maintaining jobs, and contribution to national growth, poor teacher preparation, lack of infrastructure and resource strains are obstacles to its achievement. This research aimed at modelling estimates of teacher demands in implementing CBC in Senior Secondary schools in Kenya.

1.1 Statement of the Problem

In 2017 Kenya changed the 8-4-4 system, which was largely examination-centred, to Competency-Based Curriculum (CBC). This reform was set out to enhance a more inclusive and student-centered education to be in line with the international trends where a lot of emphasis is being placed on 21st century skills namely being a critical thinker, creative, collaborative and a lifelong learner. Although the CBC has much potential to transform education, its implementation has suffered setbacks such as inappropriate training of teachers, poorly trained teachers, shortage of teachers, inappropriate teacher/learner ratio, inadequate resources and infrastructure as well as lack of parental support. Previous research indicates that these problems are not peculiar to Kenya. Indeed, United Nations Educational, Scientific and Cultural Organization [UNESCO] (2019) reported that in some African nations, such as Rwanda and Uganda, carrying out competency-based reforms faced a setback in teacher preparation and building infrastructure, slowing down the results. Along the same line, Kafyulilo and Fisser (2019) noted that in Tanzania, teachers were not ready to assume their role of facilitators because they lacked pedagogical and curriculum design training. These analyses show that teacher capacity is identified as an ongoing caveat to the achievement of competency-based reforms.

In the Kenyan level, research has made inroads in recording the challenges. According to Oduor (2021), most of the teachers in primary and junior secondary schools stated that they received poor training to deliver CBC effectively and as a result, they lack confidence in the delivery of the curriculum. According to a study by Wasanga and Wambua (2022), unfavorable teacher to student ratios, mostly among the rural counties worsened the objective of individualized learning that CBC positioned as a philosophy. Similarly, in a report compiled by the World Bank (2022), it was stated that despite the potentiality of CBC, the absence of proper facilities, diminished instructional resources, and less parental involvement remain as the key factors that negatively impact the implementation process.

Nonetheless, there are serious gaps in the research. Studies have paid more attention to the initial years of implementation (pre-primary, primary and lower secondary) and on broad issues like training and resources. Not many have conducted a systematic modelling or projections of teacher needs at senior secondary schools, and this is a critical threshold where the learner becomes specialized and therefore the need of subject area specific expertise becomes critical. Besides, whereas global research has shown that long term capacity planning is vital in teacher supply and career development (Darling-Hammond et al., 2020), Kenyan research has not made any empirical projections that can be used to inform policy and resource allocation in the implementation of seniors secondary CBC. To address this issue therefore, this study will model projection of teacher needs on application of the CBC in senior secondary schools in Kenya, hence, making a contribution to evidence-based planning on sustainable curriculum reform.

1.2 Research Objective

To model projections of teacher requirements for the implementation of the CBC in Senior Secondary Schools in Kenya.

1.3 Research Question

What is the projection of teacher requirements for the implementation of CBC in Senior Secondary Schools in Kenya?

II. LITERATURE REVIEW

2.1 Theoretical Review

This research made use of the rational comprehensive (Synoptic) planning theory set forth by Faludi and Needham in 1973. Because the other major planning methods are based on the four steps of the rational comprehensive theory which include (1) objectives setting, (2) policy alternatives identification, (3) determining means relative to ends,

and (4) implementing of policy, it has been adopted as a de facto standard (Chapin & Kaiser, 1979). There can be several iterations, feedback loop, further elaboration of sub-process in this planning process. Such theories allow one to carry out the evaluations through tools such as cost-benefit analysis systems, operations research, operations and forecasting and research. Rational planning forecasting models are of two types: deterministic, which is based on econometric modeling and multiple regression analysis and trend extrapolation, and probability envelopes and contingency models that consider possible changes in the expected patterns. Moreover, the common approach adopted by comprehensive planning theory is systems based in which mathematical or conceptual models are utilized to connect goals and the available resources and constraints; mathematical information and quantitative studies and analysis are highly valued (Hall, 2002). Note, it is an algorithm, a set of rules to tackle some type of issue. The quantitative methods enable it to give optimal results in most instances. This methodology is commonly applied to operations research, trend prediction, linear planning as well as input-output work. Rational comprehensive planning theory that attempts to form a systematic structure of analytical and objective criteria of decision making was thus implemented in this paper. This scientific theory is very flexible in terms of its adjustability to various operating environments and its potential to deal with an exceptional number of issues. Likewise, the theory has an internally consistent and self-reinforced system of both methodologies and data requirements. The theory advocates holistic planning that takes into consideration every element without restraining the level of planning whatsoever. It allows making long-range plans of an entire education system of a country which normally runs more than five years. This entails the employment of a trend extrapolation and quantified analysis. In the specific research, it is applicable since it is being applied to the projection of the implementation of the CBC at Senior Secondary Schools in the year 2026.

The theory would fit this study because the theory concentrates on the forecasts of enrolments, teachers, text books, classrooms that could assist in implementing a new curriculum successfully in the Senior Secondary Schools in the year 2026.

2.2. Empirical Review

The role of a teacher is central to the education in any country, and it is not a farfetched idea to attribute great importance to teacher involvement regarding student achievement (Hanushek et al., 1998). Research on curriculum reforms, such as the Competency-Based Curriculum (CBC), unanimously highlights that success is conditional upon teacher preparation, training and implementation (Zeiger, 2018). Even at that, teacher shortage and proficiency gaps still plague most of the countries threatening to cut across curriculum reforms (Santiago, 2002; Sinyolo, 2007).

The experience of Kenya is that the teachers who introduce CBC lack pedagogical knowledge, ICT skills, and interpretation capacity of the curriculum (Munyao et al., 2023; Waweru, 2018; Okeyo & Mokua, 2023). Weaknesses in the teacher participation in curriculum design have not helped in providing effective implementation as well (Muchira et al., 2023). Similar results are produced by other African settings, including Tanzania and Zimbabwe whose inadequate training, availability of resources, and teacher participation spoiled the enactment of CBC (Makunga, 2016; Muneja, 2015; Zhuwale & Shumba, 2017). The same scenario played out in Rwanda and South Korea where teachers did not embrace new changes, or growth under the CBC methodologies because of poor professional growth and support structures (Urunana, 2018; Choi, 2018).

There is evidence that, to implement CBC, there must be long-term teacher training, curriculum design in collaboration with the teachers, and institutional backing. The best practices in the world, i.e., teacher-led action research in South Korea and Teacher Resource Centres in Rwanda, have shown that when engaged in curriculum development and maintaining professional goals on a continuous basis through self-efficacy, teachers become creative and student-centered (So et al., 2017; Urunana, 2018). Nonetheless, in Kenya, there is still a form of grave shortage in teachers, especially in science and mathematics disciplines, and the lack of an equal distribution of teachers as well as poor deployment structures are also into the mix (MoE, 2018).

Comprehensively, teachers have been universally recognized as critical and this has already been evidenced despite the fact that empirical research indicates that eminent issues have been used, which are common to the success of CBC, namely, poor training, a poor supply of teaching materials, and teaching staff shortages, and low participation in curriculum reform. Despite the government of Kenya's efforts, such as the Teacher Education Curriculum Framework (Ministry of Education [MoE], 2019), there are gaps in the provision of 21st-century pedagogical skills to teaching professionals as well as in personnel distribution. Such constraints highlight the need for specialized study on teacher preparedness for CBC at the senior secondary level, which will be implemented in 2026.

III. METHODOLOGY

3.1 Research Design

The research utilized a predictive design methodology. In predictive research design, the investigator must explicitly state that the objective of the investigation is to ascertain the predictive capacity of a specific variable (Pandita, 2012). Consequently, this design necessitates that the researcher possesses both a predictor variable and a criterion

variable. This design holds considerable importance in research endeavors focused on predicting a specific phenomenon. Predictive research design focuses on predicting future outcomes or trends based on prevailing data and patterns. It aims to anticipate what will happen rather than simply describing what has already occurred. This approach utilises various techniques, including statistical modelling and machine learning, to identify relationships between variables and project future events. The research design applied in this study is predictive research design which involves a study of the past configurations, survey, and related information to find patterns and develop statistical models applicable in the prediction. The four fundamental categories of information that would be used to draw projections in education planning are including the school-age population, the current enrolment information, ratios formed with reference to the aforementioned information and administrative policies that determine the participation of students (Mehta, 1994). The first would be to estimate future school age population and enrollment, on which the demand of teachers, classrooms, textbooks, finances and other schooling resources will be based.

To obtain correct forecasting is indispensable since there is a mutual dependence between population and educational development, where the fluctuations in the demography influence education and vice versa, education influences demographic patterns of growth and population distribution (Ahmed, 2000). Projections are especially vital in this respect to reveal the prospective enrollment demands and required resources that will be put in place to implement the Competency-Based Curriculum (CBC) in senior secondary schools in Kenya by the year 2026.

3.2. The Location of the Study

The research was implemented in Vihiga County, Kenya, chosen among some random sample of four populous counties i.e. Nairobi, Mombasa, Kiambu, and Vihiga. Vihiga County is one of the counties created by the 2010 Constitution that holds a population of 554,622 at the 2019 Census with population density of 1,045 inhabitants per square kilometre, as the third most populous county after Nairobi and Mombasa. It is highly populated, which has burdened the natural and social resources such as land, forests, wetlands, or even education infrastructure and thus planning is seen as unavoidable when it comes to ensuring successful implementation of the Competency-Based Curriculum (CBC).

The 2019 Kenya Population and Housing Census has indicated that the levels of poverty in Vihiga are at 39 percent, which is below the national level that is pegged at 45 percent. This restricts the contribution of the stakeholders in teaching and learning facilities and the problems related to poverty are a threat to enrolment despite the efforts the government have provided like Free Primary Education and Subsidized Secondary Education. In terms of its geographical location, Vihiga County is located bordering Kakamega, Nandi, Kisumu and Siaya counties with an annual rainfall of 1,800-2,000 and average temperature is 24C. The county has 457 primary schools and 150 secondary schools and 39,413 enrolled students in total (Government of Kenya [GoK], 2019; County Government of Vihiga, 2018).

3.3. Target Population

This study targeted all primary schools because they released pupils for Junior Secondary Schools who will there after transit to Senior Secondary Schools. Secondary schools were also targeted in this study as they will receive students for Junior and Senior Secondary education under CBC. The population of the study was, MoE County Director of Education from the sampled county, 457 head teachers and 161 principals of the sampled schools.
This study targeted all primary schools which released pupils to Junior Secondary and eventually Senior Secondary Schools education under the new curriculum.

3.4 Sampling Techniques and Sample Size

Sampling involves making of conclusions about an entire population using a subset of the population (Orodho 2004). The sample consisted of all 161 principals and all 457 head teachers adopted using a census approach. The schools were categorised into various categories basing on their characteristics. That is boarding girls, boys or mixed, day girls, boys or mixed, both day and boarding boys, girls or mixed.

3.6 Research Instruments

Questionnaires, document analysis and direct observation were the main research instruments determined and tied to the study methodology. These methods were used to get data from key respondents in order to model projections of the enrolment and requirements for Senior Secondary Schools for the implementation of CBC in Kenya.

3.7 Validity of Research Instruments

The researcher established the content validity of the instruments by engaging in talks with university supervisors, department lecturers, and coworkers to evaluate the items included in the instruments. In addition, the study enlisted the assistance of independent educational researchers and 35 specialists in instrumentation to evaluate the accuracy and reliability of the data collection instruments. Subsequently, the researcher utilized the provided guidance

to make necessary modifications and rectifications to the instruments in order to mitigate any potential validity limitations.

3.8 Reliability of Research Instruments

A preliminary study was conducted in five schools within a certain sub-county to enhance the reliability of the instruments. Repeated administrations to the same sample of people allow researchers to gauge the reliability of a study tool (Mugenda & Mugenda, 2003). A week after the first administration, the second one happened. To check for consistency and reliability, we linked the two tests' scores using Pearson's product moment correlation. At the 0.05 level of significance, the Pearson's correlation coefficient for the two sets of data was0.00, indicating that the data were reliable.

3.10 Data collection

The researcher first applied for permission from the National Council of Science and Technology to conduct study, as well as from the County Commissioner and the County Education office in the Counties that were sampled. The researcher conducted site visits to the selected schools and secured authorization from the school officials to gather data.

3.11 Methods of Data Analysis

The study estimated enrolment of CBC cohorts through to 2028, based on the methods of Gould (1993) and Thonstad (1981). There are three ways that Gould describes to project enrolment: the current average historical retention rate, the current recent retention rate, and weight averaging to smoothen seasonal variation. The second method was used by the researcher, whereby, emphasis is laid on recent retention patterns that were characterized by an increased in-transfers into the county.

In a projected implementation, Thonstad Grade Transition Model which is widely used in conducting projections of primary education was applied. A flow table of CBC cohorts was prepared to follow transitioning through grades. The Teacher Student Ratio (TSR) approach that is suggested by MoE (2012) was then used to estimate teacher requirements assuming the projected enrolment. In this strategy, the size of the classes, number of hours spent per week in instruction and the work load of teachers were considered (Mehta, 2004). Under the Basic Education Curriculum Framework, the lesson of the study was calculated per subject and thereafter per school, sub-county and finally Vihiga County teachers needed. The following formulae was used:

$$T=E/R$$

Where:

T = Number of Teachers required

E = Projected enrolment

R = Average number of students per teacher or size of average class

IV. FINDINGS & DISCUSSION

4.1. Projection Model of Teacher Requirements for the Implementation of the CBC in Senior Secondary Schools in Kenya

The sustainability of key educational resource requirements, such as having enough well-trained teachers, is crucial for ensuring excellent education. Without this, the implementation of the CBC in Kenya, which aims to provide quality education as envisioned in Vision 2030, may face obstacles. Cheptoo and Ramdas (2018), discovered that instructors encountered significant resource limitations and struggled to adapt to big class sizes when implementing the new learner-centered CBC approaches. This occurred during the implementation of CBC (Competency-Based Curriculum) in Kenya in 2017. Given that the 8-4-4 system of education in secondary schools will be running alongside the 2-6-6-3 system, it is crucial to anticipate the projected enrollment and adequately plan for a sufficient number of teachers well in advance. This proactive approach is necessary to prevent a last-minute scramble that could compromise the provision of high-quality education. By the year 2027, the final group of students under the 8-4-4 education system will be completing their secondary education, allowing for the complete adoption of the CBC at both junior and senior secondary levels. The study relied on the Grade Transition model. The Grade Transition Model (GTM) by Thonstad is based on the assumptions that the enrolment in the next grade level is estimated by the procedure that helps to track the survival rate, promotion, and the transition rate of learners whilst in the school system (Thonstad, 1978). The model is very applicable to CBC that appreciates progressive learning in the stages of primary school, junior high school, and senior high school. The model also allows future enrolment projections to absorb foreseen enrolment gains taking into consideration transition rates, dropout rates, and grade-level retention, thus providing a more realistic future of education demands. Table 1 displays the anticipated total enrollment of students in Junior and Senior Secondary Schools in Vihiga County for the CBC program.

Table 1

Vihiga County's Grade Transition Model for Projecting Enrolment, 2017-2026

Year / Category	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Enrolment 2017	17,990	—	—	—	2022	2023	2024	2025	2026	2027	2028	—
Enrolment 2018	18,190	18,340	—	—	—	—	—	—	—	—	—	—
Enrolment 2019	18,452	18,718	18,749	—	—	—	—	—	—	—	—	—
Enrolment 2020	18,146	18,689	19,534	19,588	—	—	—	—	—	—	—	—
Enrolment 2021	17,345	18,593	19,429	19,882	20,313	—	—	—	—	97,583	—	—
Projected 2022	17,461	18,703	19,051	20,198	20,236	21,065	—	—	—	—	—	—
Projected 2023	—	—	18,740	20,167	19,520	20,998	20,597	21,844	—	—	—	—
Projected 2024	—	—	—	20,113	21,746	20,001	21,829	20,964	22,653	—	—	—
Projected 2025	—	—	—	—	21,586	23,449	20,494	22,694	21,337	23,491	—	—
Projected 2026	—	—	—	—	—	23,167	25,285	20,999	23,592	21,717	24,361	115,954
Projected 2027	—	—	—	—	—	—	24,864	27,264	21,516	24,527	22,104	25,263
Projected 2028	—	—	—	—	—	—	—	26,685	29,399	22,046	25,498	22,498
Teachers Required (2028)	—	—	—	—	—	—	—	—	—	—	—	3,384.98
Proportion	1.0732	1.0783	1.0246	1.0396	1.0178	1.0370	—	—	—	—	—	—
Proportion	1.073248955	1.078293456	1.024633528	1.039595484	1.017815092	1.037012457						

Step1 Get proportions for the enrolment in 2021 divided by the enrolment in 2020.
Step2 Apply the proportions to project the enrolment in t+1, i…n.
step 3 G2 2022 projected using excel forecast 18340, 18718, 18686, 18593 to get 18703

Based on the 2017 Grade One CBC cohort in Vihiga County, the GTM reveals that there is an upward trend in the enrolment over the years at both Junior and Senior Secondary level. It is projected that the enrolment figures of Junior Secondary will rise up to 23,491 in the year 2025 starting with the number 21,844 of the year 2023 with a growth of 7.54%. Just as it is evident in the case of Senior secondary education, the enrolment in 2028 is projected to increase to 26,198 as compared to 24,361 in 2026; a growth of 7.54 percent. In general, 152,324 students will attend schools in junior and senior secondary by 2028.

According to the GTM, there should be a parallel growth in teaching personnel based on this growth of the enrolment of students. The county will basically need 3,385 teachers in 2028 with a teacher–student ratio (PTR) of 45:1. At present, nevertheless, there are not sufficient teachers which deliver instruction in Vihiga, as the latter teach the former 872 teachers who correspond to 26 percent. This deficiency will end up worsening the quality of teaching and learning without the necessary interventions, which is consistent with Maina and Ojobo (2020). opinion that high PTRs in new secondary schools hampered the capacity of teachers to supervise learners and that consequently, there was a negative impact on academic performance.

The total number of students enrolled in Junior and Senior Secondary School will be 152,324. The rise in school enrolment should be accompanied by a corresponding increase in the allocation of teaching resources. With 152324 learners and a PTR of 45:1, we will need 152324/45=3384.9778 rounded off to 3385 teachers. At now, there are 2513 teachers available to teach at secondary schools in the county. However, there is a shortage of 872 instructors to adequately instruct the predicted 152324 students. This calculation assumes that the county will retain its current teaching staff employed by the instructors Service Commission. The current deficit stands at 26 percent. The current number of teachers in secondary schools in Vihiga County is 2513, which accounts for 74% of the total number of teachers needed by 2028. Nevertheless, it is imperative to establish mechanisms to tackle the existing scarcity of teachers

in order to prevent any adverse impact on the educational standards of both the 8-4-4 and the 2-6-6-3 school systems. The Teachers' Service Commission should deploy primary school teachers who meet the qualifications for teaching in secondary schools in a systematic manner, in order to address the teacher shortage and manage the transition crisis in Junior Secondary Schools. It is advisable to carry out this deployment in phases and also recruit additional intern teachers on a temporary basis.

According to Maina and Ojobo (2020), the student-teacher ratio at newly established secondary schools was seen to be excessively high, which hinders effective teaching and learning. The ability of teachers to supervise individual learners was constrained, and it was seen that schools with a significantly high student-teacher ratio exhibited low performance due to the overwhelming number of learners that teachers had to handle.

This aligns with a study by Sitenei (2020) that examined the impact of school-based factors on the implementation of CBC in primary schools within Kibera Sub-County, Kenya. The results indicated that a significant proportion of Teachers (81.6%) participated in a one-week training program, whereas a smaller segment (18.4%) engaged in a two-week training course. This suggests that a significant number of Teachers had not been sufficiently trained in the new curriculum. Moreover, it has been indicated that the duration provided was insufficient for the CBC lessons, particularly in light of the substantial class sizes. Reports indicate that a significant number of schools in Kibra Sub-County are either lacking or possess insufficient materials necessary for the effective implementation of the curriculum. Moreover, the results substantiated that the public primary schools in Kibra were significantly overcrowded. The classes were so densely populated that it necessitated some students to engage in their studies from outside, particularly during practical subjects that demanded demonstration. This was, in a manner, influencing the successful execution of the curriculum. The teacher-pupil ratio of 1:80 was exceedingly high, thereby placing considerable strain on the teachers' ability to manage pupil discipline, facilitate teaching and learning, and implement effective teaching methodologies. The research underscored several obstacles impacting the execution of CBC; however, it concentrated solely on the lower primary grades. Consequently, it is essential to engage in forward-thinking as the execution of CBC at Senior School approaches.

The study conducted by Wambiya and Ogula (2023) regarding the efficacy of CBC adoption and implementation in primary schools across East African Community Countries was underpinned by a grounded theory design, alongside a document analysis technique for data collection. The research concluded that the CBC serves as a suitable educational framework for the member states of the East African Community. The excessive workload faced by teachers is a direct result of understaffing in conjunction with overcrowded classrooms. The workload of Teachers is substantial, and this challenge is exacerbated by a lack of adequate staffing. Teachers exhibit a critical disposition towards the Competency-Based Curriculum. The implications of these findings suggest that governments should consider increasing the hiring of Teachers, enhancing infrastructure, and placing greater emphasis on refresher courses and ongoing professional development for teachers, alongside continuous support mechanisms.

This is in line with what Maina and Ojobo (2020) discovered when she examined the data and discovered that 60% of the schools had a student-teacher ratio higher than 45 students per instructor. This exceeds the 40:1 ratio that UNESCO has recommended for developing nations, as cited in Okigbo and Osuafor (2008). According to the research, newly constructed secondary schools in Mathira Constituency have an extremely high student-teacher ratio, which makes it difficult for students to learn effectively. In wealthy nations, the student-teacher ratio is 29 according to the UN, but in 42 developing nations, it is 40. This disparity was highlighted in the study. Regardless, the majority of the schools had a high student-teacher ratio, according to the statistics.

In addition, Mogere and Mbatanu (2023) on determinants of CBC Implementation in selected Public Primary Schools in Nairobi City County, Kenya adopted descriptive survey study design in which 35 public primary schools in the aforementioned County of Kenya were studied. The study established that implementation of CBC is impacted by teacher training and schools' leadership style and that better communication and collaboration practices bear on its effective operationalization.

According to Okigbo and Osuafor (2008), schools that have a large number of students per teacher tend to have lower academic performance because teachers are unable to effectively handle the high number of students. Akinsolu (2010) employed ANOVA and Spearman's correlation analysis to demonstrate a strong association between instructors' experience, teacher-student ratio, and students' academic achievement.

Based on the GoK (2007) report, there has been a consistent rise in student enrollment in secondary schools. The number of pupils increased from 618,500 in 1990 to 1,180,300 in 2007, representing a growth of 90.8%. The number of secondary schools experienced a significant increase from 2,557 in 1990 to 4,236 in 2007, representing a growth rate of 65.7%. Nevertheless, the number of secondary school teachers experienced a growth rate of only 58 percent, rising from 28,056 in 1990 to 44,305 in 2007. The disparity between the growth rates of teachers, schools, and student enrollment could have a detrimental impact on the quality of education in public secondary schools during the implementation of the CBC system. Masika (2023) on CBC implementation: Assessing Kenya's Readiness adopts literature review design in the study. The researcher is conscious of the fact that demographic factors of swelling class enrollment and a gap in teaching force and pedagogical gaps on the practicing teachers.

Ogembo (2025) employed mixed methods to investigate teachers' perceptions on the implementation of the CBC in Kenya. Fifty-three Teachers were sampled for the study, and a five-point Likert Scale questionnaire was developed and employed to gather the data. The acquired data were subjected to thematic analysis. Both deductive and inductive coding methodologies were employed. The Teachers indicated that the professional development program adequately equipped them for the implementation of the CBC in classroom settings. Teachers were assessed objectively, and the majority did not meet the minimal quality levels satisfactorily. The findings indicated that although sufficient published curricular materials existed to support teaching and learning, the quality of the textbooks was lacking. The study identified a deficiency in physical and ICT infrastructure, as well as laboratories, necessary to facilitate teaching and learning activities. The limited number of teachers resulted in substantial workloads, affecting service delivery. Parental support was also lacking. Teachers expressed contentment with collegial support. However, assistance from the Teachers Service Commission and the teachers' union was inadequate. These findings have implications for stakeholder engagement aimed at enhancing CBC implementation. The Ministry of Education and associated parastatals should develop and disseminate pertinent published curricular materials, as well as organize teacher refresher programs and ongoing professional development support to improve curriculum theory and practice (Ogembo, 2025).

These findings align with those published by Waweru (2018), who conducted research assessing the degree of training received by lower primary school teachers for implementing the CBC in Nyandarua North Sub-county, Kenya. The results indicated that 98.8% of the teachers lacked training to implement the curriculum, particularly in the new learning areas. In a similar vein, Waweru, (2018) investigated the degree of training obtained by primary school teachers in the implementation of the CBC and found that the majority had not undergone any training about the new curriculum. Moreover, the results align with those of Abdullahi (2019), who examined the school characteristics affecting the adoption of CBC in preschools in Garissa Sub-County, Kenya. The study determined that a majority (68%) of instructors in public schools had not participated in any training on the implementation of the new curriculum.

Furthermore, these results align with the conclusions of Molapo (2018), which aimed to determine the implementation of the new curriculum by grade 3 teachers in Limpopo primary schools in South Africa. The study indicated that most grade three instructors lacked the necessary skills and expertise for effective curriculum implementation, which impeded the process. Furthermore, the results align with the findings of Kanyonga et al.., (2019), who indicated that most trainers possessed limited knowledge and skills in integrating the fundamental elements of the curriculum in Arusha, Tanzania. Furthermore, Makunja's (2016) study on the adoption of CBC to enhance the quality of secondary education in Tanzania revealed that teachers, as primary implementers, lacked the requisite knowledge and skills for effective curriculum implementation. The study recommended that the government undertake immediate and regular in-service training for teachers to equip them with the necessary competencies for efficient and effective CBC implementation. The substantial proportion of pre-primary school teachers untrained in CBC indicates that most Teachers lack the knowledge and abilities for effective curriculum implementation. Consequently, obstructing the successful execution of the Curriculum in public pre-primary schools will likewise impede its implementation at the Senior Secondary School level.

Waweru (2018) indicated that a majority (72.8%) of the teachers participated in half-day training, thereby deriving less advantage from the experience. He similarly observed that numerous teachers received insufficient training, which was conducted only once, thereby providing them with a suboptimal experience. A case study by Kisirkoi and Kamanga (2018) in Narok County revealed that all 15 instructors (100%) had not received ongoing training on the CBC, resulting in insufficient comprehension of curricular implementation. Insufficient training has been recognized as the primary factor affecting the implementation of the CBC, as noted by Handwe and Mpofu (2017), who examined teacher readiness to execute a newly established grade three curriculum in Zimbabwe. The results indicated that the implementation process failed due to insufficient training for teachers, which did not adequately meet their demands for efficient curriculum implementation. Consequently, the absence of regular in-service training on CBC will result in a deficiency of instructors possessing sufficient knowledge of the curriculum and pedagogical methods. The implementation of CBC in Senior Secondary Schools would encounter difficulties due to the limited number of teachers who have not participated in the training workshops.

Isaboke et al. (2021) assert that concerning instructors' capacity to formulate lesson plans, a majority, 18 (60.0%), of the trained individuals reported that they can independently create lesson plans that adhere to the CBC standards without assistance. Nonetheless, a majority of 31 (53.4%) teachers who had not undergone any training on CBC reported challenges in generating lesson plans that adhered to the curriculum, even receiving assistance. The majority of instructors trained in CBC exhibited superior lesson preparation skills compared to their untrained counterparts. This indicates that the training was beneficial to the Teachers. They additionally observed that the substantial quantity of pre-primary school instructors lacking training will adversely impact the implementation procedure. Jeng'ere (2017) elucidates that the production of reflective lesson plans is essential for the proper implementation of CBC. The findings are corroborated by Waweru's (2018) study on the training of lower primary school teachers to apply the CBC in Nyandarua North Sub-county, Kenya, which revealed that 95% of these teachers found it impossible to prepare CBC lesson plans. Komba and Kira (2015) examined the challenges associated with the

implementation of CBC in secondary schools in Tanzania. The study's findings revealed that the majority (86%) of teachers possessed insufficient knowledge of the curriculum. Moreover, the majority (78%) of the analyzed lesson plans failed to exhibit the characteristics of a competence-based lesson plan. Consequently, all Teachers in public pre-primary institutions must get training on the formulation and implementation of lesson plans that encompass all components delineated in the curriculum designs.

This finding aligns with Mandukwini (2016), who investigated the challenges of curriculum implementation in high schools within the Mount Fletcher district, Eastern Cape. It was determined that while teachers endeavor to fulfill their roles and responsibilities to facilitate effective curriculum implementation, they still necessitate training in developing learning outcomes and assessing the achievement of established objectives at the conclusion of lessons. The results align with Kangori (2014), who examined the impact of in-service training and professional development for preschool teachers on the implementation of the scientific curriculum in Nairobi City County. The research demonstrated that teacher in-service training and professional development impacted their classroom delivery capabilities. Consequently, the County Government of Vihiga must facilitate ongoing training and professional development for pre-primary, primary, junior secondary, and senior secondary school Teachers via in-service training programs; this initiative will enable teachers to gain expertise in managing diverse elements of the Curriculum.

Moreover, the results align with those published by Zhuwale and Shumba (2017), who examined teacher-related issues that obstructed the effective implementation of the curriculum in rural schools in Zimbabwe. The study indicated that teachers' insufficient pedagogical understanding about the integration of curricular elements into instruction was the primary obstacle impeding curriculum implementation. The report advocated for extensive training of Teachers on the curriculum. The findings corroborate those of Kanyonga et al. (2019), who investigated the implementation of core features of CBC by technical trainers in Arusha, Tanzania. The survey determined that most trainers had undergone in-service training but possessed limited comprehension of the curriculum and lacked expertise and abilities in integrating its main components. The study's findings indicate that, despite a projected shortage of teachers at the senior secondary level in 2026, both trained and untrained teachers necessitate ongoing in-service training to enhance their ability to integrate core competencies into instruction. Consequently, continual training for public school teachers on the implementation of the fundamental components of the CBC is essential.

Ndayambaje et al. (2021) identified the problems encountered in the implementation of the Competency Based Curriculum in Rwandan schools. The report found that although all primary school teachers received training on curriculum implementation, some were opposing change. Consequently, they persisted in utilizing the outdated instructional materials and techniques. Ndayambaje (2018) identified the insufficiency of teaching-learning materials as a significant obstacle to the effective implementation of CBC in Rwanda. This indicates that providing sufficient educational materials and ongoing teacher training to alter their perceptions of the CBC is crucial for its implementation.

Research by Makunja (2016) examined the problems encountered by teachers in the implementation of the Competency Based Curriculum in Tanzania. The study determined that Teachers encountered numerous problems that hindered the successful application of the curriculum in teaching and learning. The study identified insufficient in-service training for teachers on CBC, inadequate teaching materials, overcrowded classrooms, and low student capability as the primary obstacles to effective curriculum implementation in Tanzania. Based on the findings, the study advised that Teachers be permitted to engage in curriculum development. The report recommended that the Ministry of Education develop methods for supplying teaching materials aligned with the CBC. This indicates that the training of teachers in curriculum implementation, the provision of instructional resources, and the availability of sufficient classrooms are essential for the effective execution of the CBC as we approach its adoption at the Senior School level.

The existing teacher deficit in Kenyan elementary schools is 37,643, whilst in secondary schools it is 49,750 (Wanzala, 2019). The CBC mandates a minimum of three Teachers per class for successful execution. There is a necessity to recruit additional Teachers to efficiently execute the CBC. Therefore, in planning for the allocation of teacher resources in Vihiga County, it is essential to acknowledge that the enrollment of students in secondary schools is anticipated to rise by 19.9% from 2023 to 2028.

V. CONCLUSION & RECOMMENDATIONS

5.1. Conclusion

The suggested PTR for Vihiga area Junior and Senior Secondary Schools is 45:1, which means that by 2028, 3,385, teachers will be needed to manage the many pathways of the 2-6-6-3 system of education and improve the quality of education provided in the area. By 2030, there would be a deficit of 872 teachers in Junior and Senior Secondary Schools in Vihiga County if the current number of teachers is maintained.

5.2 Recommendations

The analysis clearly indicated that secondary schools in Vihiga County will require additional instructors, classrooms, boarding facilities, technological facilities, and restrooms in order to accommodate the projected increase

in student enrollment by 2026. In order to accommodate the expected rise in enrollment at the Senior School in 2026, it is recommended that additional Constituency Development Funds be granted to the existing day secondary schools in Vihiga County to enhance their instructional facilities. The capacity of teachers at all levels needs to be improved and also begin sensitizing instructors in tertiary institutions and lecturers in universities on CBC.

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