MATHEMATICS TEACHERS' PERCEPTIONS OF THE IMPLEMENTATION OF COMPETENCY-BASED CURRICULUM: A CASE STUDY OF MANICALAND PROVINCE, ZIMBABWE

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APPROVAL OF THE THESIS

MATHEMATICS TEACHERS' PERCEPTIONS OF THE IMPLEMENTATION OF COMPETENCY-BASED CURRICULUM: A CASE STUDY OF MANICALAND PROVINCE, ZIMBABWE

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ABSTRACT

MATHEMATICS TEACHERS' PERCEPTIONS OF THE IMPLEMENTATION OF COMPETENCY-BASED CURRICULUM: A CASE STUDY OF MANICALAND PROVINCE, ZIMBABWE

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The implementation of the competency-based curriculum (CBC) in Zimbabwe aims to transition mathematics education from a primarily content-focused approach to one that emphasizes practical skills, problem-solving, and critical thinking. Despite this shift, questions persist about the degree to which mathematics teachers comprehend and effectively apply CBC in classroom settings. This study examined mathematics teachers' perceptions of CBC implementation in secondary schools in Manicaland Province, Zimbabwe, with particular attention to teachers' understanding of CBC, the extent of its implementation, challenges faced, and strategies for enhancing implementation.

A pragmatic research paradigm guided the study, which employed an exploratory-explanatory case study design and a convergent parallel mixed-methods approach. Data collection involved questionnaires, semi-structured interviews, and focus group discussions with 140 participants, including mathematics teachers, school administrators, and inspectors. Quantitative data were analyzed using SPSS, and qualitative data were transcribed and subjected to thematic analysis. The questionnaire exhibited acceptable internal consistency (Cronbach's $\alpha = 0.82$). Triangulation, member checking, and peer review enhanced the credibility of the qualitative findings.

The findings revealed that while most mathematics teachers understood the core principles of CBC, effectively applying this knowledge in classroom practice remained challenging. Seventy-five percent of participants demonstrated a strong understanding of CBC, 15% had partial knowledge, and 10% lacked understanding. Teaching experience was significantly associated with CBC comprehension ($\chi^2 = 12.1$, $p < 0.01$). In terms of implementation, 55% of participants reported positive implementation, with higher adoption rates in urban schools compared to rural ones. Regression analysis showed that training and resource availability accounted for 65% of the variation in teacher confidence regarding CBC implementation ($R^2 = 0.65$). Key challenges included insufficient training and resources, large class sizes, assessment difficulties, limited access to technology, and resistance to change. Training gaps and infrastructure deficits explained 70% of the reported implementation challenges ($R^2 = 0.70$). The most effective strategies identified for addressing these challenges were increased funding ($M = 5.16$), provision of authentic assessment tools ($M = 4.78$), and stakeholder engagement ($M = 4.38$).

The study concludes that, although mathematics teachers generally understand the principles of CBC, effective classroom implementation is hindered by professional, institutional, resource, and assessment-related challenges. This research contributes to the literature by offering Zimbabwe-specific empirical evidence on mathematics teachers' perceptions and implementation of CBC. Additionally, it integrates the Concern-Based Adoption Model (CBAM) with Reimers' Five-Frame Theory to elucidate the relationship between teachers' concerns and the structural conditions influencing curriculum implementation. This integrated approach provides a multi-level explanation of the varying stages of teacher concern and curriculum use. It presents an evidence-based framework for enhancing teacher preparation, institutional support, assessment alignment, and sustainable CBC implementation in mathematics education.

DECLARATION

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgment, the work presented is entirely my own.

AI ACKNOWLEDGMENT

Use of AI

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DEDICATION

This thesis is dedicated to my beloved family, whose unwavering love, patience, and support have been the foundation of my journey. To my spouse, thank you for your constant encouragement, understanding, and belief in my dreams even during the most demanding times of this study. To my children, your laughter and curiosity have been my greatest motivation and reminder of why education matters so deeply.

I also dedicate this work to my parents, who instilled in me the values of hard work, perseverance, and faith. Your sacrifices and guidance have shaped the person I am today, and this accomplishment is as much yours as mine. Your belief in the power of education has been the light that guided my path.

Lastly, I dedicate this research to all the teachers of Manicaland Province and beyond who continue to shape young minds under challenging circumstances. Your dedication and passion for teaching inspire change and progress in our education system. This work is a tribute to your commitment to nurturing learners through the competency-based curriculum and your tireless efforts to make learning meaningful and impactful.

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LIST OF ABBREVIATIONS

CBAM Concern-Based Adoption Model

CBC Competence-Based Curriculum

CBE Competence-Based Education

FGD Focus Group Discussions

KBC Knowledge-Based Curriculum

MoPSE Ministry of Primary and Secondary Education

OBC Outcome-Based Curriculum

PCIET Presidential Commission of Inquiry into Education and Training (PCIET)

ZCF Zimbabwe Curriculum Framework

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CHAPTER 1: INTRODUCTION

INTRODUCTION

This chapter offers an overview of the research investigation and establishes the foundation for the study. It introduces the context, purpose, and scope of the research, thereby clarifying the basis for the research. The chapter commences with a background of the study, outlining the rationale by situating the research within broader academic and practical contexts. This section identifies key issues, trends, and gaps in existing knowledge that justify the research. After the background, the chapter presents the statement of the problem, which defines the specific problem the study addresses. The purpose of the study is then outlined to clarify the research's overall intent and its response to the identified problem. Subsequently, the research aim, objectives, and research questions are presented to establish a structured framework that guides the research.

The chapter also examines the study's nature and significance, emphasizing its potential contributions to theory, practice, and policy in the field. This is followed by a justification of the research, explaining its necessity and how it addresses gaps in existing literature and practice. Additionally, the chapter outlines the assumptions underlying the study, as well as the limitations and delimitations that define its scope and boundaries, thereby promoting transparency and academic rigor. Finally, the chapter presents the overall organization of the thesis. By outlining the content and structure of subsequent chapters, this introduction serves as a roadmap. It offers a comprehensive overview of the study’s goals, relevance, and purpose. It prepares the reader for the next chapters: the literature review, research methodology, presentation and analysis of findings, and discussion, conclusions, and recommendations.

BACKGROUND TO THE STUDY

This study aimed to elucidate the implementation of the competency-based curriculum (CBC) in Mathematics in Zimbabwe. A favorable characteristic of competency-based education (CBE) is that several countries have already adopted its implementation. Competency-based education is gaining global popularity in contemporary educational environments. Competency-based education has established itself as an innovative methodology for teaching and learning in several countries. A competency-based curriculum (CBC) is an instructional approach tailored to individual student needs, prioritizing the acquisition of essential knowledge and skills for life success (Everett, 2019). Competency-based education prioritizes the uniqueness and personalization of each student. Rather than memorizing facts and concepts, students in competency-based curricula (CBCs) are evaluated on their ability to exhibit mastery of certain competencies.

The Zimbabwean context

The new millennium in Zimbabwe was marked by significant economic and political challenges that led to widespread suffering for many people. This affected the quality of education. Many teachers left the country in search of greener pastures. Some students dropped out of school, and those who remained could not meet the demands of the labor market (Gory et al, 2020; Reimer, 2020). In 2014, the Government of Zimbabwe initiated the development of the Zimbabwe Curriculum Framework (ZCF), shifting from the knowledge-based curriculum (KBC) to the competency-based curriculum (CBC) (Mopse, 2018). The imperative to raise educational standards in Zimbabwe provided an additional rationale for the curriculum modification (Mopse, 2018).

The Presidential Commission of Inquiry into Education and Training (PCIET), or the Nziramasanga Commission, advocated in its 1999 report a fundamental shift from an examination-centric educational system to one that prioritizes experiential learning and the cultivation of essential traits and competencies (PCIET, 1999). Consequently, the Zimbabwean government instituted an outcome-based curriculum (OBC) in accordance with the recommendations of the PCIET, which is extensive in subject offerings and emphasizes learning domains, employability skills, and other essential competencies to be developed throughout the curriculum. Despite the Zimbabwean government's attempts to address certain deficiencies in the traditional curriculum (KBC), several elements remain inadequately addressed, thereby posing significant impediments to the efficacy of the proposed reforms (Gory et al., 2020).

The competency-based curriculum (CBC) in mathematics posed challenges for teachers because it required an alternative pedagogical approach. In a conventional mathematics curriculum, educators often deliver lectures and assign activities to support students' retention and comprehension of mathematical concepts. In a competency-based curriculum, educators must provide students with opportunities to apply their mathematical knowledge to real-world situations. This means that professional development was needed. The incorporation of professional development is a vital component of curriculum reform. The Zimbabwean government implemented a professional development initiative called the Train-the-Trainer (ToT) approach to assist teachers in schools (Reimer, 2020). The Train-the-Trainer approach in Zimbabwe is a capacity-building model implemented across various sectors to expand skills, knowledge, and programs efficiently. This model involves training a select group of individuals who subsequently train additional participants, thereby creating a multiplier effect. The main challenge of this approach is the dilution of content as the training cascades down.

The efficacy of any educational change is predominantly contingent upon the attitudes and principles of its implementers. The objective of this study is to assess the extent of mathematics teachers' engagement in implementing the CBC. The curriculum was fast-tracked, and the fast adoption of CBC in Zimbabwe (MoPSE, 2018) indicates that mathematics teachers are likely to face several challenges throughout its implementation.

Recent empirical evidence indicates that implementation challenges remain unresolved. For instance, a 2024 study of government high schools in Gweru District found that, despite generally positive attitudes towards the competency-based curriculum (CBC) among teachers and school heads, there were notable differences in teachers' preparedness and understanding of the reform. The study further revealed that some school leaders believed teachers were insufficiently involved in the curriculum-planning process, raising concerns about ownership and readiness for implementation (Muzvondiwa et al., 2024). Similarly, Shinda and Banda (2024), in their study of CBC implementation in a Zimbabwean primary school, identified inadequate material and human resources, low teacher morale, and insufficient teacher knowledge and skills as significant barriers to effective curriculum implementation. These findings are especially pertinent to Mathematics, as successful competency-based mathematics instruction requires teachers to shift from content transmission to approaches emphasizing problem-solving, inquiry, application, and competency-oriented assessment.

Competency-Based Education in other countries

In most countries, the concept of CBC is not novel. Competency-based education (CBE) was first introduced in the United States of America in the early 1960s, followed by its adoption in the United Kingdom and Germany in the early 1990s (Marzano, 2010). Several causes prompted the transition from traditional teaching and learning methods to competency-based education.

Factors included technical advancements, emerging job competencies, and globalization. Some governments, such as the government of the United States of America, have launched teacher training in competency-based education. The program aimed to enhance teachers' comprehension and valuation of competency-based education. The program aimed to equip teachers with the information and skills to engage students from diverse backgrounds and abilities. Competency education was implemented as a kind of vocational training in nations such as Australia, Germany, and New Zealand (Marzano, 2010). The competency-based approach was implemented to train personnel as specialists in their respective fields. When training is conducted using a competency-based approach, participants seem to achieve competence. This assumption may also hold when engaging with students.

In addition to European nations, the competence-based curriculum has been implemented in Latin American countries, including Peru. In Peru, a competency-based curriculum was implemented to improve educational quality and reduce inequality (Ramos, 2020). The Ministry of Education of Peru (MINEDU) has established learning requirements as part of implementing a new CBC. Furthermore, they instituted the Students' Census Evaluation (ECE), a nationwide assessment initiative designed to enhance educational standards and mitigate inequality (UMC, 2019). Despite CBC's nascent phase in Asia, this trend is anticipated to continue in the coming years. CBC has the capacity to elevate educational standards throughout Asia by improving students' preparedness for the challenges of the twenty-first century. In 2008, the Japanese government implemented an extensive CBC reform, establishing itself as a pioneer in the domain. Notwithstanding the varied responses to the alteration, it has compelled the Japanese educational system to prioritize skills and problem-solving (Haris et al, 2021). CBC has been widely utilized in South Korea.

The competency-based curriculum has lately gained traction in African countries. CBC underscores the transition from teacher-centered to learner-centered methodologies. It underscores the importance of acquiring information essential to success in life and business. A competency-based curriculum (CBC) was implemented in Tanzanian schools to address the need for qualified, competent workers who can compete in the global economy (Upendo, 2022). CBC was also established and implemented in Zambia in 2013. Kabombwe (2022) asserts that the transition from a traditional curriculum to a competence-based curriculum was implemented with the recognition that students must encounter real-world situations during the educational process to cultivate life skills that align with societal expectations.

Also, African countries, including Rwanda, South Africa, and Kenya, have adopted the competency-based curriculum. In Kenya, the competency-based curriculum (CBC) was instituted to enhance student engagement by fostering their ownership of the learning process, which is one of its most significant impacts. CBC offers a fully customized experience that promotes individualized learning and accommodates diverse learning preferences (Gruber, 2018). Furthermore, CBC's learning outcomes underscore the capacity to generate and apply knowledge, as well as the attainment of fundamental skills and perspectives. Numerous impediments hindered the implementation of CBC in these countries, including resource scarcity and teacher capacity constraints. Teachers must participate in educational reform and innovation for the effective implementation of educational programs at the national, regional, and institutional levels. Teachers' involvement and function are essential to curriculum development (Carl, 2012).

STATEMENT OF THE PROBLEM

Competency-based education is intended to equip learners with knowledge, skills, attitudes, and competencies that can be applied to authentic situations beyond the classroom. Ideally, its implementation in Mathematics should move beyond the transmission and reproduction of mathematical knowledge towards learning experiences in which learners apply mathematical concepts to solve problems, reason critically, communicate mathematical ideas, and demonstrate competencies in practical contexts. Effective implementation, therefore, requires teachers to understand the principles and expectations of the competency-based curriculum (CBC), translate curriculum intentions into appropriate classroom practices and assessment strategies, and have adequate resources, professional development, and administrative support. Under these conditions, CBC should contribute to meaningful learning experiences and improved learner outcomes in Mathematics.

However, more than ten years after the introduction of the Competency-Based Curriculum in Zimbabwean secondary schools, evidence indicates a gap between the intended curriculum and its implementation in classrooms. Gory et al. (2020) identified noticeable discrepancies between the intended outcomes of the CBC and actual classroom practices, pointing to uneven implementation of the curriculum. Their findings, which focused largely on the policy rollout, raised concerns about the quality and effectiveness of CBC implementation. This suggests that the formal adoption of a competency-based curriculum has not necessarily translated into consistent competency-based teaching practices. In Mathematics specifically, the extent to which teachers understand the CBC, translate its principles into classroom instruction, and use appropriate competency-based assessment practices remains insufficiently established. Consequently, the

existence of the CBC policy cannot, by itself, be taken as evidence that the curriculum is being effectively implemented.

The concern is further supported by empirical evidence on learner performance in Mathematics. Gadzirayi et al. (2016) reported an improvement in the national Mathematics pass rate from 14.32% in 2010 to 25.19% in 2013. However, subsequent examination statistics indicate a less favorable pattern. Between 2019 and 2022, the O-Level Mathematics pass rate generally declined, falling from 19.23% in 2019 to 18.21% in 2020, then increasing slightly to 18.71% in 2021, before declining again to 18.03% in 2022 (Muzira, 2023). Importantly, Muzira (2023) reported that Mathematics pass rates declined, while performance in other subjects showed no significant difference. This Mathematics-specific evidence strengthens the need to investigate factors associated with the teaching and learning of Mathematics under CBC rather than attributing the pattern solely to general changes in educational performance. Although examination performance alone cannot establish that inadequate implementation of the CBC caused the decline, the evidence, when considered alongside documented gaps between intended curriculum outcomes and classroom practices, raises an empirical problem warranting investigation.

The implementation context provides further justification for examining this problem. The introduction of CBC in Zimbabwe was undertaken within a relatively short period between curriculum development and implementation, raising questions about the preparedness of those responsible for translating the policy into classroom practice. Effective implementation of a competency-based Mathematics curriculum requires teachers to possess appropriate knowledge and pedagogical competencies, as well as access to curriculum-aligned teaching and assessment resources and continuing professional development. ADEA (2012) notes that competency-based approaches require resources and practices that differ from those associated with conventional

approaches. Where such resources, training, and support are inadequate, teachers may experience difficulties in moving from traditional content-oriented teaching towards practices that emphasize the demonstration and application of competencies. Similarly, school administrators have an important role in supporting curriculum implementation, yet Kabita and Ji (2017) indicate that administrators may themselves have limited knowledge and skills regarding CBC implementation. These conditions may constrain teachers' capacity to implement the curriculum as intended.

Despite these concerns, there remains insufficient empirical evidence specifically explaining how Mathematics teachers in Zimbabwe are experiencing and using the CBC in their day-to-day practice. Existing studies, such as Gory et al. (2020), provide evidence of uneven implementation and gaps between policy intentions and practice, but a more focused examination of Mathematics teachers' stages of concern and levels of use is necessary to understand the implementation problem at the practitioner level. The Concern-Based Adoption Model (CBAM) provides an appropriate framework for examining teachers' concerns about an educational innovation and the extent to which they are progressing in their use of that innovation (Apau, 2021). Examining Mathematics teachers' stages of concern and levels of use can therefore provide evidence about whether difficulties arise from limited awareness and understanding, concerns about innovation, inadequate support and resources, or challenges in progressing towards more sophisticated levels of implementation.

The problem addressed by this study, therefore, is the persistent gap between the intended outcomes of the competency-based curriculum and its actual implementation in Mathematics classrooms in Zimbabwean secondary schools. This gap is evidenced by documented uneven implementation and discrepancies between intended outcomes and classroom practices (Gory et al., 2020), concerns about the quality and effectiveness of CBC implementation, and the

mathematics-specific decline in O-Level pass rates reported by Muzira (2023). If these implementation challenges remain insufficiently understood and addressed, teachers may be unable to translate CBC principles into effective Mathematics teaching and assessment, potentially limiting learners' opportunities to develop the intended mathematical competencies and contributing to unsatisfactory learning outcomes. It is therefore necessary to investigate Mathematics teachers' implementation of the CBC, with particular attention to their understanding, stages of concern, levels of use, access to implementation resources, and administrative support, to establish the nature and extent of the implementation gap and identify strategies to address the challenges.

PURPOSE OF THE STUDY

This study aimed to investigate mathematics teachers' perceptions of the implementation of the competency-based curriculum (CBC) in Manicaland Province, Zimbabwe. The researcher selected this subject due to the relative novelty of Zimbabwe's competency-based curriculum (CBC). The use of CBC in the Zimbabwean educational system is unprecedented. Ford (2014) asserts that a thorough comprehension of CBC necessitates an assessment of its implementation. Consequently, the need to make informed decisions in CBC assessment reinforces the rationale for this study. The study also sought to assess how effectively teachers are using their understanding of a competency-based curriculum. This involves focusing on factors such as teachers' subject-matter proficiency, their implementation of successful mathematics teaching methodologies, and the extent to which students achieve the designated learning goals within the allocated timeframe.

The study sought to determine whether the competency-based curriculum used by teachers had any deficiencies. If challenges exist, the study will investigate the possible fundamental causes. For instance, it may result from insufficient funding, inadequate education, or poor school administration. This research aimed to provide recommendations and implement measures to enhance the usage of the competency-based curriculum. Some proposals and mitigation techniques were offered. The primary objective of the study was to provide insights into CBC in the Zimbabwean context, formulate recommendations, and implement mitigating strategies. The expedited implementation of CBC renders the Zimbabwean scenario unique.

RESEARCH AIMS AND OBJECTIVES

Every research endeavor needs to have clearly defined goals and intended outcomes, as these provide direction and purpose to the investigation. Clearly articulated aims and objectives establish a structured plan of action that guides the research process. When research aims and objectives are well defined, the study can maintain focus, coherence, and consistency throughout all stages of the research.

Research aim

The research aim is a broad statement that explains the study's primary objective. A primary purpose or intention that is motivating the study is displayed here.

This study aimed to analyze mathematics teachers' perceptions of the implementation of the competency-based curriculum (CBC) in Manicaland Secondary Schools, Zimbabwe.

Research Objectives

Research objectives are specific, measurable, and achievable goals formulated to support the study's overall aim. They provide a clear and comprehensive outline of the researcher's

intended outcomes and guide the research process by translating the broad aim into practical, attainable outcomes.

The objectives of the research were as follows.

(i) To find out the level of understanding of mathematics teachers about CBC.

(ii) To analyze the extent to which mathematics teachers are implementing CBC in Mathematics.

(iii) To find out the challenges encountered by mathematics teachers in the implementation of the competency-based curriculum (CBC) in Mathematics.

(iv) To propose solutions for the challenges raised.

RESEARCH QUESTIONS

Research questions are fundamental in guiding investigations and are closely connected to achieving the study's objectives. They function as a roadmap, providing clarity and focus throughout data collection, analysis, and interpretation. Clearly defined research questions ensure that the investigation is systematic, transparent, and accountable, and that it remains aligned with the research's stated purpose. Additionally, research questions shape critical elements of the study, including research design, methodology, data-collection instruments, and analytical techniques. Well-constructed research questions help prioritize the study's focus, directing time and resources toward the most relevant and significant issues. Ultimately, research questions bridge the study's aims and objectives with the empirical evidence collected, influencing both the depth and scope of the research findings. Below are the research questions for this study.

Major research question

What are the perceptions of mathematics teachers about the implementation of the competency-based curriculum (CBC) in Mathematics?

Sub-research questions

To fully investigate the major research question, the following sub-research questions were used.

(i) To what extent do mathematics teachers understand competency-based curriculum?

(ii) To what extent do mathematics teachers implement a competency-based curriculum?

(iii) What are the challenges faced by mathematics teachers in the implementation of a competency-based curriculum (CBC) in mathematics?

(iv) How can the challenges be mitigated?

NATURE AND SIGNIFICANCE OF THE STUDY

The significance of the study

This study is significant as it provides Zimbabwe-specific evidence on mathematics teachers' perceptions regarding the implementation of the competency-based curriculum (CBC). By focusing on the experiences and perspectives of mathematics teachers, the research offers a nuanced understanding of the practical realities, challenges, and successes of CBC implementation in the Zimbabwean context. This localized insight is critical because it addresses a gap in the existing literature, which often overlooks the perspectives of teachers at the frontline of educational reform.

The study adds new academic insight by applying both the Concerns-Based Adoption Model (CBAM) and Reimers' Five-Theory Framework to mathematics education. By combining these theoretical and conceptual perspectives, the research offers a novel analytical lens for examining curriculum change, teacher adoption, and instructional practices. This dual-framework approach not only enriches the academic discourse on education reform but also provides a robust structure for evaluating the effectiveness and challenges of CBC in mathematics classrooms.

Furthermore, the study supports teacher development by identifying key areas where mathematics teachers require training, resources, and institutional support. Understanding these needs can guide professional development programs, enabling teachers to implement CBC strategies more effectively and confidently. By highlighting specific gaps in knowledge, skills, and support structures, the research contributes directly to enhancing teachers' instructional capacity and pedagogical decision-making within a competency-based framework.

From a policy and practice perspective, the findings will inform curriculum developers, school leaders, and the Ministry of Primary and Secondary Education on strategies for effective CBC implementation. The study offers actionable recommendations that can align classroom practices with curriculum intentions, ensuring that policy objectives translate into meaningful learning outcomes for students. In doing so, the research serves as a tool for quality assurance, helping stakeholders evaluate whether the current approaches to CBC implementation are progressive and effective or require refinement.

This investigation is also expected to contribute to professional growth within the broader field of education. By offering empirical insights into the practical application of CBC in mathematics, the study may guide the development of more effective pedagogical strategies, assessment techniques, and learning interventions tailored to competency-based instruction. Additionally, it addresses the well-documented challenge of discrepancies between curriculum policy and classroom practice, highlighting areas where teacher support and curriculum alignment are necessary (Ford, 2014).

Mathematics educators in Zimbabwe face a particularly complex transition as they shift from traditional content coverage to a focus on student learning outcomes. This research illuminates the pressures teachers face, including managing mandated curricula, limited

instructional time, and the need to develop students' competencies effectively. By identifying strategies to mitigate these challenges, the study contributes to enhancing instructional practices, student learning, and overall educational quality. Importantly, the CBC framework has the potential to improve learners' outcomes by fostering essential skills and knowledge crucial to lifelong learning. Research suggests that students taught through competency-based curricula often outperform their peers under conventional systems. Therefore, by examining the implementation of CBC in mathematics, this study underscores its potential to elevate teaching quality, enhance student achievement, and ensure that learners acquire the skills necessary to thrive in a dynamic and knowledge-driven society.

In summary, this research holds significant value for multiple stakeholders: it provides empirical evidence on teachers' perceptions, offers theoretical and practical contributions to curriculum reform studies, supports teacher development, informs policy and practice, and helps improve mathematics education in Zimbabwe. By bridging the gap between curriculum design and classroom practice, the study promises to advance both academic knowledge and practical application in the context of competency-based learning.

The nature of the study

The nature of the research problem informed the choice of a mixed-methods approach, specifically a convergent parallel mixed-methods design, which enabled the study to examine the implementation of the competency-based curriculum (CBC) in Mathematics from both quantitative and qualitative perspectives. Wisdom and Creswell (2013) describe mixed methods as an approach that systematically integrates quantitative and qualitative data within a single study to provide a more comprehensive understanding of a research problem. In a convergent parallel design, quantitative and qualitative data are collected concurrently, analyzed separately using

appropriate procedures, and subsequently integrated during interpretation to compare, corroborate, and complement the findings. In this study, quantitative data were obtained through questionnaires, while qualitative data were generated through semi-structured interviews and focus group discussions (FGDs).

The quantitative component provided measurable evidence of mathematics teachers' perceptions and experiences regarding CBC implementation, while the qualitative component provided contextual explanations of teachers' experiences, challenges, and strategies associated with curriculum implementation. Quantitative data were analyzed using descriptive statistics, while qualitative data were subjected to thematic analysis. The two strands were then brought together during interpretation to identify areas of convergence, complementarity, or divergence between the numerical patterns and participants' reported experiences. This integration strengthened the interpretation of the findings by allowing the study to examine both the patterns in CBC implementation and how and why mathematics educators experienced them.

A case study approach was adopted to provide an in-depth examination of CBC implementation within its real-life educational context. Patton (2015) explains that case study research involves a systematic and detailed investigation of a bounded phenomenon within its context. The case study approach was therefore appropriate for examining how CBC is experienced and implemented in secondary school Mathematics, where curriculum implementation is influenced by contextual factors such as teacher preparedness, resource availability, institutional support, and classroom practices. The approach enabled the study to develop a contextualized understanding of CBC implementation rather than examining the phenomenon in isolation from its educational setting.

The Demographic of Interest

The study focused on secondary schools in Manicaland Province, Zimbabwe, with particular attention to Mathematics teachers, school heads, and inspectors involved in or knowledgeable about curriculum implementation. The geographical focus provided a defined context within which the implementation of CBC in Mathematics could be examined. According to Mopse (2018), Manicaland Province has 298 secondary schools and approximately 500 Mathematics teachers.

The focus on these participants was important because they occupy different positions within the curriculum implementation process. Mathematics teachers are directly involved in classroom-level implementation, while school heads and inspectors provide institutional and supervisory perspectives on curriculum implementation. Examining these perspectives together enabled the study to consider CBC implementation at the classroom, school, and supervisory levels. The findings are therefore intended to provide context-specific insights that may contribute to understanding challenges and experiences associated with CBC implementation in Mathematics in Zimbabwe.

Sample and Research Instruments

The study involved 140 participants, comprising 120 secondary school Mathematics teachers and 20 administrators, including school heads and inspectors. The participants were drawn from secondary schools in Manicaland Province and were selected to provide information relevant to the implementation of CBC in Mathematics.

Data were collected using questionnaires, semi-structured interviews, and focus group discussions. Questionnaires provided quantitative information on teachers' perceptions and experiences of CBC implementation, while interviews and FGDs provided qualitative accounts of

participants' experiences, challenges, and strategies related to the curriculum's implementation. The use of multiple data collection methods was consistent with the mixed-methods design and facilitated the examination of the research problem from complementary perspectives.

Sampling Procedure

The study employed a combination of probability and purposive sampling to select participants for the quantitative and qualitative components. Mathematics teachers participating in the questionnaire survey were selected through random sampling. In contrast, participants in the interviews and focus group discussions were purposively selected for their relevance and experience in CBC implementation.

This combination enabled the study to obtain quantitative information from a broader group of Mathematics teachers while also obtaining detailed qualitative perspectives from participants with relevant knowledge and experience. The sampling approach consequently supported the broader purpose of the mixed-methods study by providing both measurable evidence and contextual accounts of CBC implementation in secondary school Mathematics in Manicaland Province.

JUSTIFICATION OF THE STUDY

The research study was conducted during a period of significant transformation in Zimbabwe's educational landscape, marked by the widespread implementation of the competency-based curriculum (CBC) and the aftermath of the national COVID-19 lockdowns. These simultaneous developments created a distinctive and challenging context for mathematics education, underscoring the need to examine the obstacles and experiences educators face in implementing the CBC effectively.

This study is warranted by the notable lack of empirical research in Zimbabwe addressing the specific challenges that mathematics teachers face when adopting a competency-based approach. Understanding these challenges is essential for identifying gaps in teacher preparedness, instructional practices, and institutional support. By investigating teachers' perceptions and experiences, the research offers evidence-based insights to inform policymakers, school administrators, and curriculum developers in enhancing the effectiveness of CBC implementation.

The findings of this study have practical implications for educational stakeholders. Policymakers and school leaders may utilize the results to design targeted intervention programs, develop pre-service and in-service training materials, and allocate the necessary resources and support to strengthen mathematics instruction. By identifying barriers to effective CBC adoption, the study also informs strategies to enhance teacher capacity and professional development, thereby supporting the translation of educational reforms into measurable student learning outcomes.

Furthermore, this research contributes to the broader national objective of elevating educational standards. Effective implementation of CBC equips students with essential skills and competencies for lifelong learning and empowers mathematics educators to deliver high-quality instruction. The study also identifies potential gaps in curriculum execution, offering an evidence-based foundation for remedial action by government and educational authorities. In summary, this study is justified by its timeliness and relevance to ongoing educational reforms, as well as its potential to enhance teacher effectiveness, improve student learning outcomes, and inform policy and practice in Zimbabwe's secondary mathematics education. The research offers both academic and practical contributions by addressing the urgent need to bridge the gap between curriculum policy and classroom implementation.

ASSUMPTIONS

It was posited that mathematics teachers possessed diverse interpretations of the notion of a competence-based curriculum. Teachers might contend that competency-based education prioritizes the distinct needs, abilities, and learning styles of each student. It is expected to facilitate personalized learning experiences that enable students to progress at their own pace and attain mastery in their most proficient subject areas. It was also posited that mathematics educators encounter various obstacles in implementing a competency-oriented curriculum. Educators accustomed to traditional approaches might anticipate challenges in implementing competency-based curricula. It can be quite demanding to navigate the distinct educational pathways for each learner and to acclimate to an innovative instructional framework.

One must consider that not all teachers hold these assumptions. Significant variations are evident in individuals' views regarding competency-based education. The efficacy of any educational methodology depends on a range of factors, including the availability of resources, support from school administration, and the willingness of both instructors and students to embrace innovative practices.

DELIMITATION

Delimitations are the specific boundaries of the study. These boundaries define the research's focus. By explicitly stating what is included and excluded, delimitations ensure that the study remains manageable, feasible, and relevant. Furthermore, they provide transparency regarding the extent and limitations of the research, clarifying the context in which the findings should be interpreted.

This study was delimited to Manicaland Province in Zimbabwe, which served as the geographical focus. Within this province, 70 secondary schools were selected, providing a representative and practical sample for examining the implementation of the competency-based curriculum (CBC) in mathematics education.

The primary objective of this investigation was to identify the challenges mathematics teachers face when implementing the CBC in secondary schools. By focusing exclusively on mathematics teachers and their experiences with the CBC, the study excluded other subjects, educational levels, and provinces. This narrowing of scope enabled a more in-depth, focused analysis, providing meaningful, context-specific insights into the practical realities of CBC implementation while maintaining feasibility and relevance. In summary, the delimitations of this study define its geographical boundaries and thematic focus, thereby establishing a clear framework to guide data collection, analysis, and interpretation.

LIMITATIONS

Although conducting research is a useful method for developing and understanding information, it does have its shortcomings. During the study, the researcher encountered some limitations. Some were easily defeated, while others were not. The fact that Manicaland is a mountainous region and that its roads are in poor condition was one of the challenges this study had to overcome. As a result, several schools were not accessible by automobile. In the end, compromised data collection.

In addition, several areas in Manicaland are experiencing network difficulties, and as a result, some participants eager to take part in the research were unreachable on their mobile phones. The limited funding available for the research may limit the study's scope or the methods

used to collect data. In that sense, participants in the focus group talks were exclusively from Mutare Urban. Due to budgetary constraints, some participants with expertise were unable to join the focus group discussions.

Because there was no financial incentive and attendance was completely optional, some participants declined to attend. For the study's conclusions to be considered trustworthy and impartial, it is necessary to address researchers' biases. The researcher contacted a few colleagues to revise some items in the questionnaires to address potential subjectivity. To avoid researcher subjectivity, the investigator employed strategies such as member verification, maintaining a research journal, and peer debriefing during the analysis of results.

ORGANIZATION OF THE THESIS

The study was organized into 5 distinct chapters as follows:

Chapter 1: Introduction

The first chapter of this dissertation establishes the groundwork for the entirety of the research that follows. It presents an overview of the research issue and explains why it is important to study. Additionally, it offers a summary of the thesis statement. It reviewed the study's background, the explanation of the problem, the aim of the investigation, and the goals and objectives of the research conducted. In addition, the study's research questions, the importance of the investigation, the type of study, the reasons for conducting it, the scope of the study, and its limitations were highlighted. The thesis arrangement and the definition of terminology were both demonstrated.

Chapter 2: Literature Review

The second chapter of the dissertation provides an exhaustive analysis of the existing research and literature on the topic. It is intended to provide a critical analysis and synthesis of the scholarly works, theories, and research findings that are currently available on the topic at hand. In this chapter, the theoretical framework that is used as the basis for this investigation is discussed. In addition to the theoretical framework, the available information on competence-based curricula was examined. The literature review provides an in-depth overview of the key concepts, terminology, and factors associated with competence-based curricula. This chapter examines a range of viewpoints, methods, and tactics used by other scholars to address comparable topics.

Chapter 3: Research Methodology and Design

The third chapter of a dissertation is often dedicated to discussing the research methodology used to address the issues posed by the study. Because it outlines the methods for gathering, analyzing, and interpreting data, this chapter is quite important. This ensures that the research is both reliable and valid. The chapter focused on the research methods and design chosen for the study. To develop a more comprehensive understanding of the study topic, the researcher employed a mixed-methods research design, combining quantitative and qualitative methods. The researcher can capitalize on the advantages of each technique while accounting for their respective limitations by combining the two data types.

Chapter 4: Data Presentation and Analysis

The outcomes of the research study are normally presented in Chapter 4 of a dissertation. The primary objective of this chapter is to provide the findings and data analysis from both the quantitative and qualitative components of the study. Because it directly addresses the research questions or objectives stated in Chapter 1, it is an essential component of the dissertation. To put

it another way, this chapter will present, analyze, interpret, and discuss the data. To facilitate the study and interpretation of the data, the information was organized into topics.

Chapter 5: Implications, Recommendations, and Conclusion

Chapter 5 presents the critical stage of data analysis and interpretation. It offers a comprehensive account of the investigation's findings and a detailed examination of the data collected. The chapter systematically analyzes the data to address the research questions, identifies trends and patterns, and draws conclusions based on the evidence. This chapter serves as a central component of the research by connecting data collection to the study's overall conclusions. Chapter 5 also summarizes the research process and results. It highlights key findings, discusses their implications, and situates them within the broader context of existing literature and theoretical frameworks. In addition to presenting the results, the chapter offers well-founded conclusions and practical recommendations, ensuring that the outcomes are clearly linked to the study's objectives and contribute to understanding and improving competency-based curriculum implementation.

DEFINITION OF KEY TERMS

Competency is the ability to do something well, using a combination of knowledge, skills, and abilities that enables one to perform a task or job effectively (Kabombwe & Mulenga, 2019). Competence can be developed through training, education, and experience.

Competency-Based Curriculum: A curriculum that places more emphasis on a student's skills than their information (UNESCO, 2017). The foundation of CBC is the notion that for students to succeed in life, they must be able to apply their knowledge and abilities in real-world situations.

Competency-Based Education: A learning system that measures student success by mastery of specific skills and knowledge rather than the amount of time spent in the classroom.

Curriculum is a set of courses and experiences designed to help students learn and grow (Haris et al., 2021). In this study, the curriculum is the learning experiences designed to assist students in learning mathematics.

Implementation is the process of putting a plan or design into action. It is the act of carrying out a task or achieving a goal (Haris *et al*, 2021). In this, implementation is the process of interpreting the syllabus and putting it into practice, that is, teaching.

Mathematics is the science of numbers, patterns, and shapes.

A mathematics teacher is a trained teacher with a diploma or degree in mathematics who teaches students from form 1 to form 6.

Perceptions refer to mathematics teachers' views, interpretations, and understanding of the Competency-Based Curriculum, as well as their experience implementing it in secondary school mathematics classrooms.

Understanding, perceptions, and implementation are interrelated. Teachers' understanding of the competency-based curriculum (CBC) provides the cognitive basis for their perceptions of it. These perceptions, in turn, shape their attitudes, willingness, and confidence regarding its implementation.

CHAPTER SUMMARY

This chapter lays the foundation for the dissertation by establishing its context, purpose, and scope. It places the study within the broader educational landscape, highlighting the

importance of understanding how the competency-based curriculum (CBC) has been implemented in Zimbabwe, especially in mathematics education. The chapter begins by reviewing the historical development of the CBC, tracing its evolution from international practices to its adaptation and adoption within Zimbabwe's education system. This historical overview provides a framework for understanding the policy goals, objectives, and challenges of CBC implementation.

The chapter also provides a detailed overview of the study, including the research rationale, objectives, and significance. It explains the reasons for conducting the research, showing its relevance, timeliness, and necessity, especially amid ongoing curriculum reforms and educational challenges in Zimbabwe. The chapter emphasizes how the study contributes to both academic knowledge and practical application, such as informing curriculum development, teacher training, and policy decisions.

Additionally, this chapter discusses the study's underlying assumptions, limitations, and delimitations, clarifying the scope and constraints that guide the research. It ensures transparency about what the study aims to examine, what it intentionally leaves out, and the context within which the findings should be interpreted. This helps readers understand the research's scope and the methodological choices shaping the design. Furthermore, the chapter outlines the dissertation's structure, guiding readers through each chapter's content and purpose. This roadmap clarifies how each section contributes to addressing the research problem, from reviewing relevant literature to presenting findings and recommendations.

Importantly, the chapter identifies a research gap regarding the implementation of the competency-based curriculum in mathematics education. While the CBC has been widely adopted, there is limited empirical evidence on how mathematics teachers perceive, interpret, and apply the curriculum in their classrooms. This gap underscores the need for this study. It sets the stage for

the next chapter, which offers a detailed review of the relevant literature and identifies areas for further investigation. In summary, this introductory chapter establishes the context, purpose, and significance of the study, outlines its scope and boundaries, and places the research within both local and global perspectives on curriculum reform. It lays the foundation for understanding the challenges and opportunities of implementing CBC in Zimbabwean mathematics education, providing a clear rationale for subsequent research.

CHAPTER 2: LITERATURE REVIEW

INTRODUCTION

This chapter provides a comprehensive review of literature supporting the investigation of competency-based curriculum (CBC) implementation in secondary school mathematics. Its purpose is to situate the study within the existing scholarly discourse, establish its theoretical and conceptual foundations, and identify research gaps that justify the study. Through a critical examination of both international and local literature, the chapter provides a robust academic foundation for understanding curriculum reform and its implications for mathematics teaching and learning.

The Concerns-Based Adoption Model (CBAM) serves as the main theoretical foundation for this study. The chapter examines CBAM in detail, emphasizing its relevance for analyzing teachers' concerns, stages of adoption, and levels of use during educational change. The application of CBAM enables a systematic exploration of how mathematics teachers perceive, experience, and respond to the implementation of CBC. The chapter also presents Reimer's 5-frame theory as the conceptual framework illustrating relationships among key variables influencing CBC implementation.

Additionally, the chapter reviews literature on the mathematical competencies required of teachers within a competency-based framework. These competencies include pedagogical content knowledge, assessment literacy, instructional strategies, and the capacity to facilitate learner-centered and skills-oriented mathematics instruction. Understanding these competencies is essential for evaluating teachers' readiness and capacity to implement CBC effectively. In

summary, this chapter establishes a robust scholarly foundation for the study by integrating theory, policy, and practice. It informs the research methodology and provides a clear rationale for investigating mathematics teachers' concerns about CBC implementation, thereby setting the stage for the dissertation's subsequent chapters.

THEORETICAL FRAMEWORK

The Concerns-Based Adoption Model (CBAM) served as the theoretical foundation for this study. Developed in the early 1970s by Gene E. Hall and Shirley M. Hord, CBAM examines how teachers experience, perceive, and respond to educational innovations and reforms. This research employed the CBAM framework to investigate mathematics teachers' perceptions regarding the implementation of the competency-based curriculum (CBC). By focusing on teachers' stages of concern and levels of use, CBAM offers a systematic approach to understanding the personal, professional, and contextual factors influencing the adoption of curriculum reforms. The application of CBAM in this study enabled a structured examination of how mathematics teachers in Zimbabwe interpret, engage with, and implement the CBC in classroom practice.

The Term 'Concern'

To completely comprehend the CBAM theory, it is essential to grasp the concept of concern. Concern is characterized as a sensation of concern or uneasiness (Cambridge Dictionary, 2020). This study defines concern as a sense of duty or obligation (George, Hall, & Stiegelbauer, 2013). An individual's mood and cognitive processes may be enhanced by their "interest" in engaging activities. Both (2010) underscored the importance of psychosocial factors, including

individual origins, personalities, goals, desires, emotions, educational levels, roles, and status in influencing how individuals evaluate and respond to stimuli that capture their attention.

The Concerns-Based Adoption Model (CBAM) is a framework that focuses on the responses of many stakeholders, including lawmakers, parents, educators, and students, to change (Khoboli & O'Toole, 2011). CBAM is used in educational environments to aid understanding and implementation of new concepts or changes. It addresses the apprehensions of those involved in the adoption process, helping them overcome initial fears and implement the new approach with confidence. This study used the CBAM due to its relevance to the CBC implementation process in Zimbabwe. The effective implementation of CBC depends on teachers' perceptions, as CBAM states.

Highlighting CBAM

Teachers' concerns about adopting educational innovations are highlighted by the Concerns-Based Adoption Model (CBAM), which serves as a template for this study (Apau, 2021). The Concerns-Based Adoption Model (CBAM) was designed to assist researchers and decision-makers in understanding, guiding, and overseeing the complex process of educational change (Paramasveran & Nasri, 2018). The Concern-Based Adoption Model (CBAM) has been used in educational settings for over 40 years to deepen understanding of educators' concerns, behaviors, and modifications during the adoption of educational innovations (Hall & Hord, 2020). Because the Concerns-Based Adoption Model (CBAM) is widely used in educational environments across a range of situations and has a solid foundation in change research, the researchers selected it as the framework for their study. There is a correlation between the Concerns-Based Adoption Model, the conceptual framework for this investigation, and studies of

participants' reactions in "top-down" scenarios. Based on this information, it is essential to emphasize the assumptions underlying CBAM.

CBAM's Assumptions

The acceptance of innovations in educational contexts, particularly in schools, formed the basis of the assumptions (WSU, 2015). The assumptions are extremely important because they give a concise overview of how the CBAM model operates in the context of educational innovation. The following points summarize the assumptions or statements on which CBAM is based.

i. Change is a process rather than a unique event, and as such, it requires time for its implementation. To make change easier, people need to be given the highest priority, since institutional transformation depends on the evolution of those within the institution.
ii. The experience of change is inherently personal, with individual perspectives significantly influencing outcomes.
iii. Individuals undergo various stages in developing their emotions and competencies associated with innovation.
iv. The availability of a client-centered diagnostic/prescriptive model enhances the facilitator's capacity to aid staff development; and
v. Those responsible for the change process must function in an adaptable and systematic manner, necessitating regular progress reviews (WSU, 2015; Nevenglosky et al, 2019). When designing the implementation model, it is essential to follow the assumptions of the Concerns-Based Adoption Model (CBAM).

Key Notions about CBAM

The idea of the Concerns-Based Adoption Model (CBAM) is based on the assumptions that change is a process rather than a single event and that it is a very personal experience that involves improvement in both abilities (levels of usage) and feelings (stages of worry) (Gautam, Lowery, Mays & Durant, 2016).

Change is a Process, not an Event.

This must be reiterated regularly. According to research on school reform (Doyle, Zhang, & Mattatall, 2015), integrating changes in classroom methods can take anywhere from 3 to 5 years. Projects that involve more significant, systemic change require more time to complete since they engage so many people at once (Haines, 2018). Nevertheless, the introduction of the competency-based curriculum (CBC) in Zimbabwe was carried out hastily, without considering that educational development is a time-consuming process.

Synopsis of Change According to CBAM

The process of change is highly individualized and includes the growth of both emotional intelligence, as measured by the Stages of Concern, and competence, as measured by the Levels of Use. Furthermore, throughout the process of implementing a new idea, people demand continuous guidance, and as their needs grow, they will desire a variety of forms of assistance (WSU, 2015). It is important to keep in mind that personal concern is legitimate and related to one's health. On occasion, personal concerns are treated as if they are of little consequence or, even worse, they are classified as the unwanted reaction of the Resister (Doyle et al., 2015).

Resistance to change is a characteristic that is frequently observed in people. It manifests in a variety of ways, including through overt animosity, procrastination, or demanding questioning. Experiencing new things can affect a person, and it is normal to be interested in how these

experiences influence oneself. In addition, it is normal to worry about losing one's sense of competence, comfort, control, and confidence (Haines, 2018; Washington State University, 2015; Nevenglosky et al., 2019). When it comes to implementing the competency-based curriculum (CBC) in Zimbabwe, teachers are required to abide by regulations imposed from above and are not allowed to offer their opinions. If you fail to cooperate, you might be charged with insubordination.

Overview of CBAM

The Concerns-Based Adoption Model (CBAM) is a framework for understanding how individuals, including parents, educators, students, and legislators, respond to change (Khoboli & O'Toole, 2011). The model elucidates the evolution of concerns about innovations over time, which is typical during periods of advancement. The Concern-Based Adoption Model was created to comprehend the personal aspects of the change process and to facilitate the adoption of new curriculum and instructional materials (Haines, 2018).

The phases-of-concern hypothesis posits that human learning and development unfold in seven stages, each characterized by consistent shifts in an individual's focus or degree of concern. Teachers can engage in the Concerns-Based Adoption Model (CBAM) at any of its seven steps as they collaborate to adopt innovative concepts. In the Concerns-Based Adoption Model (CBAM), the phases of change encompass, but are not restricted to, focusing, working with others, managing personal worries, awareness, and information dissemination.

Levels of Change in CBAM

The stages of change in CBAM include awareness, information, personal concerns, management, repercussions, collaboration, and refocusing. The seven phases of concern in the CBAM model are illustrated in the table, along with methods for evaluating each step.

Table 2.1

Typical Expressions of Concern about Innovation

Stage of Concern	**Expression of Concern**
6. Refocusing	I have a few suggestions on an idea that might be even more effective. While cognizant of the advantages associated with the alterations made, the individual turns his or her attention back to the matter at hand and contemplates new opportunities or improvements to the existing idea.
5. Collaboration	How can I connect the activities I am currently undertaking to those of others? While maintaining a focus on teamwork and collaboration, the user uses the invention.
4. Consequence	What impact is my usage having on others who are learning? What changes can I make to it to increase its impact? Many people focus on how technology will impact children, given its effects. In this step of the process, the individual considers the students' level of competence, their capacity to apply the innovation in their studies, their performance in completing the task, their appraisal of the achievement, and the adjustments required to improve their performance.

3. Management	It appears that I am devoting all of my time to preparing the materials. By taking full advantage of the resources and information available to them, the individual can focus on the job they are currently working on and on executing the concept. All of these factors are essential: competence, efficiency, management, and scheduling.
2. Personal	What kind of impact will it have on me if I use it? The individual is concerned about the impact that a program will have on his or her financial situation and social position, both in relation to himself or herself and to others with whom he or she works. The individual assesses the dynamic link between one's own commitment, the assumption of responsibility in decision-making, the accounting for conflicts, and the organization's pay system. The individual is concerned about how the program might affect their social life and finances, as well as those of their colleagues.
1. Informational	I am interested in learning more about this subject. An individual demonstrates a basic understanding of the invention and expresses a willingness to learn more about it. People do not feel self-conscious about creation. The significant and impersonal elements of the invention, including its extensive features, outcomes, and prerequisites, are what pique people's interest.
0. Awareness	I do not have any concerns about it.

(George, Hall & Stiegelbauer 2006)

The phases-of-worry hypothesis posits that human learning and development unfold in seven stages, each marked by discernible changes in an individual's focus or level of care (see

Table 2.1 above). The degree of concern is directly correlated with its manifestation, as shown in the table. The expressions of worry reflect sentiments typically expressed by those apprehensive about an invention at that stage of development. The following is a comprehensive elucidation of each degree of concern.

Awareness

The initial phase is awareness, focusing on the aspiration to understand the innovation and the reasoning for its proposal. Sultana (2015) asserts that consumers are made aware of the issue or difficulty at this level, even in the absence of significant immediate worry. Currently, individuals are only becoming acquainted with innovation and are not expressing concern regarding it. They are uncertain about its nature or potential effects on them. They may express interest; however, they have not committed (WSU, 2015).

Individuals at the awareness stage often express sentiments such as,

"I am familiar with that new program, but my knowledge is limited."

“It appears intriguing, yet I am uncertain about its nature.”

“I seek to acquire further information regarding it.”

Individuals in the awareness stage want to learn about the innovation. They must comprehend its nature, functionality, and potential impact on them. They must also understand its significance and the advantages it will offer (George, Hall & Stiegelbauer, 2006). Individuals with a fundamental understanding of the technology may proceed to the educational phase of the CBAM. The adoption of CBC in Zimbabwe drew criticism from teachers who found it time-consuming and complex. Individuals at the awareness stage require guidance; for instance, disseminate information about the innovation. Disseminating information might inform them

about the alteration. Furthermore, it is essential to reply promptly to their queries (Kwok, 2014). A prompt answer to queries may foster faith in the invention.

Individuals in this group require support in comprehending the benefits of the innovation. Individuals are inclined to embrace change when they recognize its benefits (Nevenglosky et al., 2019; Al-Shabatat, 2014). This may facilitate some acceptance of the shift. One may provide a foundation for a successful implementation of the innovation by supporting individuals at the Awareness stage. Upon completing the awareness stage, individuals go to the informative stage.

Informational

According to the Concerns-Based Adoption Model (CBAM), the first stage of concern is known as the Informational stage. Acquiring knowledge about the project and conducting a preliminary feasibility evaluation are both part of the information stage (Bakir, Devers, & Hugs, 2016). At this stage, the individual's curiosity is piqued by the innovation's remarkable and objective traits, including its prerequisites, outcomes, and broader characteristics (Khoboli & O'Toole, 2011). At this point, the individual is eager to learn more about the subject. Even though they may be aware of some things, they are interested in obtaining further information concerning its functioning, capabilities, and present users (WSU, 2015). They may be worried about the consequences the invention could have for their professional field. When people acquire information, it is common for them to voice worries over the following issues:

- What kind of cutting-edge technology is being discussed?
- What is the mechanism by which it functions?
- What is the identity of the other users?
- What advantages may be gained from its use?

- What are the challenges that arise when it is put to use?
- How is it relevant to my job situation? Kwok (2014) states that...

During the informational phase, the individual looks for both guidance and assistance. They ought to be able to both ask questions and get answers. In addition, they should be able to interact with others who use the invention to gather a variety of opinions about it. The informative phase is of the utmost importance (Both, 2010). All the following degrees of worry are based on it, making it the foundation for all future concerns. Instructors may find it difficult to proceed to the following stages of the process and fully embrace the innovation if they do not receive sufficient support during the informative phase (Nevenglosky et al., 2019; Al-Shabatat, 2014).

At this point, people are showing great interest in the invention. They are eager to obtain further information about the change that has been implemented. Administrators can provide personnel with training materials and information about the innovation, such as brochures and webpages, to assist them throughout the informative phase (Nevenglosky et al., 2019; Al-Shabatat, 2014; Both, 2010). In addition, you should promote networking by putting them in contact with people who are using the innovation and by encouraging them to ask questions and seek explanations (Both, 2010). In the end, it is important to exercise patience and display an understanding of the situation, the development of an organization that represents them, and the emergence of various issues. WhatsApp groups focused on mathematics education at the secondary school level are indicators that some mathematics teachers in Zimbabwe have embraced networking.

Personal

The personal stage of the Concerns-Based Adoption Model (CBAM) is distinguished by anxieties about the effects that the modification will have on the individual, who in this instance

is the teacher. During this period of time, it is common for people to be concerned about the manner in which they will acquire new abilities, the manner in which this will influence the way in which they communicate with their colleagues, and the manner in which it will influence the way in which they provide instruction (WSU, 2015; Kwok, 2014). In addition, they may feel anxious about the time and energy required to complete the move. Individuals at the personal stage often say, "I am not sure if I am ready to learn this new skill."I am concerned about the impact it will have on the way I communicate with the students I teach." "I do not have the time to learn this at the moment, and I am unsure of whether or not I will be able to pull this off" (Nevenglosky et al., 2019).

To navigate the personal stage, people need access to both knowledge and help. They must obtain proof that they are not the only ones concerned about these issues, and they must acquire the new skills they require (Al-Shabatat, 2014; Both, 2010). In addition, they require opportunities to practice the new abilities they are learning and to get feedback. Individuals who have successfully navigated the personal stage are more likely to be open to change and capable of carrying it out effectively once it is complete. The personal stage is an essential component of the entire change process. Bakir, et al (2016). Teachers at this stage of their careers can be effective and flourish if administrators empathize with their concerns and provide the support they need.

To help workers navigate the Personal Stage, an administrator should carefully consider employees' concerns and show respect for their feelings (WSU, 2015). In addition, they have to provide them with information on the adjustment and how it would affect them. It is advisable to assist people in the personal category in the development of a strategy for gaining proficiency in the new skills they are acquiring. In addition, administrators may provide them with opportunities

to apply their newly acquired skills and receive feedback on their performance (Both, 2010). Feedback is essential because it encourages greater self-reflection on progress made.

Management

When people adopt an invention, they go through a series of stages of worry, with the management stage being the third, according to the Concerns-Based Adoption Model (CBAM). Many individuals at this level are concerned about how to manage innovation in their day-to-day employment (WSU, 2015). Their primary concern is the practical aspects of implementation, including obtaining the materials and equipment they require, integrating the innovation into their daily routines, and creating a timetable for their time and workload.

The management stage of the change process is of utmost importance because it is at this point that people begin to incorporate the innovation into their day-to-day work (Both, 2010). People may grow discouraged and give up if they are unable to manage the invention properly. During the management stage of the process, several steps can be taken to support individuals as they navigate it. First and foremost, it is essential to provide them with clear, accurate information about the objectives, methods, and available resources for innovation (Bakir, Devers, & Hugs, 2016; Hall & Hord, 2020). Secondly, you must provide them with both support and encouragement, which may take the form of mentorship or coaching (Kwok, 2014). Thirdly, it is essential to demonstrate tolerance and compassion towards them. They may want some time to become accustomed to changes.

With the necessary assistance, individuals will be able to complete the Management stage and begin reaping the rewards of the innovation. The management team can support them in

navigating this phase of their lives, but only if they can understand their problems and provide the aid they require (Bell, 2015; Caropreso, Haggerty, & Ladenheim, 2016).

The following questions may be asked by a teacher who is in the management stage of the Cognitive Behavioral Approach to Management (CBAM):

Which place is best for me to go to get what I need?

What modifications can I make to my schedule as it now stands?

What am I going to do about the fact that my workload is getting heavier and heavier?

What strategies can I use to keep my pupils interested?

What methods may I use to assess how well my pupils are progressing? (Hall & Hord, 2020).

Breaking the concept into smaller, more manageable segments is one possible strategy to help individuals navigate the Management stage. Management should also provide opportunities for feedback and practice. A person may be motivated to achieve at a higher level if they get constructive feedback. Hall and Hord (2020) and Bakir, Devers, and Hugs (2016) are two sources that have researched this topic. It is essential to highlight a few achievements along the way while offering constructive criticism. One further strategy for assisting folks in navigating the management stage is to network and collaborate with others who are using the innovation (Paramasveran & Nasri, 2018).

Consequence

According to the Concerns-Based Adoption Model (CBAM), people experience the fourth stage of concern when adopting a new thought. The fourth stage, called the Consequence stage, is when people begin to think about the impact the new idea will have on their lives. Individuals in this stage of development are concerned about the effects of innovation on their own lives and on the

lives of their pupils and coworkers (Bell, 2015; Caropreso, Haggerty, & Ladenheim, 2016). It is common for teachers who are operating at this level to raise questions such as;

"Is it making a difference?"

"What impact is my application of this new invention having on the students I teach?"

"What can I do to make it even more powerful?"

At this point in their careers, professionals, including teachers, are more likely to consider how they might share their experiences with others (Bakir et al., 2016; Paramasveran & Nasri, 2018). In addition, they consider collaborating with colleagues to enhance the use of innovation during implementation. Because it is at the consequences stage of the CBAM model that people begin to realize the advantages of their efforts and decide whether to continue using the innovation, this phase is particularly important (Hall & Hord, 2020). Individuals are more inclined to proceed to the cooperation stage, during which they exchange experiences with others and collaborate to improve the innovation, if they are satisfied with the innovation's outcomes.

The following is a summary of some of the behavioral signs that might be seen during the Consequence stage of the CBAM:

• The individual is interested in learning about how the innovation will affect the organization, the students, and the employees.

• The individual is looking for information on how well the concept works in practice.

• The user draws a comparison between how they utilize the invention themselves and how other people use it.

• As a response to the outcomes, the user modifies their approach to utilizing the innovation.

• In order to enhance the manner in which the invention is used, the individual works together with other people (WSU, 2015).

The Consequence stage of the CBAM model is valuable because it reflects people's enthusiasm for the idea's success. They may start to acknowledge the advantages that it provides. It is essential to remember that not everyone will progress through the stages of worry in the same way. There is a possibility that certain members of the workforce (for example, teachers) will either skip a step or spend more time than is necessary at that level (Paramasveran & Nasri, 2018; Both, 2010). It is important to always bear in mind that the phases of worry do not follow a linear sequence. As individuals continue to develop and learn, they may go forward and backward through the many phases of development (WSU, 2015). Creative thinking is employed in this situation.

Collaboration

The Concerns-Based Adoption Model (CBAM) identifies cooperation as the fifth stage in the change process. The Collaboration stage is a pivotal phase in the transformation process. Individuals are currently concentrated on collaboration to enhance outcomes and progress the initiative (WSU, 2015). They are enthusiastic about engaging in dialogue and exchanging ideas with others who are similarly executing the concept. The program has made significant strides in originality and innovation at this juncture.

During the Collaboration phase, individuals commonly express the following concerns:

How can I collaborate with others to execute this idea?

How are others executing this function?

How can I obtain further support from my colleagues?

How can we enhance this innovation? (Both, 2010).

The objective of the collaboration stage is to cultivate a congenial environment in which individuals feel at ease sharing ideas and collaborating to further the innovation. Facilitating cooperation through team meetings, professional development courses, and online discussion forums might aid in doing this (Nevenglosky et al, 2019). Establishing a respectful workplace is crucial to helping individuals feel at ease articulating their opinions. The partnership phase is crucial to the transformation process. Collaborative efforts among educators may address difficulties, disseminate information, and foster more effective solutions. Individuals may proceed seamlessly through the Collaboration stage of the CBAM if allowed to collaborate (WSU, 2015). This may encompass group conferences, continuing education workshops, or internet discussion forums.

Management must motivate individuals to express their ideas and experiences. Exchanging views and experiences may foster healthy perspectives. Management should provide compassion and support to staff. This may be improved by cultivating an environment of respect and trust (Kwok, 2014). Additionally, emphasize achievements along the process. Recognition of an individual's achievement fosters a sense of ownership.

Refocusing

The Concerns-Based Adoption Model (CBAM) identifies refocusing as the sixth and final step in the change process. Now, individuals are very confident in their ability to operate the technology, and they have begun to consider ways to improve it (Both, 2010). They could begin experimenting with new concepts or methods, or they might start sharing their thoughts with

others. During the Refocusing stage, the following kinds of worries are commonly expressed by persons who are going through it:

- "I can think of some ideas that would be even more successful."
- "I wonder if this innovation can be used in other ways."
- "I am curious to learn more about the analysis of this innovation."
- "I am considering ways to collaborate with others to use this innovation." (WSU, 2015)

During the Refocusing stage, individuals should set aside time to reflect on how they might continue to make the most of the innovation. In addition, allowing individuals to exchange their thoughts with other people provides them with the opportunity to both educate and learn from one another. The Refocusing phase of the transformation process is of the utmost importance. Change agents can help individuals shift their attention away from themselves and toward the concept and the promise it holds to benefit others. They accomplish this by offering support and encouragement. During the transition, the Refocusing phase is of utmost importance. Change facilitators can help ensure the public embraces the concept by helping folks focus on the innovation and its potential to benefit others. You can do this by inviting others to share their opinions and experiences with you.

Such an indication of a change in emphasis may be the interactions that take place between individuals within an organization. Therefore, allowing individuals to engage with one another in situations requiring cooperation might encourage the generation of new ideas. People may receive assistance from management in their search for information resources to better understand the innovation (Bakir, Devers, & Hugs, 2016; Hall & Hord, 2020; Paramasveran & Nasri, 2018). A

diverse selection of learning resources may facilitate the acquisition of information across a wide range of areas.

It is essential to recognize successes and encourage individuals to continue learning and progressing in their personal development. Motivated teachers are capable of performing at a level well beyond the established norms. It appears that motivation is a driving force that encourages individuals to achieve at a higher level (Kwok, 2014). For example, instructors could begin to consider ways to adapt a recently adopted mathematics curriculum to accommodate their pupils' needs after it has been introduced.

Summary of CBAM's Key Points

The use of the pronouns "I" and "me," as exemplified by the statement "I am frustrated," may indicate self-centered behavior, potentially aligning with the lower three levels of self-focus. The intermediate stage of management emphasizes achieving task mastery to the extent that these tasks become routine and are performed with greater ease. This stage is characterized by the use of "it" or similar references to the activity rather than to the self (Nevenglosky et al., 2019). A manager facing difficulties might express, "The prioritization of my time and the management of paperwork is overwhelming."

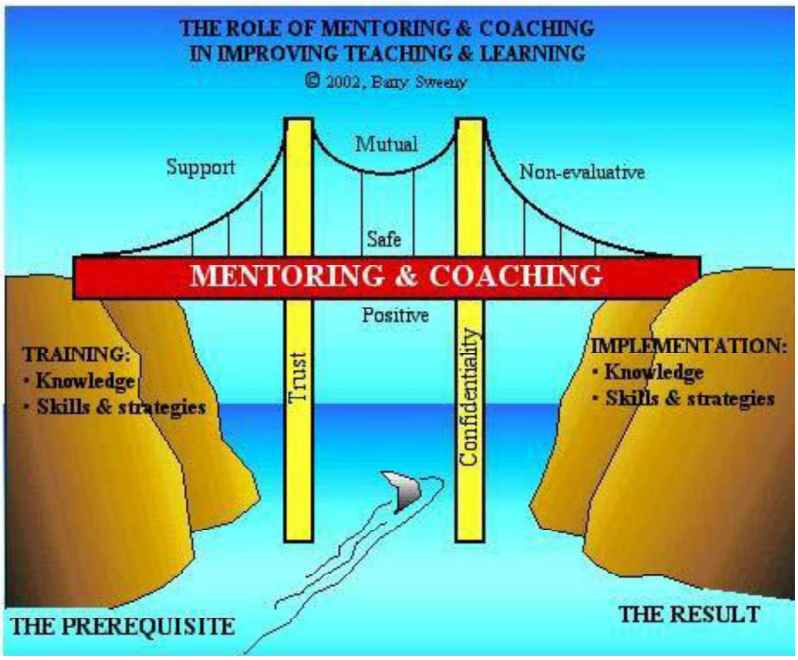
The use of pronouns referring to clients, protégés, or participants who benefit from the activity may indicate that the upper phases of concern are focused on the activity's outcomes and impact (Gautam et al., 2016). An example could be, "Since I implemented that strategy, the students are demonstrating improved learning outcomes." Customers appear to appreciate personalized service, resulting in increased product purchases.

Connecting the Stages of Concern and the "Bridge"

The "Bridge" outlines the steps individuals need to take to apply their training and emphasizes the importance of mentorship during this process (WSU, 2015). This principle serves as the foundation for all development support initiatives (Haines, 2018).

Fig 2.1

The Role of Mentoring and Coaching in Improving Teaching and Learning



(Adapted from WSU, 2015:6)

Connecting the "Bridge" idea with the Stages of worry framework indicates that the initial stages of worry are situated on the training side of the "Bridge" (Kwok, 2014). It includes the awareness, informational, and personal phases of Concern. The skills development component is another facet that transpires inside the training domain of the "Bridge". Therefore, the management phase encompasses demonstrations, participant practice, and remedial feedback. During the course, participants engage in practice, and the teacher may provide constructive feedback on their

performance (Nevenglosky et al, 2019). Mentorship is crucial to participant success when an individual endeavors to autonomously apply their training in their environment and achieve a regular level of task management (Stage of Concern).

Individuals can advance and develop if mentorship is provided immediately. In this instance, teachers who do not receive assistance will be unable to develop professionally (Nevenglosky, Cale, & Aguilar, 2019). A teacher lacking mentorship may underperform. Overwhelmed teachers will forsake creative tactics in favor of coping mechanisms for inadequate practices.

Linking CBAM and the Competency Based Curriculum (CBC)

The Concerns-Based Adoption Model (CBAM) and the competency-based curriculum (CBC) may mutually enhance each other. The CBC is a curricular framework designed to provide students with the skills and competencies necessary for success in life (Both, 2010). It is predicated on the notion that information should be used to address real-world issues and that learning should occur through action. For teachers and students to effectively embrace innovations, educators must provide the necessary support (Kwok, 2014). Moreover, educators must be attuned to teachers' apprehensions.

The CBAM assists educators and administrators in identifying potential issues students and instructors may encounter with a new CBC curriculum (Al-Shabatat, 2014; Bakir et al., 2016). Addressing their concerns and providing appropriate support will facilitate the effective adoption of the new competency-based curriculum by teachers and students. For example, educators in the personal phase of CBAM may be concerned about the impact of the new curriculum on their teaching efficacy (Nevenglosky et al., 2019; Haines, 2018; George et al., 2013). Policymakers may

alleviate these concerns by setting explicit expectations for educators and facilitating the development of the skills needed to implement the new competency-based curriculum effectively.

Decision-makers and educators can utilize the CBAM stages of concern to inform curriculum design through the CBC. For example, if educators are at the "informational" stage of worry, the curriculum must provide them with succinct, explicit information on the new subject and skills (WSU, 2015). Prior to implementing the CBC, educators may need training to understand the curriculum. Educators must participate in conferences and seminars focused on implementing CBC (Al-Shabatat, 2014). Introductory seminars on topics such as lesson planning and syllabus interpretation may be held before the curriculum's implementation phase begins.

Educators and relevant stakeholders may use the CBAM framework to identify the essential resources required to implement a CBC. The CBAM identifies three distinct types of assistance: technical support, experiential support, and informational help (Al-Bakir et al., 2016; Nevenglosky et al., 2019; Haines, 2018; George et al., 2013). Administrators must demonstrate prudence and authenticity while communicating the CBC's goals and objectives to educators. When provided with accurate knowledge, educators can effectively apply the CBC. Alongside the implementation of an open-door policy, support and guidance for the use of the CBC should be provided to ensure mutual understanding and agreement among stakeholders (Kwok, 2014). Educators and other stakeholders should have the opportunity to share their experiences with CBC and gain insights from one another.

As educators and learners adapt to a new CBC, the CBAM is utilized to assess their needs. Conversely, CBC may be used to provide professional development opportunities that address the common issues faced by both educators and learners (Both, 2010). The CBAM can also be used

to monitor the CBC's instruction and implement necessary modifications. Educators may enhance the efficiency and supportiveness of the learning environment for all students by integrating the CBC and CBAM.

The Concerns-Based Adoption Model (CBAM) may be used to monitor the progress of Competency-Based Curriculum implementation. The CBAM provides a framework for collecting information about the challenges faced by teachers and other stakeholders, as well as the support they require (Al-Shabatat, 2014; Nevenglosky et al., 2019). The CBC may be adjusted as required using this information to ensure its effective execution. CBAM serves as an effective instrument for understanding, facilitating, and managing the execution of a competency-based curriculum. Educational institutions can increase the likelihood of a CBC's success by recognizing educators' and other stakeholders' concerns while providing the necessary resources. The Concerns-Based Adoption Model and competency-based curriculum can synergistically enhance educational practices (Al-Shabatat, 2014). The CBC helps schools focus on desired student outcomes, whereas the Concerns-Based Adoption Model helps schools understand and address teachers' and other stakeholders' concerns (George et al., 2013). Educational institutions can enhance the probability of success for any reform initiative by integrating these two tactics.

Concerns for Teachers

Teachers' concerns affect whether the new curriculum is accepted. This is because teachers can influence what they include or exclude from the curriculum (Nevenglosky, Cale, & Aguilar, 2019). The Concerns-Based Adoption Model is a valuable tool for identifying the challenges educators encounter and developing solutions to eliminate impediments. Lambert, Velez, and Elliot (2014) examined the difficulties teachers face when adopting a new curriculum, analyzing

implementation experiences and revealing the problems they encountered. The lack of resources, the abundance of content that cannot be completed within an academic year, inadequate compensation, and the absence of opportunities for professional growth and collaboration are all problems that have been observed. A number of the conclusions from previous research investigations (WSU, 2015) appear to align with these obstacles.

When decision-makers are aware of the specific concerns that teachers adopting innovations should have, it becomes easier for them to choose the most effective means of support for the instructors. For example, Donovan, Green, and Mason (2014) employed the CBAM innovation configuration (IC) to examine the various ways in which 21st-century skills are manifested in classrooms. If the administration is informed of these issues in advance, they may be able to obtain assistance in resolving them before a change is implemented. Being able to concentrate on specific challenges at the beginning of the shift makes it reasonable to fine-tune PD options to reduce worry (Nevenglosky et al., 2019).

Teachers have made little headway beyond the Consequence level of the Concerns-Based Adoption Model (CBAM) due to the traditional organizational structures and processes in place. This is a direct consequence of the continuous, frequently unproductive struggle between the time available for work and productivity and the time available for teachers to collaborate and improve their skills (WSU, 2015). The impact of their work on the people that it is meant to affect, such as pupils, is the focus of a single teacher at the consequence level (Al-Shabatat, 2014). It is definitely a positive thing to simply be there! However, because they do not have enough time each day to interact with and learn from their colleagues and peers, people who work in traditional, non-

collaborative institutions and are separated from others are less likely to achieve greater professional growth or produce better outcomes (AIR, 2016).

A research study conducted in Hong Kong by Kwok (2014) examined educators' concerns about the implementation of a liberal studies curriculum for secondary school students. Based on the data, there was a significant degree of concern apparent during each of the previously described phases. Throughout each level, the educators exhibited obvious signs of tension and worry (Kwok, 2014). Experts often recommend that teachers who report a high degree of anxiety focus on professional development (PD) that emphasizes collaboration with their colleagues.

Gautam, Lowery, Mays, and Durant (2016) state that the majority of research supports recognizing the issues that arise from change and implementing these tactics to minimize discomfort and concern. By considering these aspects, as they are reasons people resist change, it may be feasible to provide instructors with greater assistance and improve students' experiences (Nevenglosky et al., 2019). Existing research consistently highlights the need to identify teachers' concerns before the planned deployment of a curriculum, as this may increase the likelihood that the curriculum will be implemented effectively (Doyle, Zhang, & Mattatall, 2015).

CONCEPTUAL FRAMEWORK

The notion of competency-based curriculum will be described in relation to Reimer's Five Frame Theory of Educational Change, which outlines the five frames necessary for educational change. The five-frame theory developed by Reimer was selected as the conceptual framework. The reason for this selection was that it provides an examination of the changes in education. As a result, this study examined mathematics teachers' perceptions of the implementation of the

competency-based curriculum. The traditional curriculum is being replaced with a new educational philosophy known as the competency-based curriculum (CBC). When investigating perspectives, it was essential to select a conceptual framework that addressed the significant problems associated with educational change.

Reimer's Five-Dimension Theory on Educational Change

Reimer's Five-Frame Theory of Educational Reform is a framework that helps educators understand and analyze the educational reform process. Reimer (2020) has stated that a successful educational reform ought to incorporate the five views of culture, psychology, professionalism, institutionalism, and politics. A thorough discussion will be held for each frame. Schools do not exist in isolation from the rest of the world; thus, cultural concepts should be taken into account when modifying the curriculum. In educational reform, the psychological concept is based on the assumption that each student is an individual with a unique set of learning skills (Reimer, 2020). The successful implementation of the curriculum, according to Gory, Bhatia, and Reddy (2021), requires that educational reforms take into account teachers' professional development, the provision of school equipment, and the political context.

Teachers interested in gaining a better grasp of educational transformation and in encouraging it will find Reimer's theory a valuable tool. The notion serves as a framework for educators to analyze the difficult process of educational reform. It may also assist educators in developing more effective tactics for implementing change (Gory et al., 2021). According to Reimer, the following are some of the several viewpoints or frames of reference that exist in relation to educational change:

a) The Cultural Dimension

Reimers provides the following definition of culture: "the beliefs, values, and practices that a group of people shares" (Gory et al, 2021; Reimers & Chung, 2018). He maintains that culture is always changing and never static. Any attempt to bring about change in the field of education ought to take into account the concept of culture in this context. Culture should be used as a guide in selecting which topics to teach in schools, but only to a certain extent. Reimer developed five characteristics of the cultural dimension to support his conviction (Reimer, 2020). The five components of culture are cultural context, cultural substance, cultural process, cultural symbols, and cultural power. The following is a detailed description of each aspect.

Cultural Context

Reimers asserts that fostering an appreciation of other cultures necessitates education. He believes that schools should teach kids about other cultures and help them learn how to talk to and get along with others (Reimers, 2020). So, culture should be part of the curriculum because it encourages alternative ways of thinking. Using the cultural context part (Reimers & Chung, 2016) can help a teacher better understand how the values of the dominant culture are shown in the curriculum. A teacher could, for example, see that the curriculum focuses more on Western European legacy and culture than on indigenous heritage and cultures. In the Zimbabwean mathematics syllabus, the problem of unhu/ubuntu, meaning the exercise of Zimbabwean standards and values, has been integrated into the syllabus preamble.

Content of Culture

Cultural content is the second part of the cultural frame. This group contains the morals, skills, and knowledge that schools teach. The cultural background and the aims and top priorities of the educational system influence this material. The cultural content should help shape the curriculum in certain ways (Reimers, 2020). In a classroom, for instance, a teacher can use the cultural content dimension to make the curriculum more relevant to students' cultures. For instance, a teacher may include stories and poetry from many cultures in the curriculum or ask people from those cultures to talk to the class. The government of Zimbabwe wants mathematics teachers to design school-based syllabuses tailored to the needs of local schools. This kind of work fits with Reimer's definition of cultural context.

Cultural Process

The cultural process is the third part of Reimer's cultural frame. In this context, evolving educational practices are perceived as a cultural phenomenon that entails a transformation in attitudes and values (Reimers & Chung, 2016). When it comes to how learning happens in schools, the cultural processes are important. This encompasses the techniques used to create and communicate information, as well as communication between instructors and students (Reimers, 2020). A teacher might use the cultural process to make the classroom more student-focused. The mathematical cultural process involves multiple pedagogical approaches that shape students' understanding of mathematical topics. For example, a teacher could give pupils their individual learning projects or have them work together on learning tasks. Thus, the Zimbabwean CBC is predicated on continuous assessment learning activities (CALA), in which learners are required to conduct investigations on a particular topic, for example, Statistics.

Symbols of Culture

The fourth problem is the importance of cultural symbols. In this dimension, Reimer discusses the signs and items used in schools. These cues, which can be behavioral, visual, or verbal, make students and teachers feel like they are part of a group (Reimers & Chung, 2016). A teacher can use the cultural symbols dimension to make the classroom more welcoming and open to everyone. The Zimbabwean mathematics syllabus suggests using simple terminology for verbal symbols so that students may readily understand them. For instance, a teacher may hang pieces of art from various cultures throughout the classroom or designate an area where students can display items from their own cultures.

Cultural Authority

The cultural power dimension is the fifth and concluding part of Reimer's cultural frame. The distribution of authority within educational institutions constitutes an aspect of cultural power. This encompasses the authority of instructors, students, parents, and administrators, as well as the prevailing culture. Using the cultural power dimension, a teacher might query about the distribution of power in the classroom (Reimers, 2020). In this work, cultural power is depicted in several ways. First, policy is transmitted from the top down, such as from the secretary of the Ministry of Primary and Secondary Education (Mopse) to instructors. Secondly, math teachers are part of groups, in this instance, groups that deal with teaching and studying math. In addition, the CBC in Zimbabwe is student-centric, as learners are required to participate in debates or choose the direction of study in Mathematics.

b) The Psychological Dimension

Reimer examines educational transformation through a psychological lens that emphasizes the unique demands and motivations of educators and learners. He contends that for educational innovations to be enduring, they must account for the psychological variables that influence learning and responses to change (Gory et al., 2021). Reimer delineated four psychological elements that facilitate the adoption of educational transformation. The four main criteria were the need for protection and security, independence, meaning and purpose, and challenge.

Need for Safety and Security

People are more willing to accept change when they feel comfortable and secure. This means creating a safe, encouraging environment and setting clear rules and expectations. If instructors feel like they own the curriculum, they will be able to use it successfully in the classroom. Not feeling responsible for the curriculum might lead to poor implementation (Reimers, 2020). Some schools let instructors develop their own professional development programs when they begin using CBC in math. As a result, they felt more in charge of the process and could see more easily how the seminars would fit their specific needs. They felt like they owned the program. MoPSE also wrote a paper on welcoming schools. The paper discusses the importance of school security so students can study without fear.

The Need for Independence

People need to feel that they oversee their own learning. Providing individuals with the resources they need for success entails giving them a role in decision-making. The Zimbabwean Mathematics curriculum appears to be learner-centered on paper; however, a closer look reveals that most of the content is teacher-centered. Students were not allowed to participate in decision-

making about the school's math program. As a result, they cared less about their education and were more likely to fail. The average O-level Mathematics pass rate in Zimbabwe is a little over 25% (MoPSE, 2018). Students can have some control over their learning if they are allowed to take part and make choices.

The Need for Meaning and Purpose

People are more inclined to seek change if they think it will benefit them and be worth their time. This means explaining how new information aligns with people's goals and interests and how it can affect the world (Reimers, 2020). To embrace this idea, the Ministry of Primary and Secondary Education organized a series of seminars to help people understand the new Mathematics syllabus. Teachers received more support and mentoring as they learned new ways to teach. This helped them get beyond problems and stay motivated. The lack of resources, on the other hand, has made it harder to adopt and use CBC in arithmetic in Zimbabwe.

c) The Professional Dimension

The term "professional dimension" refers to the skills and knowledge that instructors need to be successful in their jobs. It is essential to consider this issue to ensure that instructors have the tools they need to implement innovative practices (Reimers, 2020). For example, educators need access to professional development opportunities that equip them with the latest pedagogical practices and available educational materials. Reimer's professional dimension of global education (Gory et al., 2021) places particular attention on the knowledge, skills, and attitudes that educators must possess to be effective in teaching global education.

He argues that instructors must possess a comprehensive understanding of the entire world, including its cultures, history, and challenges. In addition, students need to think critically and creatively about the challenges the world is facing today. In addition, they need to foster a learning climate that is both open and accepting, in which students feel comfortable discussing and debating international issues without fear of consequences.

The Zimbabwean competency-based curriculum embraced Reimer's professional character. As a result of its acceptance, the Zimbabwean government required universities such as Bindura University of Science Education (BUSE) to provide mathematics instructors with additional training in contemporary pedagogies. Furthermore, the Ministry of Primary and Secondary Education, in collaboration with organizations outside government control, such as UNICEF and UNESCO, organized several workshops to provide professional development opportunities for mathematics instructors.

The professional component of global education is essential to ensuring that all students can develop the knowledge, skills, and attitudes necessary to become global citizens. By providing educators with the resources and support they require, policymakers can help teachers deliver global education effectively and prepare students for the challenges they will face in the twenty-first century (Reimers & Chung, 2016). Reimer's professional aspects include the following elements, among others.

Understanding of the world

A comprehensive understanding of the world, its various cultures, history, and challenges is essential for teachers. Through formal education, professional promotion, travel, and other

personal experiences, they can acquire this information. Teachers who have a solid grasp of current global trends are better equipped to impart knowledge of concepts that might help their students find their place in the global community (Reimers, 2020).

Books, films, and news articles are examples of resources instructors may use to incorporate global information into their courses. This has the potential to help students gain knowledge of a variety of other cultures and perspectives. Throughout this study, the subject of knowledge of the world has been reflected in various ways. Several mathematics instructors currently use software that helps them teach their students effectively. At this point, students are expected to own smartphones, which they may use to submit instructional videos covering a range of mathematical topics.

Critical thinking and problem-solving capabilities

Educators must be able to think critically about global issues and develop creative solutions. This requires identifying and analyzing problems, developing solutions, and assessing their effectiveness. Problem-based learning is one instructional method teachers can use to encourage critical thinking and problem-solving skills in their students. One strategy to achieve this goal is to provide students with real challenges that require them to consider international concerns. Problem-solving skills receive particular attention in the competency-based curriculum (CBC) for mathematics. Students are encouraged to use their problem-solving skills in their daily activities.

Abilities Related to Global Citizenship

Teachers must be able to assist students in their endeavor to acquire the knowledge and ideals of global citizens. Skills such as problem-solving, effective communication, teamwork, and critical thinking are included in this. The mathematics curriculum now used in Zimbabwe's competency-based curriculum (CBC) was designed to integrate global citizenship-related abilities (Mopse, 2018). As a result, educators may provide students with service-learning projects that allow them to apply knowledge gained in the classroom to real-world problem-solving. When students work on a Continuous Assessment Learning Activity (CALA) to improve their learning, they demonstrate this ability. By adopting this perspective, students may cultivate a sense of global citizenship.

Capacity to cultivate an environment in which learning is inclusive and supportive

Teachers need to cultivate a classroom climate that is inviting and inclusive, so that students feel at ease when discussing issues of global importance. This requires creating an environment where all points of view are respected, and students feel comfortable expressing their own opinions. Creating an inclusive and supportive learning environment was one of the objectives of the Zimbabwean competency-based curriculum in Mathematics. When educators collaborate to share resources and ideas, that goal can be achieved. When mathematics teachers work together, they can share their ideas, which encourages collaboration. Consequently, they might develop their professional knowledge and capabilities.

d) The Institutional Dimension

The formal institutions and structures that make up the educational system constitute the institutional dimension. The government, educational institutions, teacher unions, and curriculum

designers are examples of this. The informal norms and practices that direct how the educational system functions are also a part of the institutional dimension (Reimers, 2020).

According to Reimer, the institutional dimension is significant because it affects how education is provided for and experienced. Whoever has access to education, what is taught, and how it is taught are all determined by the formal institutions and structures of the educational system. Looking at the highlighted questions, CBC in Zimbabwe was tailored to address such concerns. The Zimbabwean mathematics syllabus was crafted so that topics span from primary to secondary levels. At the educational level, informal norms and practices can also have a significant impact. The institutional aspect is dynamic and multifaceted. It is always changing because of societal, political, and economic developments (Reimers, 2020). It continues to have a significant role in determining the goals of educational systems, nevertheless.

When attempting to comprehend the goals of education, the institutional aspect is an important consideration. It is critical to be aware of the various ways that the institutional component might influence the aims of education and to consider changes that could be made to achieve more desirable outcomes. In the current study, the institutional aspect is very important in determining the performance of various schools in Mathematics. There are three main aspects of Reimer's institutional dimension: the distribution of power, the allocation of resources, and the organization of the system.

The Distribution of Power

Who has the power to make decisions about educational issues? This involves the government, school boards, teachers' unions, and other parties. In a nation like Zimbabwe with a

centralized educational system, the government has considerable control over what should be taught. This is because the curriculum, literature, and instructional techniques used in schools are under government control (Reimers, 2020). However, in a country with a decentralized educational system, power over educational objectives is more decentralized. This gives educational institutions and local communities more latitude in selecting the curricula and pedagogical approaches that best suit their needs. However, in Zimbabwe, power is centralized; hence, teachers follow orders from their superiors. There is little room for creativity, and teachers, for example, mathematics teachers, follow the timetable religiously.

The Allocation of Resources

The question, "What is the distribution of resources like money, time, and teachers throughout the educational system?" highlights the issue of resource allocation. The amount of funds allocated to education can have a big impact on its goals. Schools in under-resourced nations may be compelled to prioritize teaching fundamental reading and numeracy skills over loftier objectives such as fostering social justice or cultivating critical thinking. In Zimbabwe, parents are compelled to buy textbooks for their children without government support. Hence, this has created a huge gap between the poor and the rich. Learners from low-income families lag in literacy because they lack educational resources, such as textbooks.

The Organization of the System

How is the structure of the educational system? This covers the structure of the educational system, curriculum development, and modes of instruction. English serves as the official language of instruction in Zimbabwean schools. For most learners, however, English is a second language,

whereas indigenous languages are primarily spoken at home and within communities. This linguistic disparity creates substantial instructional challenges, especially in mathematics, a subject that depends on precise terminology, accurate problem interpretation, and deep conceptual understanding. Limited language proficiency can impede learners' comprehension of mathematical concepts, their ability to follow instructions, and their capacity to interpret examination questions accurately.

Consequently, language barriers have contributed to elevated failure rates in mathematics, as learners often struggle with both mathematical reasoning and the subject's linguistic demands. This situation increases teachers' responsibilities, as they must implement effective instructional strategies to address language gaps while meeting curriculum requirements. Addressing these language-related barriers is essential for enhancing learner performance and promoting equitable access to mathematics education in Zimbabwe.

d) The Political Dimension

The political aspect of education pertains to how political factors such as government, economics, and social structure influence educational systems. Reimer asserts that political values and priorities are manifested in children's education, since education constitutes a political endeavor (Reimer, 2020). The political dimension of education is complex and fluid. Nonetheless, to implement substantial modifications to the educational system, it is imperative to understand this facet. The Zimbabwean education system is predicated on the ideology of the ruling authorities (Gory et al, 2021). The education system serves as a conduit for disseminating skewed knowledge that favors political elites.

Reimer asserts that, despite occasional neglect, the political dimension of education is essential for understanding its operation and for enhancing it (Reimer, 2020). To enhance democratic decision-making, all stakeholders in the process are summoned. In Zimbabwe, decisions are made at the highest level. Individuals in senior roles, such as the Minister of Primary and Secondary Education, the Permanent Secretary, and the Directors, typically make decisions without consulting the instructors who engage with the students every day. This study took Reimer's theory as its conceptual framework against this backdrop. Reimer highlighted three fundamental characteristics of the political dimension of education: the distribution of power, the allocation of resources, and the control of knowledge (Reimer & Chung, 2018). The three sub-dimensions are elucidated comprehensively.

The Allocation of Authority

To ascertain the distribution of power, one may inquire, "Who governs education?" Who determines access to education, the curriculum, and the pedagogical methods employed? The government determines the financial allocation for education in Zimbabwe (Gory et al., 2021). Nevertheless, the funding designated for education typically falls short of meeting the requirements. Inadequate budgeting has led to a significant accumulation of new schools. The inadequacy of government schools has led to the proliferation of unregistered schools whose standards fall far short of acceptable benchmarks. The scarcity of schools has left a significant number of youngsters out of school. Some have discontinued their education due to the lengthy commute from home to school. Consequently, this discovery from Reimer's theory seems to align

with the reality of competency-based curriculum implementation in Zimbabwe, particularly in Mathematics.

The Zimbabwean government enacted a regulation requiring school administrators to obtain approval before increasing tuition costs. At first glance, the policy appears to protect parents from excessive school fees; however, it is detrimental to educational advancement. In most cases, the government does not sanction the fees proposed by the institutions. This often hinders the provision of excellent education, as limited budgets constrain schools.

The Distribution of Resources

Regarding resource distribution, inquiries such as, “How are educational resources distributed?” The question "Who receives what, and why?" may provide insight into the prioritization of education (OECD, 2019). In Zimbabwe, policy mandates that each school establish a School Development Committee (SDC). Parents and community members can influence educational policy by participating in school board elections and lobbying elected officials. The SDC often convenes with school officials to allocate school finances. Due to insufficient funding, the majority of Zimbabwean schools operate on severely constrained budgets that fail to meet fundamental educational requirements.

Inadequate resource distribution has led to a significant imbalance between the affluent and the impoverished in Zimbabwe. Children from affluent households who attend prestigious schools have greater access to quality education than their peers from impoverished backgrounds. This situation appears to reinforce educational disparities rather than promote educational equality.

The Regulation of Knowledge

To comprehend the topic of knowledge control, one must consider issues such as: "What information is regarded as significant and valuable to acquire?" The question of who sets the curriculum at educational institutions must be examined (OECD, 2019). In Zimbabwe, as in any other nation, the government develops curricula and assessments for grades 7, form 4, and form 6. The Zimbabwe Schools Examination Council (ZIMSEC) is responsible for the formulation and evaluation of exams for grade 7, form 4, and form 6. ZIMSEC is also responsible for issuing certificates to applicants who take the tests.

In Zimbabwe, teacher licensure and certification are regulated by governmental policies. The newly qualified instructors undergo vetting before employment. Student instructors at teachers' colleges must pass a program titled National Strategic Studies (NSS). The contents of NSS appear to support the ideology of the ruling authorities. A thorough examination of the module reveals notions designed to indoctrinate student teachers.

Upon qualifying as educators, teachers are often encouraged by their unions to affiliate with them. The unions assist educators in acquiring knowledge about innovative teaching methodologies, curriculum development, and related topics. The impact of teachers' unions on educational policy is significant.

The merits of Reimer's Five-Frame Theory of Educational Change

There are several reasons this hypothesis is significant. To begin with, it is a comprehensive framework that considers all aspects of educational transition. When it comes to preparing for

change, the idea ensures that all aspects of education are considered (Reimers, 2017). This can help avert unexpected consequences and ensure the change is successful in the long run. The idea is essential to our investigation, as the implementation of a competency-based curriculum in Zimbabwe was carried out expeditiously. Therefore, when it comes to the teaching and learning of mathematics, the application of Reimer's theory may be more likely to highlight difficulties in implementing the competency-based curriculum.

Secondly, Reimer's theory is essential because it provides a flexible framework that may be adjusted to accommodate a variety of situations. Providing a framework for communication and collaboration among different parties is one of the theory's advantages (Reimers, 2017). This might help build consensus and support for the suggested change. Because it emphasizes the distinct characteristics necessary for ensuring a seamless transition and the implementation of educational transformation, this theory was selected as the foundation for the conceptual framework. This decision was made in the context of this discussion. The research examined the implementation of the competency-based curriculum in Zimbabwe, with a particular emphasis on secondary mathematics. Therefore, the theory was utilized as a standard against which the implementation of CBC could be compared.

The additional advantage of the Reimer theory is that it may be used for both planning and executing change, as well as for determining when change is necessary. One way in which the theory might be applied is to evaluate the effectiveness of educational changes (Reimers & Chung, 2018). This might help identify the aspects that still require further development. This investigation was conducted to determine whether the application of CBCs, particularly in mathematics, has

been successful. To accomplish this goal, the conceptual framework was built around Reimer's theory, which served as its anchor. As a general rule, Reimer's concept may be beneficial for educational leaders seeking to implement effective transformations within their institutions.

The Relationship Between Competency-Based Curriculum and Reimer's Five Frame Theory of Education

According to Reimer, education must be transformed to meet the needs of students in the twenty-first century (Reimer & Chung, 2018). He asserts that several teaching methods still used in schools today are both conventional and out of date and unsuccessful. He claims five areas need to be reformed to transform the educational system.

According to Reimer:

- Teachers should serve as learning facilitators, and students should be the center of attention in the classroom;
- To succeed in the 21st century, learners must be able to think critically and solve problems.
- To succeed in the global economy, children must learn how to collaborate.
- For learners to succeed in the globalized world, they must be exposed to many cultures and viewpoints; and
- Learning is a continuous process that students must be ready to engage in throughout their lives.

A competency-based curriculum emphasizes mastery of skills and knowledge rather than course completion (Gory et al., 2021; Reimers, 2017). It is a student-centered teaching method. A competency-based curriculum gives students the freedom to study at their own pace and focus on the subjects they need most help with. The foundation of Reimer's theory and competency-based education is the premise that students should actively participate in their own education (OECD, 2019; Reimers & Chung, 2018). Additionally, they both stress the value of teamwork, critical thinking, and problem-solving. The purpose of Reimer's theory and competency-based curricula is to develop a more efficient and pertinent educational system for 21st-century learners.

Application of Reimer's Five Frame Theory and Competency Based Curriculum in the Classroom Setup

The following are some of the examples of how Reimer's theory can be applied in CBC:

- Teachers can design student-centered learning experiences that let students take charge of their own education.
- Teachers can give students chances to work through problems and engage in critical thinking about current events.
- Teachers might design activities that call on students to cooperate to accomplish a shared objective.
- Teachers might use resources and exercises that illustrate the variety of experiences that their pupils have had.

- Teachers can assist students in acquiring the information and abilities necessary to acquire new things throughout their lives; and
- Teachers can give their learners a more successful and relevant educational experience by implementing the ideas of Reimer's Five-Dimension Theory and competency-based curriculum into their lesson plans (Reimer & Chung, 2018). In the Zimbabwean context, the highlighted dimensions can be applied as mitigation measures to improve the implementation of CBC.

Operational Interaction Between CBAM and Reimer's Five-Frame Theory

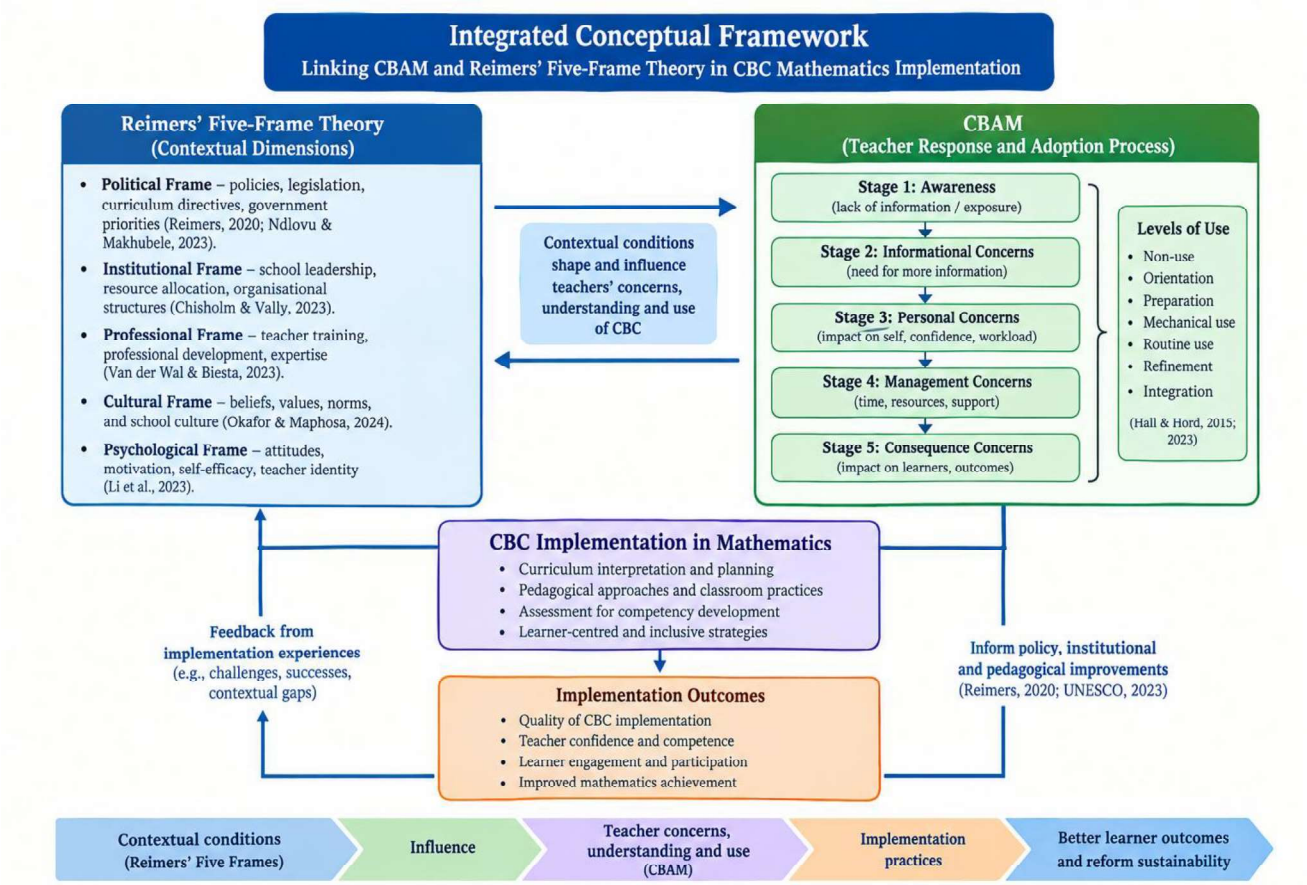
The Concern-Based Adoption Model (CBAM) and Reimers' Five-Frame Theory offer complementary perspectives on curriculum implementation by addressing different yet interconnected levels. CBAM emphasizes the experiences of individual teachers, specifically their concerns, perceptions, and stages of adoption of educational innovations. Conversely, Reimers' Five-Frame Theory adopts a broader approach by analyzing the political, institutional, professional, cultural, and psychological factors that shape curriculum implementation (Reimers, 2020).

These two frameworks can be integrated to elucidate how contextual conditions affect teachers' experiences and responses to competency-based curriculum (CBC). Political and institutional factors, such as curriculum policies, leadership, resource allocation, and administrative support, may shape teachers' concerns and their capacity to implement CBC effectively. Likewise, professional and cultural factors, including teacher training, prevailing instructional beliefs, and school norms, can influence teachers' understanding, attitudes, and

willingness to adopt new practices. CBAM identifies teachers' positions within the adoption process, whereas Reimers' framework explains the underlying reasons for their placement at specific stages.

The interaction between these frameworks provides a socio-contextual and developmental perspective for analyzing CBC implementation. Reimer's Five-Frame Theory explains the contextual conditions within which implementation occurs. In contrast, CBAM explains how individual teachers perceive, interpret, and respond to those conditions as they progress through the adoption process. Thus, the Five Frames explain the factors that may facilitate or constrain implementation. At the same time, CBAM provides a means of examining teachers' concerns, perceptions, and levels of use in response to those factors. For example, inadequate professional development, viewed through the professional frame, may contribute to teachers' informational or personal concerns within CBAM. In contrast, inadequate resources, viewed through the institutional frame, may constrain teachers' progression towards more advanced levels of implementation. Similarly, cultural expectations and established instructional practices may influence teachers' concerns and willingness to modify existing practices.

The integration, therefore, links macro- and meso-level contextual conditions to micro-level teacher responses, enabling the study to explain not only whether CBC is being implemented but also why teachers demonstrate varying levels of understanding, perception, and implementation. In this study, Reimers' framework consequently provides the contextual lens, while CBAM provides the teacher-developmental lens through which variations in CBC implementation are interpreted (Hall & Hord, 2015; Reimers, 2020).



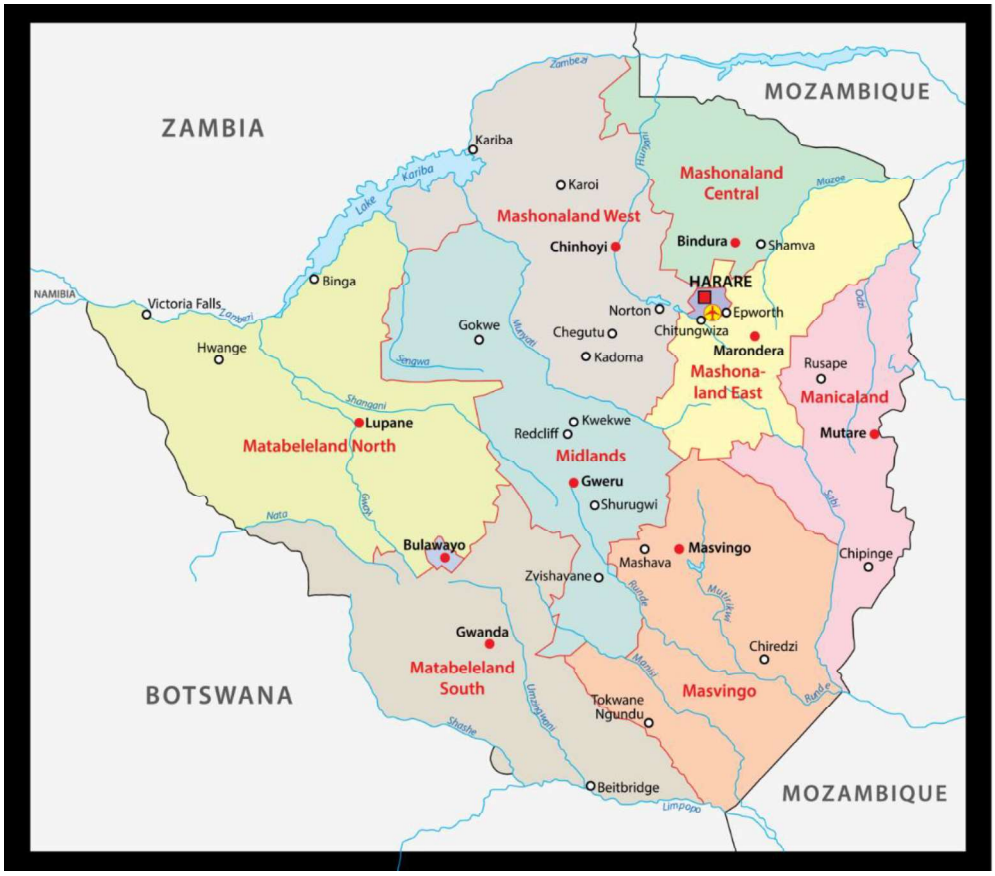
OVERVIEW OF THE EDUCATIONAL SYSTEM IN ZIMBABWE

To understand the Zimbabwean educational system, it is essential to divide history into two primary political periods: the colonial era and the post-independence era. Comprehending the two periods may elucidate the rationale for Zimbabwe's implementation of the competency-based curriculum (CBC). Zimbabwe is a landlocked country in southern Africa, bordered by Mozambique to the east, Zambia to the north, Botswana to the west, and South Africa to the south. The 2022 census recorded a population of 14,645,468 individuals in Zimbabwe. Data indicates

that more than 80% of individuals possess literacy skills (Chirinda et al., 2022). The following page presents a map of Zimbabwe that delineates its 10 provinces.

Fig 2.2

Map of Zimbabwe showing provinces



Source: https://www.worldatlas.com/maps/zimbabwe

In Zimbabwe, basic education spans 13 to 15 years, from primary to secondary education. Primary education spans over 9 years and is divided into two phases: the infant phase and the junior phase. The infant phase encompasses Early Childhood Development (ECD) through Grade

2, during which foundational skills in literacy, numeracy, and social development are established. The subsequent junior phase, covering Grades 3 to 7, focuses on developing core academic competencies and preparing learners for secondary education.

Secondary education extends over six years and is organized into two distinct phases. The first phase, General Certificate in Secondary Education (GCSE), comprises Forms 1 to 4. During this period, learners engage with a broad curriculum and prepare for the nationally assessed Ordinary Level (O-Level) examinations. Completion of Form 4 is required for advancement to the subsequent phase of secondary education.

The second phase, known as senior secondary, includes Forms 5 and 6, during which learners undertake Advanced Level (A-Level) studies. A-Level education offers specialized instruction, emphasizing in-depth subject knowledge and advanced academic skills. Successful completion of A-Level examinations generally qualifies students for admission to universities and other tertiary institutions. Learners who complete O-Level education but do not advance to A-Level studies have access to alternative pathways. These individuals may apply to apprenticeship programs, technical colleges, and vocational training institutes, which provide practical skills for employment and self-sufficiency. This educational structure demonstrates Zimbabwe's commitment to offering diverse pathways that accommodate varying learner abilities, interests, and career goals.

Colonial Educational Framework

For over a century, Europeans and Africans in Zimbabwe participated in distinct educational systems. The two systems were independently created by the colonial administration of the era and were founded on the prevailing socio-political notions of racism and racial discrimination. The Land Apportionment Act of 1930 sanctioned the protocols. This concept is significant as it endorsed and rigorously enforced racial discrimination and segregation inside educational institutions. They attended distinct educational institutions under a stringent system that categorized pupils by race: White, Black, and Asian. This segregation mirrored Rhodesia's broader social and political structure, which deprived Black individuals of opportunity and basic rights.

The initial schools in Southern Rhodesia were founded in the late 1800s by Christian missionaries. The missionaries offered fundamental education in literacy, numeracy, and religious teachings. In the early 20th century, the colonial authorities allocated limited funding for African education, significantly less than for European children (Nziramasanga, 1999). The school system in Zimbabwe was bifurcated during the colonial period. An individual's race ascertained it. Black and White individuals experienced disparate educational experiences. Nziramasanga (1999) asserts that the educational system was established to perpetuate racial segregation between whites and blacks. Black children were educated in different institutions from those of white children. The curriculum for white kids was better than that of black pupils. Black children were conditioned to become laborers, while white children were educated to be leaders and entrepreneurs (Reimers, 2020).

According to colonial officials, the stated goals of African education were to cultivate compliant laborers who would follow directives unconditionally. Political science and history were prohibited in African schools, as they were perceived as acts of defiance; hence, the curriculum prioritized practical subjects such as carpentry and agriculture (Mukomana, Mangozhe, & Gasva, 2017). The sole topics provided to the African pupils were literacy, composition, and basic mathematics.

The black community faced a constricted educational system, with only a limited number gaining admission to universities or other institutions of higher learning. In addition to enforcing racial segregation, English-language instruction was required for other courses. Indigenous languages were diminished due to the widespread use of English across many academic disciplines. Consequently, subjects such as English, mathematics, and natural sciences were given precedence (Mukomana, Mangozhe, & Gasva, 2017). This seemed to lead to a certain degree of prioritization of academic learning over the cultivation of practical skills.

A limited number of black pupils attended select secondary schools throughout the colonial period. The enrolled individuals were exceptionally talented academically. Black students, meanwhile, were mandated to enroll in arts classes. The subjects were instructed by rhetoric. Students were encouraged to engage in rote learning, which required memorizing content for reproduction during assessments (Nziramasanga, 1999). Zimbabwe attained freedom from colonial rule in 1980. The educational system requires an overhaul.

Educational System Following Independence

Following Zimbabwe's independence in 1980, the government dismantled the dual education system that had perpetuated racial segregation and inequality. Education was redefined as a fundamental human right accessible to all citizens, irrespective of race, gender, or socioeconomic status (Nziramasanga, 1999). The government subsequently implemented comprehensive reforms to promote equity, access, and national development. These reforms included expanding school infrastructure, enhancing teacher training, and broadening access to education and the curriculum. Education was positioned as a vehicle for social empowerment and economic advancement (Reimers, 2020).

The education system continued to evolve in response to shifting national and global demands. In 2015, Zimbabwe undertook a comprehensive revision of the traditional curriculum framework, eliminating residual elements of the colonial-era curriculum (Mukomana et al., 2017). This reform signaled a transition toward education that prioritized relevance, skills development, and learner-centered methodologies, culminating in the adoption of the competency-based curriculum (CBC).

Despite these reforms, significant challenges persist in secondary mathematics education. These challenges include curriculum overload, insufficient teaching and learning resources, language barriers, limited teacher preparedness for learner-centered approaches, and assessment practices that may not fully align with competency-based principles. Such issues continue to impede effective mathematics instruction and learner outcomes, underscoring the necessity for ongoing curriculum evaluation and targeted instructional support.

GENERAL CONCEPTION OF CURRICULUM

The curriculum and its importance

A country may give its residents the information, skills, attitudes, and values they need to be active in their communities and the economy. This can help both individuals and society flourish (Reimers, 2020). So, the curriculum needs to be changed to work for everyone and the whole country. In the field of education and teaching, the term "curriculum" is among the most significant, yet there is no precise definition of it in the current literature. However, most academics do believe that the term "curriculum" comes from the Latin word "currere," which means "to run" (Neary, 2002) or "racecourse" (Marsh & Willis, 2007). In today's schools, the image of the curriculum as a racetrack might highlight the importance of competition in academic achievement. Students who pass their tests are seen as winners, and those who fail are seen as losers, without considering how they did throughout the "race."

Sawyer (2004) argues that a curriculum helps each student grow over time by providing structured experiences and a framework. Sawyer stresses the importance of considering each student's unique traits when developing the curriculum, since not all pupils learn at the same pace. Students are motivated in different ways and learn at different speeds. The curriculum includes the planned activities students will engage in while in school, the information, skills, and values expected of them, and the ways they will be taught and how they will learn to achieve those goals (Frank, 2013; Reimers, 2020). For pupils in school, the curriculum contains both planned and unplanned activities and experiences. In math, the things that are in the syllabus are the activities.

The goal of a curriculum is to help pupils develop their moral, intellectual, artistic, physical, and professional skills. Frank (2013) defines a curriculum as a set of activities and learning opportunities arranged in a specific way to help students learn. It is important to clearly spell out the teaching content, methods, class organization, methods of assessing learning outcomes, and conditions. It is also important to clearly spell out the requirements for meeting the stated educational goals and the educational goals students must meet within a specified time frame (Gary, Mills, & Airasian, 2006). In Zimbabwe, the word "curriculum" refers to the planned educational activities that help pupils become people who best reflect Hunhu/Ubuntu culture (Mopse, 2018). In this study, the term "curriculum" refers to the Zimbabwean math problems in the syllabus. There are tasks for both in the classroom and at home, such as mathematics homework.

The International Bureau of Education (IBE-UNESCO) (2015) says that the curriculum links different areas of education, such as policymaking, to encourage lifelong learning. The International Bureau of Education (IBE-UNESCO) is a UNESCO agency that studies ideas, themes, and approaches to teaching, particularly in curriculum design and use. So, to ensure the curriculum is effective and sustainable, it should be developed and revised holistically and systematically, not piecemeal (IBE-UNESCO, 2013; Frank, 2013). A change process should start with thorough discussions to make sure that everyone is on board, committed, knowledgeable, relevant, and supportive. Reimer has been interested in the concept of transformation.

CLASSIFICATION OF CURRICULUM

Some scholars have proposed various frameworks for classifying curricula based on their underlying philosophies, structures, and intended learning outcomes. In this study, the curriculum is divided into knowledge-based and competency-based models. Knowledge-based curricula emphasize the transmission of subject content, factual knowledge, and theoretical understanding, with achievement typically measured through examinations that assess recall and comprehension. In contrast, competency-based curricula prioritize the development and application of skills, abilities, attitudes, and values that enable learners to perform effectively in real-world contexts. As the competency-based curriculum (CBC) is the primary focus of this research, it is the subject of a more comprehensive analysis. The study examined its guiding principles, instructional strategies, assessment practices, and implications for mathematics education, as well as the pedagogical shifts, learner-centered approaches, and outcome-based assessments required of teachers.

Knowledge-Based Curriculum

This curriculum primarily emphasizes knowledge acquisition. This approach is based on the premise that education entails disseminating vital knowledge accessible to all (Mingi, 2013). The educational curriculum comprises instructional materials, with the choice of subjects and their specific content forming the basis for curriculum development (Reimers, 2020). The fundamental educational objective is for educators to possess a comprehensive understanding of the subjects they are required to teach; hence, requirements for topic knowledge are generally incorporated into the curriculum's output standards. During assessments, students must demonstrate proficiency in

specific subject areas. In this context, the knowledge-based curriculum may also be referred to as the traditional curriculum.

The curriculum is perceived as a content system that follows a logical sequence of themes, a systematic organization of content units within courses, and a coherent link between grades and levels. This curriculum predominantly prioritizes memory and the reproduction of information in teaching, learning, assessment, and evaluation of educational outcomes (Arguelles & Gonczi, 2000). The enhancement of cognitive abilities and logical thinking is emphasized, with information and skills predominantly acquired through irregular, rarely repeated training across all subjects. The requirements for certain abilities, information, and attitudes determine the curriculum's objectives (Gay et al., 2006). The objectives are established based on the requirements for both the students and the subject content. Despite the Zimbabwean government's adoption of the competency-based curriculum (CBC), the syllabuses predominantly reflect a knowledge-based curriculum.

Competency-Based Curriculum

Numerous definitions of competence-based education exist; however, the majority are formulated from a theoretical rather than an empirical standpoint, resulting in significant variability (Van den Berg & De Bruijn, 2009). The conception and operationalization of competence-based education have been restricted. Defining the term "competency" is crucial to understanding the conceptual significance of competency-based education.

Definition of Competency

The term "competency" possesses several meanings; however, none are widely acknowledged. We examine various interpretations of writers' skill, drawing on examples from both local and international literature. "Competency" is defined as a systematic collection of talents, dispositions, emotions, and personal motivations applicable to the execution of designated context-specific activities (Van den Berg & De Bruijn, 2009). Some authors define competence as the ability to perform specific activities and functions in accordance with established standards (Kouwenhoven, 2010) or as the capability to execute the primary occupational responsibilities that define a profession in accordance with relevant standards.

Haddouchane et al. (2017) characterize "competency" as "the capacity to execute a task successfully or efficiently" and "a demonstrated proficiency in a specific domain, attributable to the extent of knowledge acquired, which can be evaluated." Teachers must have a keen awareness of the distinctive characteristics and logical framework of each student's personality. Haddouchane et al. (2017) define competence as the capacity of the human intellect to address real-world challenges. It is a compilation of psychological attributes that an individual has cultivated over time in a certain domain of activity. The thesis defines competence as the mastery of the information, skills, attitudes, and personality attributes necessary for an individual to complete a certain activity. In other words, students must have both the knowledge and the understanding (Kouwenhoven, 2010). Competency is defined as the capacity to apply relevant, task-oriented training to apply the requisite knowledge, skills, and attitudes in the appropriate work environment. Competency in Zimbabwean denotes the ability to do a task properly. Moreover, doing work proficiently is an art form.

Overview of Competency-Based Curriculum (CBC)

The phrase "competency-based curriculum" (CBC) refers to methods of grading, reporting, assessment, and instruction. To demonstrate that students have acquired the requisite skills and knowledge as they advance in their education (Mingi, 2013). A competency-based curriculum prioritizes the skills students are expected to demonstrate over the knowledge they are expected to show. This curriculum is theoretically learner-centered and sufficiently flexible to accommodate societal, pedagogical, and student changes throughout time (Belin, 2020; Frank, 2013).

It indicates that children may acquire and utilize the values, attitudes, skills, and knowledge necessary to tackle the challenges they encounter every day. "The preface of the Zimbabwean Form 1-4 syllabus states that it aims to cultivate citizens who are critical thinkers and adept problem solvers in daily life." The four-year curriculum will enhance students' mathematical literacy and numeracy, while providing opportunities to apply mathematical concepts across other disciplines (Syllabus for O-Level Mathematics, 2015:1).

In contrast, competency-based educational systems are founded on the premise that students can continuously acquire new abilities in an environment that promotes continuous learning. Competency-based programs operate on the premise that learning can occur in various environments and at different paces, eliminating the need for students to allocate a fixed amount of time in the classroom (Wongnaa & Boachie, 2018). This concept stipulates that a student must merely demonstrate mastery of a preceding topic to progress to the next topic or level. In Zimbabwe, pupils may progress to the next level only upon completing the preceding one. A pupil

who has completed Form 1 progresses to Form 2. A student may not necessarily be required to have completed Form 1 to go to Form 2.

Characteristics of Competency-Based Models

Competency-based approaches are defined by three characteristics: instruction tailored to students' current levels, student autonomy in learning, and assessment based on demonstrations of mastery in relevant academic standards appropriate to their subject area and educational level.

a) Student Autonomy in Learning

Hanewicz, Platt, and Arendt (2017) define student choice in learning as students' ability to influence many aspects of their education, including the content, methods, and timing of their studies. It is an instructional approach that prioritizes each learner's requirements and preferences. In Zimbabwe, students are solely required to adhere to the syllabus as directed by their lecturers, with no alternatives permitted.

Providing students with choices in their schooling presents several benefits. Hanewicz et al. (2017) assert that students show greater engagement and interest in their studies when they have agency in the learning process. Furthermore, students have enhanced memory recall abilities (McLeod, 2019). Providing children with more options in their schooling can enhance their capacity for critical thinking, decision-making, and problem-solving. Although having choices is beneficial for students, the Zimbabwean educational system does not permit student choice in their education. For example, math is a mandatory subject.

Student choice may be incorporated into the classroom through various methods. Primarily, it is essential to allow students to choose the learning activities they participate in. This strategy is advantageous for any topic. For instance, students may choose to undertake scientific study on a subject that captivates their attention and then discuss or display their findings (Hanewicz et al, 2017). Mathematics students may use statistical analyses, such as averages, to conduct a thorough examination when composing a report on their preferred literature.

Gold (2011) asserts that permitting pupils to select their own study techniques facilitates a degree of autonomous learning. Students may choose to watch a video, read a book, or play an interactive game to learn a new concept. Consequently, by exercising autonomy in decision-making, children may cultivate an intrinsic motivation to study.

It is essential to recognize that giving children a voice in their education does not confer total autonomy. Pinchot & Paullet (2021) assert that to guarantee pupils acquire the necessary information and skills, educators must consistently provide guidance and structure. Granting pupils autonomy in their education enables teachers to enhance the classroom's excitement and engagement for all learners.

It is essential to begin gradually; therefore, instructors should refrain from presenting children with too many options at once. Provide students with multiple alternatives for minor projects from the outset, such as completing a brief project or selecting a new topic. Moreover, it offers learners accessible and comprehensible alternatives (Pinchot & Paullet, 2021). The instructor may want to limit the options available to students to avoid confusion caused by too

many possibilities. Providing pupils with alternatives is a beneficial notion, applicable to the issues addressed in Paper 2 in Zimbabwe, where students can pick their preferred topics.

Gold (2011) asserted that instructors must respect pupils' choices. Consequently, even if the teacher opposes the student's decision, permit the student to derive lessons from their experience. The instructor may also take time to examine how student choice influences the classroom atmosphere. Autonomous learners generally exhibit innovation in their educational pursuits and readily experiment with novel methodologies. Although self-directed learners possess the innovation potential, the Zimbabwean educational system is not yet equipped to embrace this commendable objective.

b) Instructions that meet students where they are

Personalized training is tailored to each learner's specific needs and addresses their current level of understanding. It takes into account the student's previous knowledge, skills, interests, and preferred learning modalities (West, 2016). It also provides them with the support they need to succeed. There are several methods to engage kids at their current level. Differentiation constitutes one of the methodologies. Differentiation is the practice of providing students with personalized learning opportunities based on their needs (West, 2016; Sturgis, 2017). This might be accomplished by altering the topic matter, method of delivery, or educational purpose. An educator may provide students with many alternatives for completing projects or diverse reading materials based on their reading proficiency. The O-Level mathematics curriculum in Zimbabwe is tailored to accommodate pupils of all backgrounds and abilities. The syllabus also highlighted the use of diverse instructional methodologies.

Differentiation is the practice of offering pupils a variety of learning experiences tailored to their individual requirements (Sturgis, 2017; Sturgis, 2014). The lesson's content, delivery approach, or objective may be adjusted (Anderson, 2011). Based on the pupils' competency levels, a teacher may assign a variety of tasks or readings. Sturgis (2017) asserts that, when developing education tailored to students' current levels, it is crucial to recognize that each student has distinct needs. Sturgis (2016) asserts that instructors must consider each student's prior knowledge, abilities, interests, and preferred learning methods. When executed properly, the technique provides pupils with the support they need for success.

Universal Design for Learning (UDL) is an alternative methodology that serves as a foundation for developing inclusive educational resources for all students (Anderson, 2011; West, 2016). It is based on several avenues of engagement, various modes of representation, and different means of action and expression. For instance, several mathematics educators in Zimbabwe provide their pupils with a variety of instructional tools, including texts, videos, and practical activities. Learners benefit from employing diverse tactics that cater to their distinct needs.

Alongside UDL, the educator can provide the necessary support. This type of support is called scaffolding. Scaffolding can offer children temporary assistance with tasks they would otherwise be unable to accomplish (West, 2016; Vander Ark, 2015). As the learner progresses, the level of support can be gradually diminished. Teachers can provide visual organizers to help students structure their writing tasks. Mathematics instructors frequently exhibit their methods as students observe. Subsequently, pupils will execute the calculations themselves.

Alongside scaffolding, providing pupils with choices is essential for optimizing their learning potential. Students have greater autonomy when they can select educational activities that align with their needs and interests (Anderson, 2011; Vander Ark, 2015). The students' motivation and engagement levels may increase as a consequence. For instance, an educator may permit students to choose the books they wish to read for a book club or the projects they wish to do.

It is essential to recognize that addressing students' needs does not include lowering standards or assigning them simpler jobs. The emphasis is on providing students with the essential resources to achieve their fullest potential (West, 2016; Sturgis, 2014). The educator must become familiar with their pupils to offer developmentally appropriate activities. A facet of this technique is understanding their previous experiences, competencies, interests, and preferred learning modalities. In this environment, formal assessments, informal discussions, and observations can all be beneficial.

It is essential to offer pupils a variety of learning and demonstration opportunities. Instructors may facilitate opportunities for each student to realize their greatest potential. Informed educators should exhibit adaptability and sensitivity to their pupils' needs (Sturgis, 2014, 2016). The educator must be prepared to offer additional assistance to a student experiencing challenges, if necessary. Conversely, very talented kids may be assigned challenging assignments by their educators.

c) Student Evaluation

The assessment of pupils according to their proficiency in academic standards involves evaluating student learning against explicitly established criteria (Alkharusi, 2008). This type of evaluation is frequently referred to as "standards-based assessment." A fundamental aspect of conveying information on pupils' performance is standards-based assessment. The assertion that all students must have equitable access to fundamental information and skills underpins standards-based assessment (Alkharusi, 2008; Andrews, 2011). It prioritizes pupils' skills above their basic knowledge. Students may be assessed using several approaches based on their proficiency in academic standards (Buldur, S., 2014). The evaluation procedure may include written assessments and practical activities. Students in Zimbabwe are allocated CALA assessment subjects to fulfill. The CALA scores of a student constitute thirty percent of their final examination grade.

Numerous established methodologies exist for assessing students. Rubrics, portfolios, and performance evaluations are assessment activities. Andrews (2011) asserts that performance assessments are tasks that apply students' knowledge and skills in practical contexts. Performance evaluation, as noted by Collins (2012), can take several forms, including written assignments, science fair projects, and presentations. Employing diverse evaluation methods is crucial because it enables educators to identify the specific areas in which a pupil requires substantial support.

Another instance of student evaluation is the utilization of student portfolios. Klinger, Volante, & DeLuca (2012) assert that portfolios, which are compilations of student work, reflect a student's progression over time. A portfolio may encompass a diverse array of works, including exam scores, artwork, and writing. Rubrics serve as an additional instrument for assessing student success alongside portfolios. Rubrics serve as grading criteria for assessing student assignments (Klinger, Volante, & DeLuca, 2012). Rubrics often comprise a collection of criteria and an

associated grading system. An authentic assessment should be implemented. Consequently, educators must ensure that examinations are marked consistently and properly.

Specific criteria must be considered when assessing pupils' demonstrations of academic proficiency. It is essential to evaluate the following components: legitimacy, fairness, alignment, and validity. Alignment indicates that the evaluation must correspond with the anticipated academic achievement of the pupils (Shute, 2008). Any deviation from the established standards compromises the objective of an authentic evaluation.

Another factor to consider is legitimacy. The examination should assess the aims for which it was designed (Klinger, Volante, & DeLuca, 2012). A genuine assessment will rigorously examine the issues it is designed to address. In addition to validity, the assessment must be fair. Equity implies that all pupils are subject to identical evaluation criteria, irrespective of their educational background or preferred instructional method (Shute, 2008).

Reliability is another essential element. Collins (2012) underscored the necessity of obtaining correct assessment findings regularly. Reliability is crucial because it provides the evaluator with precise information about student performance. Klinger et al. (2012) observed that evaluating students based on their exhibition of mastery of academic standards is an effective strategy for enhancing student learning. It can facilitate the acquisition of essential skills and information required for student success.

Core Competencies

The seven fundamental skills defined by IBE-UNESCO (2015) must be included in the educational curricula of every nation. The essential skills that are required for success in the modern world include the ability to communicate and work collaboratively, think critically and

solve problems, use one's imagination and creativity, be a good citizen, have self-efficacy, be digitally literate, and learn how to learn.

a) Communication and Collaboration

In the twenty-first century, working together and communicating are very important for getting a task done. Collaboration is when two or more individuals work together to achieve a shared goal, whereas communication is the flow of information between them (Edgar & Lockwood, 2009). Collaboration requires excellent communication, since it facilitates the exchange of ideas, critiques, and updates among team members (Edgar & Lockwood, 2008). It also helps build the trust and camaraderie that is needed for a successful partnership.

Chungyun (2020) says that humans may communicate in many ways, including speaking, writing, and body language. Verbal communication, which includes both speaking and listening, is the most common type. Reports, emails, and letters are all examples of written communication. Nonverbal communication includes things like body language, facial expressions, and the way you speak.

It is really important to talk to coworkers in a nice, short, and straightforward way. It is also important to listen carefully and be receptive to criticism (Edgar & Lockwood, 2008; Han & Kim, 2016). Collaboration is important because it allows team members to share their skills and expertise to achieve a common objective. Working together helps you solve challenges more creatively and effectively. It can also promote morale and productivity. Students must learn to talk to each other clearly.

Chungyun (2020) notes that there are various ways to communicate, such as in person, via video chat, and on online collaboration platforms. It is important to recognize and value your teammates' ideas and labor. If you want the team to attain its goals, you too need to be willing to put in a lot of work and be flexible with your requirements. Communication is an important idea in math. One of the goals of Zimbabwe's math curriculum was to help pupils learn to work together and communicate (Mopse, 2018).

b) Problem Solving and Critical Thinking

Kim (2019) says that critical thinking is the capacity to think rationally, grasp things clearly, and see how concepts are connected. It requires the capacity to assess claims, scrutinize evidence, and formulate well-informed judgments. According to Kwon (2020), critical thinkers may spot and question assumptions, identify biases, and consider other points of view. Students can look at data while they are studying because they are creative thinkers.

Kwon (2020) defines problem-solving as the process of identifying and fixing problems. It requires the capacity to identify the issue, collect data, formulate and assess possible solutions, and subsequently execute the optimal one (Kim, 2020). People who can solve problems are flexible and inventive, and they are not afraid to attempt new things. With experience, you can learn and improve your critical thinking and problem-solving skills. Teachers are responsible for preparing their pupils to solve problems effectively.

c) Imagination and Creativity

Creativity is the ability to come up with new and interesting ideas. It is the ability to devise novel ways to solve problems (Gotlieb, Hyde, Immordino-Yang, & Kaufman, 2019). Creativity is important for progress and new ideas in many areas of life, including science, technology, art, and music. Imagination is the ability to think of or see things that are not real (Woolley, Bunce, & Boerger, 2020). It is the ability to think creatively and view things in fresh and exciting ways. Imagination is important, but it is also necessary for creativity. It helps us plan, dream, and find new ways to solve problems. Gotlieb et al. (2019) state that imagination and creativity are important skills across many areas of life. They are important for doing well in school, at work, in the classroom, and with other people.

d) Being a citizen

A citizen is a person who belongs to a nation-state or another political group (Tawil, 2013). As a citizen, you have the right to vote, run for office, and be protected by the government. They have many duties, such as serving on juries, paying taxes, and following the law. Citizenship is vital because it enables individuals to participate in democracy and have a say in how the country is run (United Nations, 2012). Consequently, individuals also feel a sense of connection and belonging. One of the main purposes of the math curriculum in Zimbabwe is to make students proud to be Zimbabweans, and citizenship is one of those goals. So, the main purpose of Zimbabwe's schools is to teach kids to be Hunhu/Ubuntu.

The United Nations (2012) identifies two major types of citizenship: citizenship by birth and citizenship by naturalization. Citizens of a country automatically confer citizenship on others born there. Naturalized citizenship is given to those who meet certain requirements, including

living in the country and being familiar with the language and laws, but who are not natural speakers of the language.

.***e) Self-efficacy***

Self-efficacy, as articulated by Wilde & Hsu (2019), is the conviction in one's capacity to achieve success in a certain context or to complete a designated task. Self-efficacy may be categorized as either general or task-specific, indicating that individuals can perceive themselves in several ways simultaneously (Bandura & Wood, 1989). Perceptions of one's self-efficacy can affect an individual's cognition, emotions, and motivation. In mathematics, students' self-efficacy is enhanced by recognizing their achievements. Positive reinforcement is crucial for establishing robust mathematical proficiency.

Kelly (2017) asserts that self-efficacy is a potent motivator affecting students' cognition, emotions, and behavior. Individuals with elevated self-efficacy are more inclined to set ambitious goals, persist in the face of adversity, and recover from failures. They are more likely to experience joy and positivity. Diverse experiences, such as active mastery, vicarious learning, and physiological condition, enhance the formation of self-efficacy. Bandura and Wood (1989) assert that the most effective approach to enhancing self-efficacy is through active mastery. The basis of self-efficacy is achievement and individual experience.

Another technique for enhancing self-efficacy is vicarious learning, alongside active learning. Observing others' success can bolster our confidence in achieving our own goals, especially when the individual we are watching is similar to us (Bandura & Wood, 1989). Students often acquire knowledge through observation.

In addition to vicarious learning, verbal persuasion serves as another means of enhancing self-efficacy. Wilde & Hsu (2019) assert that positive affirmations and others' statements can enhance self-efficacy. Students' self-efficacy often improves in reaction to affirmative feedback and reinforcement. An individual's development of self-efficacy may also be affected by their physiological state. Our self-perception may be affected by our body image (Kelly, 2015). For instance, when experiencing nervousness or anxiety, we may have diminished confidence in our own capabilities to succeed.

f) Digital Proficiency

Digital literacy refers to the capacity to use digital technology to locate, assess, generate, and communicate information (Chama & Subaveerapandiyan, 2023). It encompasses the capability to utilize computers, the internet, and various digital devices for content creation, communication, and information retrieval. Digital literacy is crucial for achievement in the contemporary landscape. It is crucial in several aspects of life, including job, education, personal relationships, and civic engagement. Examples of digital literacy include:

• Utilizing a computer to generate a spreadsheet or document.

• Performing online research.

• Developing and modifying a presentation.

• Engaging with individuals on social media.

• Employing online banking or shopping platforms; and

• Understanding the fundamentals of cybersecurity and privacy. (Chama & Subaveerapandiyan, 2023).

Digital literacy skills may be acquired via practice. Digital literacy is a crucial life skill. Enhancing your digital literacy will enable you to engage more actively in the contemporary digital landscape and generate new employment opportunities for yourself. Zimbabwe is using digital technology in mathematics. Students are now required to own computers, even though many cannot afford them due to financial constraints.

g) Metacognition

The right to learn is characterized as the ability to organize one's own education, particularly through efficient time and information management, both independently and collaboratively, as well as the pursuit and perseverance in learning (Schmidt et al., 2010). It may be used to support enduring interpersonal relationships, career objectives, and educational ambitions. The Zimbabwean Mathematics Syllabus asserts that for students to examine and interpret numerical and spatial relationships and patterns in the actual world, they must acquire and master a comprehensive array of skills, information, ideas, and methods (Mopse, 2018).

Numerous methods exist for instruction and knowledge acquisition. Schmidt et al. (2010) assert that certain individuals acquire knowledge more effectively through experiential learning, whilst others excel through reading or auditory methods. Some individuals choose self-directed learning, whilst others prefer classroom teaching (Kanadlı, 2016). The optimal study technique varies depending on the topic matter and individual learning preferences. To accommodate all pupils, the Zimbabwean mathematics syllabus recommended the use of diverse teaching and learning methodologies.

Students often must assimilate substantial knowledge to succeed in examinations. Students generally engage in active, autonomous homework that integrates memorization and elaboration

techniques to promote recall for the examination. Completing these instructional exercises requires time. Therefore, it is logical that dedicating additional time to these activities will enhance learning, provided the time is used effectively (Schmidt et al., 2010). Kanadlı (2016) posited a link between elevated academic achievement and reduced dropout rates, abbreviated study durations, and enhanced examination scores. This parallels the scenario in Zimbabwe, where pupils are required to enroll in supplementary mathematics courses to achieve passing grades.

THE DIFFERENCE BETWEEN KNOWLEDGE-BASED EDUCATION AND COMPETENCY-BASED EDUCATION

Levine and Patrick (2019) define a knowledge-based education system as the established procedures and strategies used in classrooms. Furthermore, it may denote traditional, fundamental schooling. It underscored that students ought to be educated and informed via textbooks, lectures, and standardized assessments. The traditional educational paradigm promotes teachers over learners. Conventional education is constrained by time; children in schools progress through grades at a uniform pace within age-appropriate cohorts (Tacettin & Mustafa Cem, 2021). Students continue to make progress but require additional time to grasp the content fully.

Despite students' inability to comprehend the information or skill, teachers strive to achieve the learning objectives outlined in their lesson plans within the designated timeframe. Conversely, competency-based education is centered on learning and acknowledges that students may require additional time to fully grasp the concepts and skills imparted (Levine & Patrick, 2019). Students' past knowledge is assessed, and requirements are reinforced when learning deficiencies are

identified. When ready, pupils move to the next competency level. Linear progression may be supplanted with personalized learning pathways, contingent upon the subject matter and educational objectives.

The concept that a student's success depends on factors beyond mere academic knowledge is overshadowed by the traditional educational system's narrow focus on academic performance, which prioritizes intellectual capability, rote memory, and information recall (Casey, 2018). The traditional educational framework employs a point-based system to evaluate student projects, written and oral examinations, and conduct. The concept of success varies because teachers use different grading systems. Despite the prior system's grading method suggesting recognition, it is difficult to ascertain that learning was fully achieved. In contrast, evaluation under a competency-based framework is dictated by learning and proficiency (Worthen & Patrick, 2014).

In a competency-based curriculum, errors and setbacks are regarded as essential elements of the learning process. Assessment in competency-based education (CBE) is conducted to facilitate students' academic growth, monitor their progress through the course content, and evaluate their development of essential abilities for lifelong learning. Students get comprehensive information concerning the content they must study, its application, and the criteria for mastery.

In contrast, the antiquated educational system is based on a fixed mindset that holds that an individual's talents are immutable. It further endorses the student ranking system, which establishes winners and losers among kids and maintains societal unfairness. Nevertheless, the fundamental principle of CBE is that all students should have access to greater employment opportunities and higher standards. The CBC is structured by age and emphasizes external

motivation. Although traditional curricula were developed before research on child learning and motivation, it is challenging to exclude these findings from educational systems (Casey, 2018). Conversely, CBE is predicated on existing knowledge that optimizes student motivation, engagement, and learning. Below is a summary of the CBC and the Traditional Method.

Table 2.2

Conceptual Differences between the Competency-Based Curriculum and the Traditional Method

Competency Based Curriculum	**Knowledge-Based Curriculum**
Certifications based on "observable activities demonstrated."	"Seat-time"
Competency-based assessment	"Standardized testing" (comparing students across national borders)
A "balanced curriculum" chooses a small number of important "major objectives" (medium level specificity, in between "mushy" standardized tests and "too exact" behavioral objectives)	"Segmented behavioral" curriculum measurement
"Mastery of skills" (national-local)	"Slippery" measurement, "student against student."
Flexible time structure, "as much time as needed to learn," "always opportunity to certify."	Fixed progression time units,

Modules	Group-based instruction.
Teacher directing learning	A teacher imparting knowledge
Learner centred	Teacher centred
The "focal point" is the student,	The teacher is placed in the center
The learning centers (+evaluation center), the school groups students according to topic mastery	Other students' accomplishments, testing throughout the course
Finding gaps for decision making,	Testing just for certification at the end

Source: Lassnigg (2015, page 12)

MATHEMATICAL COMPETENCIES

Niss et al. (2016) identified eight mathematical competences that may be classified into two primary categories. The ability to ask and answer arithmetic questions is what sets the first group of talents apart. This group of skills includes thinking, modeling, solving problems, and reasoning using arithmetic. The other set of skills includes talking to people, representing ideas, using mathematical symbols and formalism, and using mathematical tools and assistance. It shows that you can use and understand math language and tools. The next several paragraphs will explain each competency category and the pieces that make it up.

Ability to Think Mathematically

Being good at mathematical thinking means using mathematical concepts and methods to solve problems and make decisions. It is a complex talent that requires many cognitive functions. For example, brains with strong math skills can identify and solve problems in specific situations. They could develop and apply methods to solve problems by learning more about mathematical methods and ideas. To have this skill, you need to be able to "connect to and ask the kinds of general questions that are typical of mathematics and relate to the kinds of answers that can be expected to such questions" (Niss & Højgaard, 2019).

People who can use arithmetic to make logical conclusions are said to be good at math. They can use both deductive and inductive reasoning to solve problems and prove theorems (Kukey & Aslaner, 2023). Moreover, the ability to discern the diverse types and functions of mathematical statements (including definitions, assertions, universal propositions, existence claims, case statements, and conjectures) is essential for mathematically adept individuals. They also need to be able to connect a mathematical idea, topic, or concept to other circumstances. Mathematical activities include "abstraction," the process of making ideas and conceptions more general, and "generalization," the process of making statements more general.

Smart people who know a lot about arithmetic can explain their math ideas well. They can use graphs, diagrams, and symbols, among other things, to clarify their ideas. Mathematically adept thinkers can employ critical thinking when assessing mathematical concepts and claims (Kukey & Aslaner, 2023). They can tell if math statements are true and find mistakes. One goal of the Zimbabwean math curriculum is to help students understand arithmetic concepts. The curriculum makes it clear that students need to think logically when doing arithmetic. For kids to learn how to reason logically, teachers must be able to do it themselves.

To do well in a lot of fields, including science, engineering, business, and finance, you need to be able to think mathematically. It is an essential life skill applicable to decision-making and problem-solving across many contexts (Schmidt et al., 2010). There are several ways to help people learn how to think mathematically. The first thing to do is to give them opportunities to work on arithmetic problems that are important to them. It is also important to help students learn to discuss math concepts effectively and critically (Kukey & Aslaner, 2023; Schmidt et al., 2010). It is essential to teach pupils how to evaluate mathematical ideas and claims critically. For instance, a scientist may use mathematical models to determine how a new illness can spread, and a student may use their knowledge of geometry to determine how much chlorine to buy for a triangular swimming pool.

Ability to Solve Math Problems

Mathematical problem-solving ability is the ability to use arithmetic knowledge and skills to solve problems in different situations. The ability to identify and solve a variety of arithmetic problems across different areas of mathematics is referred to as problem-solving competency (Kukey & Aslaner, 2023). Boesen, Lithner, and Palm (2016) also say it can mean starting a task without knowing how to solve it. It is a complex skill that requires considerable thought, including identifying the problem, developing a strategy, implementing it, reflecting on it, and monitoring it. These processes are typically linked to one another and do not always happen in a straight line. People may go back and forth between different phases of problem-solving, changing how they do things based on what they know and how far they have come.

Being good at arithmetic helps people who solve problems understand the basic parts of an issue and the subject matter, which in turn helps them develop a plan of action (Amador et al.,

2022). They can understand arithmetic concepts and perform arithmetic. They can employ appropriate arithmetic skills and methodologies. People who are good at math may also examine their work to ensure it is correct and complete (Cai et al., 2022). Being able to answer arithmetic problems is important for success in many areas, including business, science, engineering, and finance (Blömeke et al., 2022). It is an important skill for life, as you can use it to solve problems and make decisions in many different scenarios. The main aim of this skill is to critically analyze and evaluate your own and others' attempts to solve problems.

The first approach is to let kids work through arithmetic problems that are relevant to them. It is essential to foster students' integrated communication skills, verbal and mathematical reasoning abilities, and other cognitive competencies (Amador et al., 2022). It is important to understand how well pupils can solve arithmetic problems and find answers. Students can use their arithmetic skills to determine item prices in word problems (Cai & Jiang, 2017). A teacher can create a lesson plan that shows students how to solve multi-step math problems. A scientist can use mathematical models to plan an experiment to test a hypothesis. So, Zimbabwe's mathematics curriculum encourages students to use mathematics in all their classes. Mathematics must not be seen as an isolated topic but as a complex discipline that may be amalgamated with other fields.

Mathematics competencies

Competence in Mathematical Modeling

Lee and Choy (2017) define "mathematical modeling competency" as the ability to apply mathematical concepts and procedures to develop and solve real-world problems. Modeling competence is the skill of evaluating and creating models for non-quantitative scenarios. It shows that you can handle circumstances, challenges, and situations unrelated to math. In addition to the

skill of creating mathematical models, it is also important to be able to critically analyze and evaluate existing models and model suggestions while keeping in mind the facts, data, goals, features, and attributes of the extra-mathematical domain being modeled (Dick, Lovett, McCulloch, Edgington & Casey, 2020). Many different mental processes are needed to be good at mathematical modeling.

Modelers who are good at math can identify the most important parts of a real-world problem and what must be repeated (Cai & Jiang, 2017). So, a modeler who is really good at arithmetic may use algebra to show what is happening in the real world. It is important to accurately identify and explain the required mathematical ideas and steps. The Zimbabwean mathematics curriculum includes modeling skills because applying mathematical reasoning and articulating mathematical ideas well are important parts of mathematical evaluation (Mopse, 2018).

Modelers who are good at arithmetic may also develop a mathematical model for a real-life situation. You can do it with either numbers or math. Consequently, users may analyze the model's output and apply it to address an actual problem (Dick et al., 2020). This can mean testing the model, generating ideas, or making suggestions. A solid understanding of mathematical modeling is essential for success in many fields, including science, engineering, business, and finance. It is an important life skill, as it may help you make smart choices about difficult problems.

To get into a university in Zimbabwe to study science, a student must have passed Form 4 mathematics. To go into teacher training programs, nursing schools, and polytechnic institutes, you need to have passed O-Level math. It is essential to examine math teachers' perspectives on the CBC's delivery of modeling skills in the present study.

Competency in Mathematical Reasoning

Mathematical reasoning (Mason et al., 2010) is the ability to make or evaluate arguments, such as a set of statements linked by deductions and given orally or in writing to back up arithmetic ideas. It also means being able to use logic and math to figure things out and come to conclusions. This talent includes both the capacity to actively defend mathematical statements and the ability to judge and critically examine past or future attempts to justify them. Mathematical reasoning is valid when conclusions and judgments are explicitly substantiated by the reasoning (Blömeke et al., 2022). It necessitates a complex interplay of cognitive functions.

Learners who are good at arithmetic can see and understand how different ideas and concepts are related to each other mathematically. Students who are good at math may construct and use mathematical arguments to support their claims. The ability to think logically about arithmetic lets you judge the strength of other people's arguments and find any errors or contradictions (Blömeke et al., 2022). Individuals with strong arithmetic skills may apply their knowledge to make choices across many different scenarios.

Henderson et al. (2001) characterize mathematical thinking as the application of mathematical knowledge, concepts, and methods to problems and difficulties across several subjects, either directly or indirectly. Numerous scholars have employed various definitional methodologies to elucidate mathematical reasoning in this setting (Mason et al., 2010). Amador et al. (2022) define it as the process of collecting and evaluating data, formulating and testing hypotheses, making predictions, experimenting with outcomes, and examining phenomena. Mason et al. (2010) characterize mathematical reasoning as a dynamic process that integrates notions to simplify complicated systems.

Developing mathematical thinking involves using experience-based knowledge to connect ideas to actions, improve problem-solving abilities, and understand how math is useful in everyday life. The subjects of the Zimbabwean math syllabus help students think mathematically. So, one of the key purposes of the math course in Zimbabwean high schools is to teach students how to use statistical data manipulation to conclude (Mopse, 2018). Manipulation, which involves gathering and analyzing data, is an aspect of mathematical reasoning.

Mathematical Representation Competency

Mathematical representation competence refers to the ability to utilize various representations of mathematical concepts and ideas (Kukey & Aslaner, 2023). This aptitude highlights the ability to comprehend, convert, and alternate among various representations of mathematical entities, relationships, phenomena, and processes. The ability to choose and use diverse representations to solve mathematical problems and situations is also highlighted.

Mathematically skilled learners can translate mathematical ideas and concepts into various visual representations, including symbols, graphs, and diagrams (Cai & Jiang, 2017). They are also proficient at deciphering these representations. They can comprehend mathematical representations after they have been deciphered. Robust mathematical foundations enable students to convey thoughts and ideas across many mathematical topics (Cai & Jiang, 2017). For example, they can transform a word problem into an algebraic equation or a graph into a set of values. Generalization can use many mathematical concepts interchangeably. Mason et al. (2010) defined generalization as the process by which individuals extrapolate conclusions to a broader array of topics from a limited number of instances. When students can transfer solutions from one issue to another, they begin to develop their generalization skills. Consequently, generalization is a

formidable challenge. Students must use mathematics to demonstrate the relationships among the variables in this procedure.

Students proficient in mathematics can determine the most suitable representation for a certain activity or context. It is plausible to assert that selecting the optimal representation is entirely conjectural. Conjecturing is the act of inferring potential links that are not yet established by analyzing relevant instances and assessing their interconnections before concluding (Blömeke et al., 2022). The ability to discern and assess hypotheses is fundamental to mathematical thinking. Thus, speculation is seen as a repetitive process (Mason et al., 2010). Students may choose to use a graph to depict the correlation between two variables or to solve an algebraic equation. Proficient mathematical representation abilities are crucial for success in several domains, including science, engineering, business, and finance.

It is a crucial life skill applicable to problem-solving and decision-making across many situations. Proficiency in Managing Mathematical Symbols and Formalism
The ability to comprehend and use mathematical formalism and symbols across many contexts is referred to as "handling mathematical symbols and formalism competence" (Cai et al., 2022). Experts denote this competency as the ability to engage with and manipulate mathematical symbols, symbolic expressions, transformations, and the governing rules and processes. This competency relies on the implementation of symbols and formalism to address mathematical contexts; conversely, it requires the interpretation and understanding of instances of symbolic expressions and transformations, alongside existing formalism (Blömeke et al., 2022). The ability to comprehend and utilize mathematical formalism and symbols across many contexts is referred to as "competence in handling mathematical symbols and formalism." Experts define

this competency as the ability to engage with and manipulate mathematical symbols, symbolic expressions, transformations, and the governing laws and protocols (Chama & Subaveerapandivan, 2023).

This competency depends on applying formalism and symbols to address mathematical contexts; concurrently, it encompasses interpreting and comprehending symbolic expressions and transformations within the existing formalism. Mastery of mathematical symbols and formalization is essential for success in several fields, including science, engineering, mathematics, and computer science (Dick et al., 2020). It is a vital life skill, enabling individuals to resolve issues and develop perspectives across many situations. The term "mathematical competence" has long been employed to describe an individual's overall understanding or application of mathematics.

Niss and Højgaard (2019) asserted that comprehending ideas, symbols, and techniques, together with their interconnections, is essential for mathematical proficiency. The Zimbabwean mathematics curriculum emphasizes students' use of mathematical algorithms to solve arithmetic problems. One of the evaluation objectives is to evaluate whether students can employ appropriate equations, techniques, and processes to resolve both routine and non-routine problems. This objective is a component of the Zimbabwean curriculum-based curriculum (CBC) in mathematics.

Competence in mathematical communication

Mathematical communication proficiency is the ability to articulate mathematical concepts in both written and verbal forms. It is generally the capacity to engage in or converse about mathematics. Niss and Højgaard (2019) assert that it involves articulating mathematics across many levels, registers, and styles. Engagement is described in this context as the process of

information exchange between people via a broad system of symbols, signals, or behaviors. Watson & Ohtani (2015) assert that children acquire mathematical knowledge most efficiently when they can implement the ideas in real situations.

Niss and Højgaard (2019) assert that mathematical communication skills encompass the ability to understand, analyze, assess, and respond to mathematical concepts, as well as to articulate them using language, notation, and symbols. Standards for mathematical communication in mathematics education must be established. The criteria stipulate that students may "utilize mathematical language to articulate mathematical concepts, organize, and consolidate their communicative thoughts." One of its principal reasons is as follows. Through verbal interaction, students may "analyze and evaluate the mathematical reasoning and strategies of others while articulating their mathematical ideas coherently and clearly to peers, educators, and others" (Niss & Højgaard, 2019).

Writing will facilitate the advancement of language for articulating mathematical concepts, understanding, and linkages. Astati and Leonard (2015) indicate that students have enhanced their conceptual understanding and problem-solving abilities, thereby aiding the resolution of misconceptions in mathematics. Cognitive style influences mathematical communication abilities (Ariawan & Nufus, 2017). The advancement of language for conveying mathematical concepts, understanding, and linkages will be facilitated by writing.

Students have successfully dispelled prevalent misunderstandings about mathematical ideas through enhanced conceptual knowledge and problem-solving skills (Ariawan & Nufus, 2017). Cognitive style affects mathematical communication skills. Junita's study (Rohid et al., 2019) revealed that students' communication and representation skills in mathematics varied by

field of study. Language, or mathematical communication, is an essential element of mathematical education as it enables the exchange of ideas and offers tools for conceptual elucidation. Moreover, it is essential to promote students' self-expression through mathematical instruction. Manouchehri (2007) contends that enhancing one's quantitative communication skills is crucial because it enables educators and learners to conduct more thorough analyses of the subject matter.

The concept of classroom engagement encompasses both audible and nonverbal interactions (Rohmah, 2017). Dialogue and conversation are synonymous. Discourse is essential because it adheres to the communication standard, which mandates that all students be equipped by their educational programs to evaluate and analyze others' mathematical reasoning and strategies, articulate mathematical concepts accurately using mathematical terminology, and convey mathematical ideas to peers, educators, and other stakeholders clearly and coherently. (Rohmah, 2017).

Proficiency in Mathematical Aids and Tools

Mathematical competence refers to the ability to utilize mathematical tools and resources effectively. The initial component of the aids and tools competency involves understanding the existence and characteristics of various relevant aids and tools, including digital instruments used in mathematics, along with their limitations and potential applications across diverse contexts (Zikirova, Turdubaeva, Saadalov & Abdullaeva, 2021). Secondly, it entails the ability to use resources and tools judiciously. It entails performing mathematical processes with tangible equipment and resources. This encompasses both physical and technological tools.

The ability to proficiently utilize tools and aids in mathematical tasks, along with the capacity to critically evaluate one's own and others' application of these resources, is the

fundamental aspect of this skill. Proficiency in utilizing aids and tools denotes the ability to employ them judiciously. In contrast, the requirements for this knowledge include awareness of the relevant mathematical tools and an understanding of their limits and potential applications across different contexts (Niss & Højgaard, 2019).

Historically, mathematicians have engaged with and preserved mathematical entities and phenomena, particularly with calculations and measurements, using various technical methods. This encompasses resources such as tables, protractors, logarithmic and normal distribution paper, as well as information and communication technology (ICT), including spreadsheets, abacuses, slide rules, calculators, and computers equipped with arithmetic, visual, and computer algebra capabilities (OECD, 2013). Expertise in utilizing and engaging with this technology is referred to as mathematical aids and tools. Considering that each of these aids employs one or more forms of mathematical representation, there exists a strong correlation between the presenting competency and the aids and tools competency. Mathematically adept individuals can select appropriate tools for certain tasks. They may select the most advantageous instrument for the work, having recognized the merits and downsides of each (Niss & Højgaard, 2019).

Students can receive instruction and support in the proper use of mathematical tools and aids. Consequently, it is important for students to meticulously follow the instructions to effectively address potential challenges (Zikirova et al., 2021). Utilizing appropriate mathematical tools and support, the learner may successfully interpret the results. Proficiency in mathematical tools and support is essential for several fields, including business, science, engineering, and mathematics. Instrumentalization is closely associated with the proficient application of mathematical tools. The connection between the tool and the user is

termed "instrumentalization duality" (Artigue, 2010). This illustrates how a tool influences a student's cognition and conduct (instrumentation) and how a student's comprehension governs their usage of an artifact (instrumentalization). It is a crucial life skill, as it can be used to resolve issues and make decisions in many situations. According to Niss and Højgaard (2019), these skills are designed to be different, signifying that each possesses a unique character while being interconnected.

This research establishes the theoretical foundation for our inquiry, which seeks to determine whether students' performance in these mathematical process skills has improved over the past decade. This study examined math instructors' perceptions of the implementation of the competency-based curriculum (CBC), which is predicated on mathematical competence as the basis of the mathematics curriculum in Zimbabwe. The utilization of technology can enhance the achievement of competencies.

IMPACT OF TECHNOLOGIES ON MATHEMATICAL COMPETENCE DEVELOPMENT

The contemporary educational system asserts that all new professionals, regardless of specialization or occupation, must possess a profile encompassing professional skills, experience, and foundational knowledge. To undertake new tasks, they must possess prior expertise in social and evaluative actions, as well as in creative and research endeavors with pupils (Zikirova et al., 2021). The CBC in mathematics in Zimbabwe focuses on integrating technology, including e-learning. Consequently, the influence of technology on the advancement of mathematical competence in the present study cannot be overlooked. The study aimed to assess mathematics

educators' understanding of competency-based curriculum and to explore their perceptions of integrating technology into CBC.

Technology may solely enhance the development of mathematical skills in several ways. Technology provides students with access to a range of mathematical resources, including interactive exercises, films, and online textbooks (Arnold et al., 2018). Consequently, students may acquire new concepts and skills at their own speed and in their own manner. Students may access a range of mathematical resources, including interactive lectures, exercises, and exams, through online textbooks and learning platforms. These platforms facilitate monitoring student progress and provide educators with insights into students' academic performance. Zimbabwe implemented online education during the COVID-19 epidemic.

The application of e-learning methodologies illustrates CBC's utilization of technology. Therefore, it is essential to determine whether mathematics educators regard the integration of technology as part of CBC. Technology facilitates interactions and collaboration between students and teachers, as well as among students themselves. This encourages children to express their ideas and understanding, to acquire information from one another, and to request help when faced with difficult problems (Artigue, 2010). Students can construct and investigate geometric objects and forms with geometry software. This program enables students to enhance their spatial thinking skills and comprehend geometric relationships. Digital representations of physical objects, known as virtual manipulatives, are used to teach and understand mathematical ideas.

Virtual manipulatives help students visualize mathematical ideas, enhance their problem-solving abilities, and understand how mathematics applies to real-world scenarios. Educators may utilize technology to provide students with personalized learning experiences

tailored to their interests and specific requirements (Moreno-Guerrero, Aznar-Díaz, Cáceres-Reche, & Alonso-García, 2020). This can expedite learning and enable children to achieve their maximum potential in mathematics. Students may benefit from using calculators and graphing tools to enhance their understanding and ability to solve complex mathematical problems. These tools can aid students in the practical application of mathematics and in developing problem-solving skills.

Enhancing student engagement and accessibility in mathematics: Technologies can improve these by facilitating learning through interactive games, simulations, and multimedia experiences. In 2018, Arnold and colleagues encouraged youngsters to adopt a positive perspective towards mathematics, thereby enhancing their enjoyment of the subject and elevating their drive to learn. Educational games and simulations facilitate the rapid and efficient acquisition of mathematical concepts by students. Besides imparting new concepts and skills to students, these simulations and games can reinforce their existing knowledge. It is essential to recognize that technology cannot substitute for high-quality training. However, technology may also be used to enhance education and provide students with additional opportunities for growth and learning (Levine & Patrick, 2019). When used effectively, technology can significantly help students enhance their mathematical skills. Mathematical technology is applied at several levels in Zimbabwe.

EMPIRICAL STUDIES ON COMPETENCY-BASED CURRICULUM

This section critically examines empirical studies on competency-based curriculum (CBC) conducted globally. The review employs a layered approach, beginning with a global perspective that

synthesizes research and experiences from multiple countries and continents. This structure facilitates a comprehensive understanding of competency-based curriculum implementation and research across diverse educational systems. The analysis then narrows to the African context, identifying regional trends, challenges, and successes in adopting competency-based approaches. The final focus is on Zimbabwe, where studies and reports on the national educational landscape are examined to situate the research in its local context. For clarity, the terms competency-based curriculum (CBC), competency-based learning (CBL), and competency-based education are used interchangeably in this study, as all refer to an education system organized around the development of specific learner competencies.

Studies on Competency-Based Curriculum in Asia

An extensive study was conducted to assess the feasibility of implementing a competency-based curriculum (CBM). Research in Turkey by Tacettin and Mustafa indicates that competency-based education cultivates several skills, including collaboration, creativity, problem-solving, and analytical thinking (Tacettin & Mustafa Cem, 2021). Throughout their lives, pupils equipped with lifelong learning skills can become self-reliant, adaptable, efficient, and autonomous adults. The objective of the present study was to determine whether this conclusion is valid in the context of Zimbabwe.

Hassanein (2021) conducted a study to evaluate EFL faculty members' overall comprehension of competency-based learning and the degree to which their pedagogical practices and EFL course descriptions align with competency-based education. The study's findings were expected to facilitate the effective implementation of competency-based learning at Northern Border University (NBU) in the Kingdom of Saudi Arabia. The survey findings indicated that

faculty members at Northern Border University (NBU) possess a moderate level of awareness of competency-based learning.

Their comprehension of competency-based learning was inadequate. They could not exhibit a deeper understanding of the principles behind competency-based learning. The conventional fixed-time teaching method underpins their educational philosophies. Although the study was conducted at the university level, the findings can be used to draw specific inferences about the ongoing examination of mathematics educators' comprehension of the competency-based curriculum in Zimbabwe. This study used the premise that lecturers lacked a complete understanding of competency-based learning to evaluate mathematics professors' mastery of competency-based curriculum.

Nederstigt and Mulder (2010) concluded in their study, Evaluating the Matrix of Competence-Based Education in Indonesian Higher Education, that although competency-based education has gained popularity, its implementation in non-Western countries may be counterproductive and convey a neo-colonialist undertone unless it is meticulously adapted to align with local labor market requirements. Historical evidence in Indonesia demonstrates that education serves as a formidable instrument. Policymakers must meticulously evaluate the risks associated with effectively leveraging possibilities to replicate or modify cultures. Further study is essential to comprehensively comprehend the impact of society on students' holistic development. This will aid in resolving the debate over whether CBE should advocate new principles of democracy and individualization or adhere to societal dictates. The project's success hinges on

CBC, an innovative educational method regarded as a solution to Zimbabwe's social and economic challenges.

Melaibari and Ismail (2022) conducted a study to improve the mathematical thinking, reasoning, representation, manipulation of mathematical symbols, and formalism competencies of first-year undergraduate students by implementing the "Realistic Mathematics Education" (RME) learning strategy. A six-week quasi-experiment was conducted using an RME-based pre-calculus curriculum, with 39 students in the treatment group and 44 in the control group. The findings indicated that RME substantially enhances students' mathematical skills, with representation competency being the least proficient and the manipulation of mathematical symbols and formalism being the most proficient. Overall, the four competence pairings showed no significant differences. Melaibari and Ismail (2022) advocated that Saudi institutions adopt the RME learning approach and adopt competency-based education to enhance students' mathematics abilities and meet market demand for skilled labor.

Wawan and Retnawati (2022), in their empirical study on variables influencing students' mathematics learning performance in Indonesia, found a positive correlation between students' perceptions of teacher competence and their desire to learn mathematics. It was determined that, although not statistically significant, students' views of instructors' abilities exerted a favorable influence. These findings contradict previous research indicating that students' attitudes and motivation to learn are influenced by their perceptions of instructors' competence; hence, educators should consistently strive to foster students' favorable perceptions of instructors' competence.

Moreover, learning motivation was found to be affected by factors beyond judgments of instructors' competence.

Studies on Competency-Based Curriculum in Europe

The objective of Kostikova et al.'s (2019) research was to ascertain the impact of a competency-based learning strategy in foreign language instruction on students' achievement in obtaining their initial English certificate. Their study indicates that competency-based training is the most effective way for teaching foreign languages for specific purposes. This study primarily examines the implementation of CBC in mathematics; nevertheless, the findings regarding foreign language education may be relevant, as mathematics is taught in Zimbabwe, where the majority of pupils are English language learners. The findings indicate that collaborative teacher learning may facilitate future CBE implementation and that CBE adoption has mostly realized its potential to enhance student employment preparation. This outcome indicates that, when implemented effectively, CBC can promote collaborative learning among teachers. One purpose of the current study was to ascertain whether Zimbabwean mathematics educators prioritize the CBC component in their education.

The research conducted by Cevikbas, König, and Rothland (2023) indicated that educators have difficulty with lesson planning and that their overall proficiency does not reach expert levels. Their performance and skills in lesson preparation demonstrated diminished efficiency and fluency, inadequate emphasis on facilitating learning, and careless selection of student activities. Teachers, especially novices, encounter difficulties with class preparation, particularly in

effectively integrating all aspects of the methodology. Thus, for teachers to get proficiency, they need a comprehensive academic foundation and practical knowledge in the domain.

In their paper entitled ‘A comprehensive literature analysis of the current discourse on mathematical modeling competencies: state-of-the-art advancements in conceptualization, measurement, and enhancement.’ Cevikbas, Kaiser, and Schukajlow (2022) discovered that modeling abilities differ across individuals. The research indicated that a systematic, bottom-up methodology is dominant in conceptualizing abilities and differentiating among various sub-competences.

The predominant method for assessing modeling abilities is non-standardized evaluation; nevertheless, the study also revealed a variety of alternatives. Many papers presented training methodologies for developing and imparting modeling competencies to modeling course instructors. The comprehensive evaluation of the literature emphasizes the need for further theoretical exploration of mathematical modeling competencies, while underscoring the diversity of existing empirical methodologies and their applicability across various educational levels and the extensive range of educational contexts in which they are implemented. This conclusion will examine Zimbabwean mathematics educators' understanding of mathematical competence. The effective execution of CBC in mathematics relies on implementers' understanding.

Gavrishina and Zaharov (2015) demonstrated that a competency-based approach to teaching professional mathematicians facilitates a seamless and prompt transition into the workforce for graduates. It is contingent upon the requirements of the labor market and prospective employers in the Kuzbass area. The examination of the economic development challenges facing

modern society reveals a disparity between the conventional university education currently offered and the requirements of local industry for highly qualified professionals. The study concluded that the preparedness of mathematics faculty graduates for the workforce is influenced by the curriculum design of higher education institutions, which emphasizes collaboration with businesses, advances in scientific research, and innovative solutions to regional development challenges. The activities of a professional mathematician are assured to be effective if they exhibit the following essential attributes: the ability for autonomous learning, proficiency in addressing practical economic issues under the mentorship of faculty graduates, and the cultivation of systemic thinking grounded in mastery of algorithmic methodologies.

Blömeke, Kaiser, König, and Jentsch (2020), in their study titled ‘Profiles of mathematics teachers’ competence and their relation to instructional quality,’ emphasized that the notion of teacher competency encompasses a wide range of generic and subject-specific attributes about the skills, knowledge, and attitudes of mathematics educators. These characteristics were evaluated consistently using validated instruments. Blomeke et al. (2020) summarized their findings on the correlation between the four competency profiles and instructional quality (INQUA).

These findings may provide insight into questions about mathematics instruction: what degree of proficiency qualifies a teacher as "competent," and can strengths in other areas compensate for deficiencies in certain areas of competence? Literature widely recognizes that classroom management is a requisite yet insufficient prerequisite for a teacher to apply the other INQUA components effectively. Evidence suggests that other factors may be more significant for student achievement. The initial class profile seemed to be the most promising in this respect.

Research employing larger sample sizes may validate this profile and demonstrate a correlation between it and both student achievement and INQUA. This would support the notion that effective mathematics educators need advanced knowledge and skills. This implies that a particular belief profile is less relevant.

Studies on Competency-Based Curriculum in America

Ryan and Cox (2017), in their study conducted in the United States, found that competency-based policies encompass both those that transform the educational system entirely from a time-based to a learning-based framework and those that only provide flexibility in credit allocation. Because state legislation does not mandate or limit the extent to which districts may adopt competency-based education, evaluating the impact of these changes on student outcomes is challenging. Districts are required to implement a competency-based diploma program across several states. Districts in other states may determine whether any or all components of the reform apply. The study's findings highlight the value of student feedback as a resource for state and district officials seeking to understand classroom implementation of competency-based education (Ryan & Cox, 2017). Student perspectives may inform forthcoming policy modifications. A recent study indicates that using these questionnaires to collect data on students' classroom experiences can yield highly reliable feedback on classroom dynamics, making them a valuable resource for implementation insights.

Evans, Erika, and Thompson (2020) conducted a study to identify variables affecting student outcomes, K–12 competency-based education (CBE) implementation, and the correlation between implementation and outcomes, revealing many factors that affect the effective

implementation of a competency-based curriculum. Barriers to the implementation of K–12 competency-based education were consistently identified across the studies. Specific elements perceived as impediments in particular contexts were regarded as enablers in others, contingent upon the degree of implementation. The investigation of the advantages of competency-based education (CBE) for K–12 students yielded inconclusive findings concerning its purported effects on (a) academic performance and development; (b) intrinsic motivation and engagement; and (c) other significant academic outcomes.

General studies on Competency-Based Curriculum

Lito et al. (2021) conducted research to investigate competency-based learning and quality education that enhance teaching modalities in the new normal, with competency-based learning programs aligned with student requirements. The study's results demonstrated how competency-based learning and programs can be tailored to address each student's distinct needs. Students felt competent in demonstrating their understanding of the content and may initiate their learning by completing an evaluation, earning credit, and experiencing a sense of empowerment. They have autonomy over the timing and location of assignment and exam completion, and they receive help throughout the entire educational process. Ultimately, students benefit from free education, as the curriculum is tailored to their needs, allowing them to complete their courses and degrees at their own pace. The statistics indicated a marked distinction in the improved quality of education and competency-based learning in the new normal. This outcome established the benchmark for the present study, which investigates educators' viewpoints on the implementation of CBC in high-quality education.

Studies on CBC in Africa

In his research on competency-based education (CBE) in Africa, Kusaka (2020) observed that concerns about the quality of education were prevalent across several African nations, where educational systems are still developing. There was a possibility that the phrase "competency-based" would be overused. If that happened, there would be an emphasis on general competency rather than on developing basic knowledge and skill sets. Furthermore, an instructor who lacks the necessary expertise and ability may evaluate general capability differently.

There is a possibility that lessons might be condensed to an activity-based curriculum. Because African nations continue to maintain insufficient educational standards, children must develop the skills required for reading and numeracy before beginning primary school. As previously stated, to foster the development of general abilities, a fundamental knowledge and skill set is required. To guarantee that these traits are encouraged, more theoretical and empirical studies on curricula will be essential.

Because children's learning environments, subject-matter expertise, and teaching practices vary from nation to nation and region to region, the strategies used to help children in affluent nations acquire the fundamental skills of reading and numeracy will differ from those used in other countries. As a result, our research took into account the fact that CBC provides high-quality mathematics instruction. The truth of this statement is still to be determined.

Mundine's (2022) research on geography teachers' receptiveness to implementing a competency-based curriculum (CBC) in secondary schools in Eastern Africa yielded numerous findings. According to the survey results, the majority of head teachers and geography instructors

had a very limited understanding of the competency-based curriculum (CBC). Nevertheless, several participants admitted that if they had received in-service training one year prior to implementation, they would have been somewhat prepared to introduce the competency-based curriculum (CBC) in high schools. As a result, it is advisable to conduct a scenario analysis to assess how well prepared instructors in other social science fields are to apply the CBC in high school. Teachers and school administrators will be required to participate in routine retraining sessions to ensure the new curriculum is effectively implemented. The results of the study can be applied to mathematics, even though the study focused on geography. This was because it was believed that Zimbabwean mathematics teachers lacked the training to adopt a competency-based curriculum.

The Ruiru District in Central Province served as a case study for Nganga's 2014 investigation into the promise and challenges of teaching and studying environmental education (EE) in secondary schools in Kenya. Data were collected through surveys, attitude scales, and content analysis of the secondary school curricula for the selected environmental education subjects. The findings of the content analysis of the chosen subjects' curricula were tabulated to illustrate the specific environmental education-related topic and the objectives included therein. The data, presented in both textual and tabular formats, was analyzed using percentages, means, and frequency tables. According to the study's findings, although environmental education is sufficiently included in the secondary school curriculum across the disciplines it covers, teachers encounter several obstacles when attempting to teach environmental education components in these subjects. These obstacles include, but are not limited to, the scattering of environmental

education themes across many courses, a lack of teaching materials, teachers' lack of readiness to discuss environmental education-related topics in their subject areas, and an overreliance on the lecture style.

Muola (2012) explored the link between a student's motivation to achieve academically and their familial environment, as well as their academic performance. Furthermore, to determine whether gender and/or differences in geographic location may account for variations in students' academic performance and motivation. The study revealed a strong relationship between students' drive to succeed academically and their classroom performance. However, its findings were also influenced by several other variables that varied from student to student. It was found that the correlation between family environmental qualities and academic success was very slight. A notable association was observed between the father's employment and the student's English language skill level. Additionally, the data showed a significant positive correlation between the size of the student's home and Kiswahili proficiency. The pupils' performance in the following subjects showed a substantial negative correlation with their mothers' employment: mathematics, science and agriculture, geography, history, civics and religious education, art and crafts, home science, and music.

In 2023, Ouko investigated to clarify the teacher's role in curriculum development as an agent of change. The teacher factor, defined as the establishment of the staff, is generally considered the most significant barrier to curriculum change. Despite several other known obstacles to curriculum reform, the teacher factor is the most frequently recognized. On the other hand, the quality of the teacher's skills and abilities was equally crucial. Teachers must have

adequate training and be prepared to teach. The purpose of the article was to identify the teacher factor as an obstacle to the effective implementation of the competency-based curriculum (CBC) in Kenya. It did so by investigating the present trends in CBC implementation in Kenya. Teachers were not adequately prepared or trained for the CBC rollout, according to the review's findings. As a result, the study recommended that the government provide programs to prepare teachers for their careers, in addition to the existing teacher training institutes (TTCs). That would help provide teachers who are already working with new abilities.

In his research on competence education in Kenya, Owala (2021) concluded that teachers lacked sufficient training and preparation for the rollout of the competency-based curriculum (CBC). As a result, the study suggested that in addition to teacher training centers (TTCs), the government should also make teacher preparation programs available. That would be beneficial by giving instructors who are already employed additional skills. The students are making progress and pursuing their education in accordance with the curriculum's instructions. However, the competency-based curriculum will not be properly implemented unless the problems are effectively addressed.

In their 2022 research in Kenya, Jesse and Olela found that the scarcity of high-quality teaching and learning resources was a key impediment to the seamless implementation of the CBC. In addition, they stated that there had been occasional delays in publishing the books, development pauses, and periodic issues sourcing certain titles. There was a certain degree of disappointment among parents and instructors who relied on those publications for their pupils' education. Jesse and Olela (2022) emphasized that a chronic shortage of workers in Kenyan public schools was an

ongoing problem, alongside a scarcity of supplies. It was predicted that to address current teacher shortages, more than 100,000 instructors would be needed at the elementary and secondary school levels. The high student-to-teacher ratio resulting from the instructor shortage led to inadequate, individualized instruction and learning. In conclusion, the researchers observed that although information and communication technology (ICT) literacy is considered an essential ability in the competency-based curriculum (CBC), the majority of instructors lack the necessary ICT skills. When technology is used as a partner in education, it can assist both teachers and students in learning new concepts. In this period of rapid technological advancement, instructors found it challenging to implement the curriculum because they lacked a sufficient understanding of information and communication technology (ICT).

Kabombwe and Mulenga (2019) conducted an inquiry on the usage of competency-based teaching and learning by history teachers in the Lusaka district of Zambia. They employed a mixed-methods approach in their research. According to the study, 67% of participants had difficulty grasping the concept of competency-based learning. This instructional approach focuses on students' ability to demonstrate mastery of specific skills and knowledge. The study also found that instructors did not use competency-based methods because they lacked the knowledge and skills to implement them effectively.

Several significant aspects related to competence evaluation were highlighted in South Africa by Khuzwayo's (2020) research. The study found that the evaluation phases enable students to work independently, take responsibility for attaining higher levels of competence, and develop a comprehensive, integrated body of knowledge, skills, and abilities. As stated in the report,

students consider competency-based assessment a fundamental component of the learning process and a reliable approach for evaluating their performance. In their research in Zambia, Mutale and Kabombwe (2019) argued that competency-based learning was equivalent to mastery-based learning.

Students in competency-based learning programs, also known as proficiency- or mastery-based learning programs, can progress through their courses based on how well they demonstrate their understanding of the material. On the other hand, the automatic promotion of students from the seventh grade in primary school to the eighth grade in high school, a component of Zambia's educational system, directly contradicts the country's adopted competency-based curriculum. To ensure that every student can acquire the skills necessary to advance to the next level, schools and instructors should offer a wide range of educational resources and support. This will allow students to make progress at a rate that is both significant and appropriate for them. Zambia's competency-based curriculum is already experiencing a lot of difficulties in terms of the accessibility of teaching and learning materials, as well as the pedagogical subject knowledge that instructors have, which is necessary for this sort of instruction, in addition to the fact that there is a lack of understanding of competency-based learning, which is a major issue in and of itself.

In their paper titled Background Paper on Secondary Education in Africa: Curriculum Reform, Assessment and National Qualifications Frameworks, Fleisch, Gultig, Allais, and Maringe (2019) explored the following questions:

- What kinds of curriculum reform have occurred in Sub-Saharan Africa (SSA) since 2007, and why have some countries moved further with curriculum reform than others?

- How successful has the practical implementation of new curricula been? Given the challenges, how can resource-constrained ministries implement curriculum reform on the ground?
- To what extent has the new curriculum content promoted 21st century skills (like creativity, critical thinking, cognitive flexibility, and emotional intelligence), as well as employability and entrepreneurial skills, as opposed to memorization of facts?
- What strategies have worked in getting the most marginalized groups to benefit from secondary education and employment skills to enable them to compete with their more privileged counterparts?"

Fleichs et al. (2019) found in their review that some researchers, including those who studied competency-based teaching practices in Cameroon, argue that insufficient funding was the root cause of poor CBC implementation. Apart from poor funding, others, such as Komba, who researched Tanzanian teachers' practices, drew attention to the discrepancy between secondary school teachers' pedagogy and the anticipated outcomes of competency-based lesson plans (in particular, increased student participation in the learning process). In this regard, some teachers resorted to traditional teaching methods rather than implementing learner-centered methodologies. In addition, resource constraints, low teacher morale, and limited English proficiency were identified as causes of poor curriculum implementation in countries such as Rwanda and Zimbabwe.

Mutsinzi et al. (2017), in their study titled "Implementation of competency-based curriculum (CBC) in Rwanda: The Case of Mathematics," concluded that without improving the

quality of teachers' questions, it is difficult to build learners' competencies. The study highlighted that although the Rwandan mathematics curriculum was competency-based, teachers' questions still reflected a knowledge-based curriculum. This finding is important to this study, which aimed to analyze Zimbabwean mathematics teachers' perceptions of the implementation of CBC in Mathematics.

A study by Dorimana, Uworwabayeho, and Nizeyimana (2021) in Rwanda, titled "Examining Mathematical Problem-Solving Beliefs among Rwandan Secondary School Teachers," concluded that teachers demonstrate an understanding of the meaning of problem-solving and how to bring it into their actual teaching of mathematics. It was shown that factors, including but not limited to the time required to prepare problems, the pressure to finish the program, the colossal amount of content to cover, and the use of problem-solving approaches, influence teacher preparation. In addition, the teachers contended that problem-solving techniques are important components of CBC. Thus, this finding is imperative to the current study because it highlights some important factors regarding the implementation of CBC in Mathematics.

Studies on Competency-Based Curriculum in ZIMBABWE

Gory, Bhatia, Reddy, and Reddy (2019) assert that the Ministry of Primary and Secondary Education (MoPSE) courageously initiated a comprehensive systemic reform and implemented the requisite changes to the plan despite encountering political, economic, and budgetary challenges. This was the most exemplary work produced by the MoPSE. The ministry has advanced towards its objective of providing all Zimbabwean children with access to pertinent

education. The Zimbabwean Curricular Reform, in addition to its audacity, implements Reimers' five recommendations for transforming education (2020).

Despite the impending conclusion of the reform with the implementation of the Zimbabwe Curriculum Framework (ZCF) for Grades 6 and 7 in 2020 and 2021, there is plenty to appreciate and learn from the progress achieved to date. Despite divergent perspectives among stakeholders, the predominant criticism focused on the ministry's operations and on contextual factors, including economic instability, international sanctions, and development partners.

Chirinda et al. (2022) noted that most schools in Zimbabwe lack digital resources, despite the curriculum endorsing students' use of such tools. The Zimbabwean curriculum is overly intellectual and inadequate for developing the human capital needed for the contemporary technology workforce. The Zimbabwean curriculum does not delineate the use of technology in mathematics education (Chirinda et al., 2022). To enhance the effectiveness of technology use in Zimbabwe's mathematics education system, it is essential to integrate technology into the curriculum with well-defined objectives.

Mawarire, in his study titled: Ordinary Level Mathematics Implementation Dynamics in Glenview-Mufakose District: Harare, Zimbabwe in 2023, recommended that:

- O-Level Mathematics teachers should make their lessons interactive and actively involve learners in the teaching and learning process.
- They should use learner-centered methodologies in teaching O-Level Mathematics as advocated for by the Competency-Based Curriculum

- Learners should take an active role as the teacher facilitates the teaching and learning process.
- The learners should refocus on the importance of O-Level Mathematics in everyday life.
- O-Level Mathematics Teachers to create an environment which is friendly to learners so that they develop a love of the subject." (Mawarire, 2023:3001). The recommendations were used in the current study as determinants of successful CBC implementation.

As alluded to in the empirical studies, implementing competency-based education was marred by several challenges. Hence, the next section highlights some potential challenges that hinder the smooth implementation of CBC.

CHALLENGES IN RELATION TO CBC IMPLEMENTATION

This section examines the challenges encountered during the implementation of CBC in Zimbabwe. The difficulties are categorized thematically to facilitate critical analysis and synthesis. As established in the preceding section, CBC implementation is constrained by interrelated academic, institutional, and socio-cultural factors rather than by a single barrier (Fleisch, 2019). These challenges include time constraints, public assessment demands, parental expectations, inadequate instructional resources, uncertainty surrounding curriculum reforms, and insufficient teacher experience and professional training (Nachua, 2019). The literature further suggests that these challenges are compounded by tensions between policies promoting curriculum change and teachers' established pedagogical beliefs and practices. Organizational structures, particularly reporting and accountability systems, impose additional constraints, indicating that successful

CBC implementation requires alignment among policy expectations, teacher capacity, institutional structures, and classroom realities.

Challenges Associated with Government

The majority of individuals in Sub-Saharan Africa are currently destitute due to the continent's dire economic conditions (Gory et al., 2021). A typical middle-class worker is often unable to buy essential communication and technological gadgets, including laptops. Due to the perception of computers as a luxury in residential, workplace, and institutional settings, most Africans may not use computer-based communication services (Yusuf, 2006). This has complicated the integration of vital online resources (newsgroups, email, the internet, Google Classroom, etc.) into competency-based learning.

The success of any educational strategy relies on governmental backing, serving as the financial entity, and the engagement of all pertinent stakeholders (Fleisch, 2019). Consequently, African governments must allocate adequate resources to implement competency-based learning initiatives. The lack of finance appears to impede the effective implementation of CBC (Gory et al., 2021). Adequate funding may facilitate the acquisition of essential resources, such as textbooks and computers, which are vital for the effective implementation of CBC. Zimbabwe is currently facing several political and economic challenges. The nation's inflation rate ranks among the highest globally.

The nation's unemployment rate exceeds 85% (Chirinda et al., 2022). The elevated unemployment rate indicates that several families are struggling to afford their children's school

tuition. In Zimbabwe, parents or guardians are obligated to furnish all essential educational necessities for their children. Consequently, due to economic challenges, several youngsters are not receiving essential educational help. The government is inadequately funding education, leading to a significant number of youngsters dropping out of school. Government policies often obstruct the effective execution of CBC. In Zimbabwe, children are prohibited from being taken home due to non-payment of fees (Mawarire, 2023). Conversely, schools require funding to operate efficiently, with tuition fees serving as their primary source of revenue. Textbooks and supplementary instructional resources are essential for the effective execution of CBC.

Challenges Pertaining to Educators

The efficacy of every educational innovation depends on teachers' perceptions. The effective implementation of CBC in Zimbabwe depends on how instructors use it. Nevertheless, most mathematics educators lack the essential skills required to implement CBC (Mawarire, 2023). Many mathematics educators may not have received adequate training or ongoing support to effectively implement the competency-based curriculum, leading to ambiguity and hindering their ability to adapt pedagogical methods. A lack of understanding of the implementation of CBC in mathematics impedes its effective application. Some mathematics educators lack essential skills to facilitate students' acquisition of the competencies and attitudes needed in mathematics (Suk, 2023).

The absence of these abilities undermines the successful application of CBC in Mathematics. In addition to the lack of understanding of CBC, educators' attitudes towards CBC

constitute another obstacle to its effective implementation. A negative attitude, combined with an unwillingness to change, undermines ownership of the CBC program. Many educators in Zimbabwe perceive the competency-based curriculum (CBC) as a government initiative that imposes excessive workloads on them (Chirinda et al., 2022). The efficacy of CBC implementation in Zimbabwe depends on the disposition of the instructors who engage directly with the program.

A further obstacle impeding the effective execution of CBC in Zimbabwe is inadequate compensation for instructors. Zimbabwean educators receive the lowest remuneration relative to their peers in Southern African nations. The inadequate compensation has led to diminished job morale (Chirinda et al., 2022). Consequently, the majority of mathematics educators, particularly those employed by the Zimbabwean government, are not fully committed to their instruction. They perform it just as an obligation. The lack of desire has compromised the quality of teaching, resulting in lower pass rates among applicants.

Alongside inadequate compensation, the transformation of a teacher's function due to the implementation of a competency-based curriculum presents an additional problem. The extent to which implementing CBE alters teachers' and students' responsibilities is often underestimated (Nachuah, 2022). This paradigm shift necessitates that a teacher's role shift from an expert disseminating knowledge to a coach facilitating students' learning. Students are expected to assume personal responsibility for their education, while teachers assume a leadership role. Both parties must adopt entirely distinct attitudes, potentially necessitating a paradigm change.

Further difficulty pertains to professional progress. CBE trainers or educators often "teach as they were taught," and without initial training and ongoing support, they rapidly revert to their

previous position as authoritative instructors (Anane, 2013). This is because the educators overseeing both the CBE and Traditional systems are the same. Difficulty arose when the facilitator transitioned from a traditional teaching role to a competency-based approach. Transitioning positions effectively requires substantial dedication and determination (Anane, 2013). Consequently, in Zimbabwe, most mathematics educators continue to employ conventional pedagogical approaches rather than competency-based methodologies.

Additional challenges related to teacher implementation include enacting substantial yet essential modifications to classroom instruction, assessment, and grading; clarifying students' misconceptions about changes to school policies and practices; and helping students cultivate the skills and attitudes necessary for success within a competency-based framework (Le, Wolfe, & Steinberg, 2014). Students ought to be empowered by transitioning from passive learning to active involvement via student-led activities, collaborative projects, and inquiry-based learning. This may involve employing diverse teaching methodologies, developing personalized lesson plans, and offering several learning pathways. Mathematics educators in Zimbabwe possess constrained resources and insufficient time to develop individualized lesson plans and facilitate inquiry-based learning.

Lack of Resources Related Challenges

Schools may lack sufficient textbooks, workbooks, digital tools, and other resources aligned with the CBC, making it harder for students to study (Suk, 2023). Most schools in Zimbabwe lack the textbooks and other materials needed to implement the CBC. Without the right tools, using CBC in arithmetic is like trying to do anything without knowing what you are doing.

In addition to insufficient textbooks, inadequate facilities and infrastructure make it hard to implement CBC. Some schools lack essential labs, libraries, and other facilities for collaborative learning, hindering the full implementation of the CBC (Mawarire, 2023). Some schools employ hot-sitting because they lack enough classrooms. Some courses start in the morning, while others start around noon.

The problem of electricity becomes clear when you realize that effective competency-based learning cannot occur without communication and technological tools such as email, fax, the Internet, television, radio, and so on (Yusuf, 2006). Many people in rural Africa lack electricity, and even those in cities experience power outages from time to time. This makes it difficult to use most digital media effectively when implementing competence-based education programs (Fleichs et al., 2019). Many Africans are too poor to know about or use alternative sources of electricity, such as solar power.

Challenges Related to Students

Students may not understand or like the new classroom rules and procedures due to the switch to competency-based education (Fleichs et al., 2019). Students should be made aware of the benefits of competency-based education and helped to become accustomed to the new ways of teaching and testing. Students' misconceptions might cause them to fail in school, as they might not study hard enough to earn decent grades. Ajjawi and Boud (2016) discussed various factors that make it difficult to give effective feedback. Most schools have many students per instructor, which makes it hard to give timely, useful feedback on how well students are doing. It seems many math professors are too busy to provide formative assessments to their students. Another problem

is that students have received negative feedback in the past, which shows they need more specific, useful criticism that offers information that might help them do better work in the future.

Course size is another major challenge in setting up a competency-based program. Having more pupils in a classroom may make it harder for students to talk to their professors and limit how much they can talk to each other during class discussions (Suk, 2023). Some students may benefit from the instructor's pace in a class with a high teacher-student ratio, while others may not, as every student learns differently. Because of this, it is very hard to apply a competency-based curriculum, and instructors cannot always use interactive, learner-centered teaching approaches.

Nachuah (2022) contends that assessment and classroom management constituted the principal problems associated with the implementation of competency-based education (CBE). Small class sizes are ideal for implementing CBE facilitation strategies, given CBE's learner-centered nature. There should be from 25 to 40 students in a CBE class. The average student-to-instructor ratio in most African nations is 1:70. Facilitators may find it hard to handle a class that large. It can be hard to educate a class of 30 or more students, as teachers may not be able to provide each student with their own instruction (Ajjawi & Boud, 2016). Teachers always want to provide each student with their own special inspiration, excitement, and attention. Moreover, teaching soft skills to a large group of students is very difficult for any teacher.

Students in competency-based education must learn new skills and ways of thinking, such as setting goals, studying at their own pace, and evaluating their own work (Gory et al., 2019). Teachers may help students build these skills and traits by providing clear instructions and opportunities to practice. Scheopner-Torres et al. (2015) asserted that it is difficult to ascertain the

impact of competency-based reforms on student outcomes due to the lack of systematically collected data on the methods and breadth of these reforms. Setting goals, learning at your own pace, and self-evaluation can be hard to teach because kids have to master so many different things. So, it is hard for pupils to learn so many things at once.

Problems with Assessment

Gory et al. (2019) contend that educators encounter considerable difficulties regarding the evaluation aspect of the competency-based approach. It is harder to grade a student's work in a CBC class than in a regular class. One issue with CBC in higher education is ensuring that talents and abilities are measured consistently across the board. This is because CBC is a personalized learning method that prioritizes mastering the material over factors such as the setting, the amount of time, or the way it is delivered (Suk, 2023).

This can also depend on how many students are in a big classroom. Hatmanto (2011) states that the CBC is used to assess a student's performance in both hard and soft skills. In a typical classroom, students' hard skills are evaluated exclusively through standardized testing and examinations. This makes the process quite complicated. Teachers often struggle to get students to show what they know, how well they can do things, and how they feel through assignments, projects, self-assessments, portfolios, tests, and examinations (Hatmanto, 2011). It takes a lot of time to check students' work on daily tasks to see how well they know their challenging skills. Students are given many writing assignments, and each one must be graded individually (Nachuah, 2022). Teachers need to review each student's portfolio of completed work to ensure the final score is accurate.

Some of the challenges schools face when conducting assessments are: How should each student's performance goal be verified? How can we meet performance standards while also letting kids show that they know something on their own? Who sets students' learning goals, and should they differ across schools? (Suk, 2023). Consequently, fewer studies have examined the usefulness of competency-based education in Southern Africa, particularly in Zimbabwe.

Scheopner-Torres et al. (2015) emphasized the necessity for substantial alterations in grading, evaluation, and instruction to facilitate competency-based education. Competency-based education prioritizes students' mastery of essential information and skills over subject content and seat time. Teachers could have trouble adjusting to this transition and might need to rethink how they teach and learn in general (Gory et al., 2019). If the teaching methods do not change, CBC may not be implemented or move forward. Teachers are a vital element in effecting change in schools; thus, their involvement in the CBC is essential to its success.

There is a lack of comprehensive data on the prevalence of competency-based education and its impact on student outcomes. To evaluate the effectiveness of competency-based education programs and inform improvements, systematic data collection is essential. Scheopner-Torres et al. (2015). It might take a lot of time and money to collect data for competency-based education. As a result, it may be difficult for schools and districts to obtain the data they need (Gory et al., 2019). This makes it hard to determine how effectively competency-based education is functioning and how to improve it. There are several ways to put competency-based education into practice. This makes it hard to obtain information that can be compared across schools and districts.

MITIGATING CHALLENGES OF CBC IMPLEMENTATION

Competency-based teaching and learning methodologies represent a departure from conventional teaching approaches by shifting emphasis from content coverage and time-based progression towards demonstrated learner competencies. Although they offer potential to meet students' needs in the digital era, the literature indicates that their effectiveness is contingent on the quality of implementation rather than on the adoption of CBC itself. Nguyen, Barton, and Nguyen (2018), for example, found that students in competency-based education programs were more likely than those in traditional programs to graduate from high school and enroll in college. However, this evidence should be interpreted cautiously because positive outcomes may also depend on institutional capacity, teacher preparedness, assessment practices, and learner characteristics. Thus, while previous studies provide support for CBC, they also suggest that its benefits cannot be separated from the conditions under which it is implemented.

It is therefore necessary to gather systematic information on pupils' development and use this information to shape the implementation of competency-based teaching. Assessment in CBC should not merely determine whether learners have achieved predetermined outcomes; rather, it should provide evidence that informs subsequent teaching, remediation, and assessment decisions. This approach enables teachers to identify students requiring additional assistance and adjust instructional or assessment procedures accordingly. Compared with traditional approaches, where assessment is often concentrated at the end of a learning period, competency-based approaches require more continuous monitoring of learner progress. However, this strategy also places greater demands on teachers, who must possess the skills to interpret assessment evidence and translate it

into differentiated instructional responses. Consequently, effective use of learner data represents both a mitigation strategy and an additional implementation requirement.

When considering competency-based learning, it is essential to recognize that it is an adaptable approach rather than a uniform model that can be transferred unchanged across contexts. A strategy that succeeds in one school or district may not produce similar results elsewhere because implementation is influenced by institutional capacity, teacher expertise, learner characteristics, resource availability, and community expectations. Ongare (2023) similarly emphasizes the importance of considering the needs of both students and staff when implementing competency-based education. This observation extends previous studies by suggesting that contextual adaptation should not be regarded as a deviation from CBC but as a necessary condition for its effective implementation. Consequently, schools and districts should identify locally appropriate strategies while maintaining the core principles of competency development, learner progression, knowledge application, and continuous assessment.

In addition, adequate teacher training and professional support are critical for facilitating the transition to a competency-based approach. Teachers require professional development opportunities that enable them to translate CBC principles into classroom practice rather than simply understand the curriculum conceptually. Nguyen et al. (2018) proposed that such professional development should include competency-based grading, performance-based evaluation, and differentiated instruction. This is particularly important because CBC changes not only what teachers teach but also how they teach, assess, provide feedback, and respond to differences in learner progress. Compared with conventional approaches, teachers are expected to

assume more complex instructional and assessment responsibilities. Comprehensive training and continuing support, however, require substantial financial resources and sustained government commitment. Equally important is the complexity of assessing competencies. Assessment standards must be explicit, equitable, reliable, and aligned with CBC principles to effectively evaluate practical skills and real-world applications. Thus, strengthening teacher capacity and assessment systems must occur simultaneously rather than as separate interventions.

This requirement contrasts with traditional approaches (Singh & Reed, 2021), in which assessment has often placed greater emphasis on the acquisition and reproduction of knowledge. The absence or inconsistent application of explicit evaluation criteria in CBC makes personalized learning difficult to achieve. Although the fundamental principles of CBC promote customized learning, providing such personalization to a heterogeneous student population presents considerable challenges (Ongare, 2023). This finding is consistent with concerns in previous studies that learner-centered approaches may be difficult to operationalize where teachers face large classes, limited resources, or insufficient assessment expertise. Therefore, providing individualized learning pathways and timely feedback requires carefully designed assessment methods, manageable teacher workloads, and clear competency standards. The literature consequently suggests that personalization should not be viewed simply as a curriculum feature but as an outcome of coordinated assessment, pedagogy, teacher development, and institutional support.

There is also evidence of resistance to the transition from traditional knowledge-based or conventional time-based systems towards competency-based models. Such resistance may involve

educational institutions, students, and teachers (Ongare, 2023). However, previous research suggests that resistance should not necessarily be interpreted as opposition to CBC itself; it may arise from uncertainty concerning new teaching roles, assessment procedures, workload, resource requirements, or expected outcomes. This distinction is important because effective management of the transition requires more than persuasive communication. Teachers, administrators, parents, and students should be involved in planning and implementation so that their concerns inform the reform process. Similarly, Singh and Reed (2021) emphasize the importance of effective feedback systems that provide learners with timely, constructive information to improve their competencies. Compared with traditional assessment systems, CBC therefore requires feedback to become an integral part of learning rather than merely a mechanism for reporting achievement. A further implication is that the shift from passive to active learning requires corresponding changes in classroom infrastructure and institutional organization.

To implement a competency-based curriculum that encourages active student participation, educational institutions require access to appropriate, up-to-date technology, including smart boards, laboratories, creative centers, and contemporary classrooms, according to Suk (2023). However, the literature indicates that technology alone does not guarantee successful CBC implementation. Its educational value depends on teachers' ability to integrate technological resources into appropriate pedagogical activities and on students' ability to access and use them effectively. Consequently, administrators need to understand not only the potential benefits of competency-based learning but also the institutional conditions required to support it. The use of media can facilitate both synchronous and asynchronous communication, providing learners with

greater flexibility in accessing learning opportunities (Nguyen et al., 2018). Nevertheless, this flexibility may be undermined where schools experience inadequate connectivity, limited devices, or unequal digital access, demonstrating that technological provision must be accompanied by broader infrastructural and pedagogical support.

Because asynchronous communication does not require students to be physically present at the same time, digital learning can support greater flexibility in teaching and learning. Nevertheless, presenting digital learning as essential without considering contextual limitations may overlook inequalities in access to ICT resources. The challenge of finding an appropriate balance between applied and theoretical learning also remains central to CBC. Practical skills are essential, but effective competency development requires learners to understand the theoretical principles that underpin their application. Ongare (2023) similarly emphasizes the importance of balancing applied and theoretical learning. This position challenges an interpretation of CBC that treats practical competence as a substitute for conceptual knowledge. Instead, the literature suggests that effective implementation should integrate theoretical understanding with opportunities for learners to apply knowledge to authentic problems. In Mathematics, for example, this requires learners not only to perform procedures but also to explain, reason, solve problems, and apply mathematical concepts in unfamiliar contexts.

Integrating a competency-based curriculum can create a learning environment that is more responsive to students' individual requirements, progression, and goals. Singh and Reed (2021) argue that, beyond academic knowledge, such empowerment can strengthen learners' capacity to apply acquired abilities in meaningful contexts. Similarly, CBC can promote practical skills and

competencies that learners can apply in everyday situations, potentially enhancing their employability and their capacity to respond to contemporary challenges. However, these outcomes should be viewed as intended possibilities rather than automatic consequences of CBC implementation. The introduction of new teaching and assessment processes also changes the professional role of educators. According to Ongare (2023), teachers increasingly become mentors who facilitate students' acquisition and application of new skills. This role requires continuing professional development because teachers must develop the pedagogical, assessment, and facilitation skills necessary for effective CBC implementation. Academic institutions must therefore align curriculum content, teaching methods, assessment procedures, and teacher development, rather than reforming each component in isolation.

As Singh and Reed (2021) have noted, this transition requires substantial expenditure on competency-based curriculum development, ICT infrastructure, and teacher preparation. This investment is particularly important because weaknesses in any one component can constrain the effectiveness of the others. For example, trained teachers may struggle to implement learner-centered activities where resources are inadequate. At the same time, sophisticated ICT infrastructure may have limited educational value where teachers lack the skills to integrate it effectively. To protect the value of competencies acquired through learning, universities and other institutions must ensure that CBC achievements are appropriately recognized and validated against criteria relevant to higher education and employment. This requires greater consistency in competency standards and assessment practices while still allowing contextual flexibility. Policymakers therefore have a central role in creating an enabling environment that supports

coherent and sustainable CBC implementation rather than relying solely on individual schools or teachers to manage the reform.

Policymakers are also required to promote equitable access to the internet and technological resources and to facilitate the adoption of digital learning (Ongare, 2023). However, comparisons with previous studies suggest that access should be considered alongside teacher preparedness, pedagogical capacity, infrastructure maintenance, and the affordability of continued use of technology. Policymakers must therefore adopt a systemic approach in which technology, professional development, curriculum reform, assessment, and monitoring reinforce one another. To ensure quality control and alignment with learning objectives, lawmakers should establish clear competency-based standards, assessment guidelines, teacher-support frameworks, and monitoring mechanisms. Such measures can create greater coherence between policy intentions and classroom implementation. Overall, the literature indicates that mitigating CBC implementation challenges requires an integrated strategy that addresses teacher preparedness, assessment capacity, stakeholder participation, resource availability, digital infrastructure, contextual adaptation, and policy support, rather than treating each challenge in isolation. This synthesis suggests that the sustainability of CBC depends on the extent to which these factors operate collectively to translate curriculum principles into effective classroom practice.

KNOWLEDGE GAP

A critical review of the literature reveals that, despite extensive international discussion of competency-based education (CBE) and competency-based curricula (CBC), significant gaps persist in understanding how teachers experience and operationalize CBC within specific national

and subject contexts. International research has primarily addressed the rationale, benefits, learner-centered principles, and competency development associated with CBC. At the same time, African studies have often concentrated on broad curriculum reforms, teacher capacity, and resource limitations. For instance, research reviewed in this chapter demonstrates that CBC implementation in countries such as Kenya, Zambia, Tanzania, and Rwanda has led to a shift towards learner-centered and skills-oriented teaching, yet has also faced challenges related to teacher capacity and resource availability. Nevertheless, these studies do not adequately explain how mathematics teachers interpret the reform, how their perceptions and concerns affect their readiness to implement it, or how these factors interact with the practical realities of mathematics instruction. Therefore, it is necessary to move beyond outlining the intended benefits and general challenges of CBC and instead examine the teacher-level processes through which curriculum reform is understood, accepted, and enacted in classroom practice.

Another gap pertains to teachers' concerns, perceptions, and readiness. The literature reviewed in this chapter establishes that teachers play a central role in curriculum implementation and that successful educational change depends in part on teachers' understanding, attitudes, and involvement. The chapter further notes that Zimbabwe's CBC was introduced relatively quickly, with research reporting uneven and inadequate implementation as well as insufficient understanding of the differences between CBC and traditional approaches to mathematics teaching. However, existing literature often treats teacher preparedness as a general issue, rather than systematically analyzing the various dimensions of teachers' concerns. Specifically, there is limited empirical evidence demonstrating how mathematics teachers' understanding of CBC,

perceptions of the reform, readiness to modify pedagogical practices, and actual implementation are interconnected. This is particularly relevant from the perspective of the Concerns-Based Adoption Model (CBAM), which conceptualizes educational change as a process in which teachers experience distinct stages of concern and levels of use, rather than simply accepting or rejecting an innovation. Consequently, the literature does not sufficiently explain how teachers' personal and professional concerns influence their progression from awareness and understanding to actual classroom implementation.

Another gap identified in the literature concerns support systems and practical conditions for implementation. Existing studies identify professional development, instructional resources, technology, assessment practices, administrative support, and funding as key factors influencing CBC implementation. Zimbabwean literature reviewed in this thesis highlights inadequate training, limited resources, insufficient support, and weaknesses in administrative capacity as barriers to effective implementation. Critically, these factors are often discussed as isolated challenges rather than as components of an interconnected support system that shapes teachers' ability and willingness to implement CBC. As a result, there is limited evidence regarding how professional development, resource availability, technological access, assessment requirements, school leadership, and ongoing monitoring collectively influence the practical implementation of CBC in mathematics classrooms.

A fourth gap arises from the contextual and methodological limitations of prior studies. Much of the reviewed literature is based on international, African, or broader Zimbabwean curriculum experiences, with limited focus on secondary-school mathematics teachers in

Manicaland Province. This thesis identifies the contextual limitation by highlighting the scarcity of empirical research in Zimbabwe that addresses the specific challenges faced by mathematics teachers when adopting a competency-based approach. Furthermore, existing research rarely integrates teachers' measurable perceptions and reported implementation levels with the deeper insights obtained through interviews and focus group discussions. A mixed-methods approach is therefore valuable, as quantitative data can reveal patterns in teachers' understanding, perceptions, and implementation. In contrast, qualitative data can elucidate the concerns, experiences, and contextual factors underlying those patterns. This distinction is significant because a teacher may report understanding CBC yet still encounter difficulties in translating that understanding into classroom practice due to inadequate resources, time, training, or institutional support.

In summary, this critical synthesis identifies a specific knowledge gap: while the literature provides substantial insight into the nature of CBC, its rationale, and the general challenges of implementation, there is insufficient integrated, context-specific evidence regarding how mathematics teachers' concerns, perceptions, and readiness interact with support systems and practical conditions influencing CBC implementation in Zimbabwean secondary schools. This study addresses the gap by focusing on mathematics teachers in Manicaland Province, examining their understanding of the CBC, the extent of its implementation, the concerns and challenges encountered, and the support and strategies needed to address them. The study is thus positioned not only to confirm the existence of implementation problems but also to explain the relationships among teacher perceptions and concerns, readiness, actual implementation, and the institutional conditions that support curriculum change. This approach aligns with the Concerns-Based

Adoption Model (CBAM), which posits that educational change is an ongoing, personal process requiring varied forms of support as teachers' needs evolve. Furthermore, the study contributes to knowledge by applying CBAM in conjunction with Reimer's 5 Frame theory, applying the issue of competency-based mathematics curriculum implementation in Zimbabwe.

CHAPTER SUMMARY

The preceding chapter provided a comprehensive and critical review of literature relevant to the study, situating the research within established scholarly discourse on competency-based education and curriculum reform. This review synthesized key themes, debates, and empirical findings and identified significant gaps in the literature, particularly regarding educators' understanding and implementation of the competency-based curriculum (CBC). By incorporating both international and regional studies, the chapter established a robust foundation for examining the Zimbabwean context and highlighted the relevance and originality of the present study.

The chapter also detailed the theoretical framework guiding the research, specifically the Concern-Based Adoption Model (CBAM). This model was chosen for its demonstrated effectiveness in analyzing stakeholders' responses to educational change, particularly during curriculum innovation and reform. CBAM offered a structured perspective for examining educators' levels of concern, stages of adoption, and patterns of CBC use, thereby providing insights into the factors influencing successful or constrained implementation. Employing this framework enhanced the study's analytical rigor and ensured a systematic approach to understanding curriculum change.

In addition to the theoretical framework, the chapter examined the conceptual framework underpinning the study, which illustrates the relationships among key variables influencing CBC implementation. This framework draws on Reimer's theoretical perspectives, offering both philosophical and practical perspectives on interpreting curriculum implementation and educational practice. Each of Reimer's five perspectives was critically analyzed to demonstrate alignment with the principles of competency-based education and to justify their relevance in explaining how educational beliefs, values, and practices shape curriculum enactment in classroom settings.

Furthermore, the chapter emphasized the need for a clear, shared conceptual understanding of the competency-based curriculum among educators and other stakeholders. It identified critical challenges associated with CBC implementation, such as teacher preparedness, limited professional development, resource constraints, assessment alignment, and policy coherence. These challenges have direct implications for effective curriculum delivery and learner outcomes. By addressing these issues, the chapter contextualized the study within actual educational conditions and reinforced the need for further empirical investigation. In summary, the literature review and framework discussions offered a coherent justification for the study and informed the development of the research design. Building on this foundation, the next chapter presents and discusses the research methodology used to investigate educators' understanding and implementation of the competency-based curriculum.

CHAPTER 3

RESEARCH METHODOLOGY

INTRODUCTION

This chapter presents the theoretical and conceptual foundations underpinning teachers' application of the competency-based curriculum (CBC) in mathematics. Building on these foundations, Chapter 3 describes and justifies the research methodology used to investigate how secondary school mathematics teachers in Zimbabwe implement the competency-based curriculum. This chapter is central to the study, as it explains how the research was systematically designed and conducted to address the study's objectives and research questions, thereby linking the study's context to its findings and conclusions.

This chapter provides a detailed account of the research paradigm, research approach, research design, study population and sample, data collection instruments and procedures, data analysis techniques, and ethical considerations. These methodological choices were guided by the study's main objective, which is to explore mathematics teachers' perceptions, experiences, and concerns regarding the implementation of the competency-based curriculum in secondary school mathematics. As outlined in Chapter 1, the introduction of the CBC in Zimbabwe represents a significant shift in curriculum policy and practice, and its successful implementation depends largely on teachers' understanding, preparedness, and classroom practices.

Informed by the background and problem statement presented in Chapter 1, the study adopted a case study research design to enable an in-depth exploration of the phenomenon within its real-life context. The case study approach was considered appropriate because it allows for a detailed examination of teachers' views and practices within a specific educational setting. This chapter discusses the rationale for selecting this design, as well as its strengths and limitations.

To address the main research question: What are mathematics teachers' perceptions of the implementation of the competency-based curriculum (CBC) in secondary school mathematics? The study employed a mixed-methods research approach. The integration of qualitative and quantitative methods enabled the researcher to triangulate data, enhance the credibility of the findings, and obtain a more comprehensive understanding of the challenges and opportunities associated with CBC implementation. Further details regarding the mixed-methods approach are elaborated in this chapter.

Overall, Chapter 3 outlines the methodological framework that guided the study and explains how the chosen research paradigm, design, and methods ensured the validity, reliability, and trustworthiness of the research findings. The chapter also discusses the ethical principles observed throughout the research process, including informed consent, confidentiality, and participant protection, to ensure the study's integrity and credibility.

PHILOSOPHICAL FOUNDATION OF THE STUDY

The philosophical foundation of research comprises the beliefs and assumptions that guide the researcher in determining what constitutes knowledge and how knowledge can be acquired. These assumptions influence the manner in which research questions are formulated, data are collected, analyzed, and interpreted (Creswell & Poth, 2018). Research is therefore not merely a technical process, but a social and intellectual activity influenced by particular philosophical positions and understandings of knowledge (Corbin & Strauss, 2008; Pelzang & Hutchinson, 2018). Philosophical presuppositions refer to the fundamental assumptions and convictions that guide a researcher's inquiry and methodological decisions (Huff, 2009). In this study, the philosophical position was informed by the nature of the research problem, which

required an examination of both measurable aspects of mathematics educators' implementation of the competency-based curriculum (CBC) and their experiences, perceptions, and interpretations of that implementation. The study's philosophical paradigm was pragmatism.

Pragmatism

Pragmatism served as the overarching philosophical paradigm of this study. Pragmatism is primarily concerned with the usefulness, practical consequences, contextual relevance, and applicability of knowledge to particular problems. Rather than requiring the researcher to commit exclusively to either quantitative or qualitative approaches, pragmatism permits methodological choices to be guided by the research questions, the nature of the research problem, and the type of knowledge required to address it (Johnson & Onwuegbuzie, 2004; Morgan, 2007). This position was particularly appropriate for the study because the implementation of the competency-based curriculum (CBC) in Mathematics has both measurable and experiential dimensions. Understanding implementation, therefore, required evidence of observable, measurable aspects of implementation, as well as an understanding of how mathematics educators perceive, experience, and interpret the implementation process.

The adoption of pragmatism provided the philosophical foundation for the study's mixed-methods approach, specifically the convergent parallel design. In this design, quantitative and qualitative data were collected concurrently, analyzed separately using procedures appropriate to each strand, and subsequently brought together during interpretation. Pragmatism provided the rationale for this integration because it allows different forms of evidence to be selected and combined according to their usefulness in addressing the research problem. Thus, the quantitative and qualitative strands were not treated as competing approaches but as complementary means of investigating different dimensions of the same phenomenon. The

quantitative strand generated measurable evidence regarding aspects such as the extent and patterns of CBC implementation, whereas the qualitative strand provided contextual explanations of educators' perceptions, experiences, challenges, and practices. The integration of the two strands enabled the researcher to compare, corroborate, and complement the findings, thereby obtaining a more comprehensive understanding of CBC implementation (Atta-Asiedu, 2022; Assimakopoulos, 2017).

Within this overarching pragmatic paradigm, positivist assumptions informed the quantitative strand, while phenomenological assumptions informed the qualitative strand. The positivist assumptions supported the view that certain aspects of CBC implementation could be observed, measured, quantified, and examined systematically using numerical data. This orientation, therefore, informed the use of quantitative procedures to identify patterns and measurable relationships in the implementation of CBC. In contrast, the phenomenological assumptions underlying the qualitative strand recognized that educators' experiences of CBC implementation involve meanings and interpretations that cannot be fully captured through numerical measurement alone. The qualitative strand consequently sought to understand educators' lived experiences, perceptions, and interpretations of curriculum implementation within their actual educational contexts. In this way, positivism contributed the measurement-oriented perspective, while phenomenology contributed the experience- and meaning-oriented perspective, with pragmatism providing the overarching rationale for integrating these perspectives.

The relationship among the three positions was therefore complementary rather than hierarchical or competitive. Pragmatism determined that no single form of knowledge was sufficient to address the complexity of the research problem. It allowed the researcher to draw on

the strengths of positivist assumptions, where numerical measurement was useful, and on phenomenological assumptions, where understanding lived experiences and meanings was necessary. The convergent parallel design operationalized this philosophical position by allowing the two strands to proceed independently during data collection and analysis before their findings were integrated at the interpretation stage. Consequently, areas of convergence between quantitative and qualitative findings could strengthen the interpretation, while areas of divergence could reveal aspects of CBC implementation requiring further contextual explanation. This reflects the view that mixed-methods research can bridge the traditional divide between quantitative and qualitative approaches by drawing on the respective strengths of both (Gorard & Taylor, 2004).

Pragmatism was also appropriate because the study sought not merely to describe CBC implementation but to identify practical challenges and strategies for improving its implementation in Mathematics education. The emphasis on practical consequences enabled the researcher to move from what the data showed to what the findings could mean for addressing implementation challenges. At the same time, the pragmatic orientation allowed the study to remain sensitive to the Zimbabwean educational context and to the meanings mathematics educators attach to curriculum implementation. This contextual sensitivity is consistent with perspectives emphasizing the importance of culturally situated knowledge, including insights associated with African Ontology and Epistemology (Mkabela, 2019; Shizha, 2017; Ndwapi, 2018). Pragmatism consequently provided a coherent philosophical framework through which measurable empirical evidence and educators' experiential knowledge were integrated to generate contextually relevant findings and practical implications for implementing the CBC in Mathematics in Manicaland Province.

Positivist Assumptions Underlying the Quantitative Strand

Positivism informed the quantitative strand of the study as a set of philosophical assumptions. Positivist assumptions emphasize systematic observation, measurement, empirical evidence, and the identification of patterns and relationships within observable phenomena. Positivist inquiry assumes that aspects of reality can be investigated through systematic procedures and that appropriately collected numerical evidence can provide a basis for describing and explaining phenomena (Hiller, 2016; Levers, 2013).

These assumptions were relevant to the quantitative component of this study because the researcher sought to obtain measurable evidence concerning mathematics educators and the implementation of CBC. Quantitative data provided a systematic means of examining variables such as educators' characteristics, curriculum implementation, perceptions, and other measurable aspects of the research problem. Statistical procedures were subsequently used to organize, analyze, and interpret the numerical evidence. The emphasis on systematic measurement contributed to the consistency and objectivity of the quantitative strand.

The positivist assumptions also supported the use of structured instruments and standardized procedures for collecting quantitative data. Such procedures enabled information to be obtained in a form that could be compared across participants and subjected to statistical analysis. The researcher therefore sought to minimize personal influence during quantitative data collection and analysis by applying consistent procedures. This was important in producing empirical evidence that could be used alongside the qualitative findings.

However, the study did not adopt the stronger philosophical claim that positivism alone could provide a complete account of CBC implementation. Such a position would have been inconsistent with the purpose of the study, which also required an understanding of mathematics

educators' experiences and meanings. Positivism was therefore confined to the assumptions most relevant to the quantitative strand, particularly systematic observation, measurement, empirical evidence, and statistical analysis. This positioning avoided treating positivism as a competing philosophical foundation alongside phenomenology.

The quantitative strand was consequently useful for establishing patterns and measurable characteristics of CBC implementation, while its findings were interpreted alongside the qualitative evidence. Within the pragmatic framework, numerical evidence was regarded as one important form of knowledge rather than the only legitimate form of knowledge. This enabled the researcher to retain the strengths of quantitative measurement without excluding experiential and contextual evidence.

Phenomenological Assumptions Underlying the Qualitative Strand

Phenomenological assumptions informed the qualitative strand of the study, particularly the exploration of mathematics educators' lived experiences, perceptions, interpretations, and meanings concerning CBC implementation. Phenomenology focuses on understanding how individuals experience and make sense of a phenomenon within their particular contexts (Teherani et al., 2015). It is therefore concerned with the meanings that participants attach to their experiences rather than merely measuring the occurrence of particular events. Hourigan and Edgar (2020) similarly explain that phenomenological inquiry seeks to understand both the experience of an event and how it is perceived.

These assumptions were appropriate for the qualitative component because the implementation of CBC is not solely a measurable process. Mathematics educators encounter curriculum requirements in particular school environments and interpret them in light of their experiences, professional knowledge, available resources, and contextual circumstances.

Exploring these experiences enabled the researcher to understand how educators perceived CBC, the challenges they encountered, and the strategies they used in responding to those challenges.

The qualitative strand, therefore, drew on phenomenological assumptions to give attention to participants' accounts of their experiences. Hermeneutic phenomenological thinking was particularly relevant because educators' experiences could not be separated from the contexts in which those experiences occurred. Hermeneutic phenomenology recognizes that understanding experience involves interpretation and consideration of the circumstances in which meanings are formed (Kafle, 2011; Lopez & Willis, 2004). In this study, educators' descriptions were consequently interpreted in relation to their school and curriculum contexts.

The phenomenological assumptions complemented the positivist assumptions used in the quantitative strand. Whereas the quantitative strand provided systematically measured evidence, the qualitative strand offered deeper explanations of how mathematics educators experienced and interpreted the implementation of CBC. The two strands, therefore, addressed different but interconnected dimensions of the same research problem. The qualitative evidence helped explain issues that numerical data alone could not fully capture, including educators' perceptions, emotions, experiences, and contextual challenges.

Importantly, phenomenology was not treated as a separate philosophical foundation competing with positivism. Rather, it functioned as a philosophical assumption appropriate to the qualitative strand within the broader pragmatic paradigm. This distinction is important because the study employed a mixed-methods design in which different forms of evidence were intentionally combined. The phenomenological perspective, therefore, strengthened the study by providing experiential and contextual knowledge that complemented the empirical evidence generated through the quantitative strand.

In summary, the philosophical positioning of the study can therefore be understood hierarchically: pragmatism constituted the overarching philosophical paradigm; positivist assumptions informed the quantitative strand; and phenomenological assumptions informed the qualitative strand. This arrangement provided philosophical coherence for the convergent parallel mixed-methods design and enabled the researcher to integrate measurable evidence with educators' lived experiences and interpretations. The resulting approach was appropriate for developing a comprehensive understanding of the implementation of CBC in mathematics in Manicaland Province.

RESEARCH APPROACH AND DESIGN

Data collection and evaluation in this study utilized a mixed-methods approach, specifically a parallel-convergent design. Mixed-methods research is widely recognized as an independent methodology that integrates quantitative and qualitative approaches within a single investigation. Johnson and Onwuegbuzie (2004) introduced the term mixed research method to describe research that intentionally combines these methods to provide a more comprehensive understanding of a research problem. In a parallel convergent design, quantitative and qualitative data are collected concurrently, analyzed separately, and integrated during interpretation to compare, confirm, and complement findings. This approach is particularly valuable for addressing complex educational issues, as it enables the collection of multiple forms of evidence and fosters a more thorough understanding of the phenomenon under investigation.

Multiple dimensions of the research problem were addressed using both quantitative and qualitative methods. Each approach offers distinct strengths and limitations that, when combined, contribute to a more robust investigation of the research questions. Quantitative methods provide

statistical evidence and facilitate the identification of patterns and trends that may be generalized across participants. In contrast, qualitative methods offer rich, contextualized insights into participants' experiences, perceptions, and meanings. Integrating these complementary forms of evidence enhances the validity and depth of the findings.

The use of both quantitative and qualitative methods is particularly beneficial in educational research. Studies have demonstrated that mixed-methods research is effective for examining curriculum implementation, as it captures both measurable outcomes and educators' lived experiences (Casey et al., 2016). Researchers employing a mixed-methods approach must be proficient in both quantitative and qualitative data collection and analysis techniques. This methodological flexibility enables the selection of the most appropriate strategies for addressing the complexities of educational settings. Therefore, a mixed-methods approach was adopted to address both objective and subjective aspects of competency-based curriculum implementation in mathematics education.

Johnson and Onwuegbuzie (2004) argue that mixed-methods research holds considerable promise for educational researchers, as it promotes methodological approaches that acknowledge the complexity of real-world educational contexts. Furthermore, mixed-methods research represents a pragmatic paradigm that bridges the traditional divide between quantitative and qualitative methodologies by integrating the strengths of both approaches (Gorard & Taylor, 2004). This integration is particularly important for understanding the implementation of a competency-based curriculum, as it requires both numerical evidence regarding implementation levels and detailed explanations of educators' experiences, challenges, and perceptions.

The use of a parallel-convergent mixed-methods design was especially appropriate for this investigation, as it enabled quantitative survey data and qualitative interview data to be

collected simultaneously, analyzed independently, and then merged to provide a comprehensive interpretation of the findings. This process enabled comparison and corroboration of results across both data strands, thereby strengthening the study's overall conclusions. Integrating quantitative measures of curriculum implementation with qualitative accounts of educators' experiences facilitated a more holistic understanding of mathematics educators' perspectives regarding the implementation of the competency-based curriculum.

To achieve a comprehensive understanding of competency-based curriculum implementation in mathematics, the mixed-methods approach proved particularly valuable. The integration of quantitative and qualitative findings enabled the researcher to identify effective teaching practices, examine challenges associated with curriculum implementation, and develop a deeper understanding of educators' experiences. Ultimately, the parallel, convergent mixed-methods design provided a richer, more balanced analysis than either quantitative or qualitative methods could have achieved independently.

Quantitative Research

A research technique comprises a specific sequence of actions undertaken by a researcher to initiate a study (Bryman, 2016). Apuke (2017) describes quantitative research methods as the collection of numerical data and the application of mathematical procedures, particularly statistics, to analyze it in order to comprehend a problem or phenomenon. Conclusions from a quantitative research technique are derived through variable analysis and quantification. It involves the analysis and application of certain statistical methods to numerical data to address the issues of who, what, where, when, how many, and how.

In quantitative research, numerical data are collected and analyzed by statistical methods (Ghanad, 2023). Apuke (2017) and Williams (2011) assert that "the process of quantitative

research involves quantifying information and employing statistical analysis to validate or challenge conflicting knowledge claims.” The initial phase of this technique is data collection. Williams (2011) asserts that the initial steps in conducting quantitative research include formulating a problem statement, developing a hypothesis or research question, reviewing pertinent literature, and conducting quantitative data analysis. Quantitative research is defined as the utilization of inquiry strategies such as surveys and experiments, along with the collection of data through predetermined instruments that produce statistical data (Apuke, 2017). Consequently, quantitative research methodologies were employed in this discourse to provide a comprehensive overview of the application of CBC in mathematics.

Quantitative research seeks to measure and quantify variables, addressing issues such as "how long," "how many," and "to what extent" (Williams, 2011). The aim is to assess hypotheses by collecting, analyzing, and interpreting quantitative data to generalize sample findings to the broader population (Ghanad, 2023). This technique relies on logical methodologies and is influenced by positivist and empiricist concepts (Bryman, 2016). The researcher employed a quantitative research strategy to facilitate the formulation of insightful conclusions about the study topic by emphasizing significant differences and specific characteristics. This study employed quantitative research due of its suitability for a large sample group. The researcher employed the survey methodology.

Survey

According to Jones, Baxter, and Khanduja (2013), a survey is a methodical approach to collecting data for the purpose of conducting survey research. In accordance with Creswell and Poth (2018), a survey is a method used to gather information about the characteristics, actions, or perspectives of a sizable community. Furthermore, the surveys may be used to evaluate the

effects of a program, as well as the desire and requirements for it. According to Brommage (2006), the term "survey instrument" is frequently used to make a significant distinction between the survey tool and the survey study it is designed to assist with throughout the survey. In order to collect data for the study, a survey was conducted to 100 teachers.

Jones et al. (2013) express their dissatisfaction with the fact that survey research is frequently used to answer questions that have already been addressed and to find solutions to issues that have already been identified. In addition, survey research establishes goals and evaluates needs, and determines whether the goals have been achieved. In addition, it establishes baselines for future comparisons and analyzes patterns over time. A broad statement is that survey research describes what is present, in what context it is found, and in what amount. In contrast to a census, which examines every person in a community, a survey is designed to collect pertinent information from a representative sample of the population (Brommage, 2006). To identify patterns in responses on the use of mathematics in CBC, the poll results were subjected to quantitative analysis. According to Creswell (2009), survey research is characterized by three distinct features. Before anything else, survey research begins with analyzing numerical data to identify group characteristics. These characteristics often require examining relationships among several factors.

The second point is that survey research is subjective, as it collects subjective information from individuals. The final point is that, in general, survey research employs a representative sample of the community to generalize or apply its results to the entire population. Therefore, in survey research, independent and dependent variables help define the scope of the study, even when the researcher does not have direct control over them. The researcher developed a model to illustrate the predicted relationships among these characteristics before conducting the poll and

releasing it to the public. As a result, the researcher in charge of this study decided to conduct a descriptive survey. Measures of central tendency, such as the mean, median, and mode, were used to conduct a statistical analysis of the acquired data.

Descriptive survey

This study employed a descriptive survey to effectively gather quantitative data from a large population. Descriptive surveys are valuable in educational research since they enable researchers to collect data on participants' characteristics, preferences, attitudes, and behaviors using standardized questionnaires or interviews (Gorard, 2020). This strategy is effective for collecting extensive information, facilitating the identification of patterns and trends within the data. A primary advantage of doing a descriptive survey was that it provided a comprehensive overview of the investigated population. The researcher ensured that the results accurately represented the broader population by using a large sample size, thereby enhancing the applicability of the findings (Fowler, 2021). This was significant in education, as understanding the diverse experiences and perspectives of several individuals might yield improved findings and recommendations.

Descriptive surveys facilitated the collection of quantifiable data, which were statistically analyzed to provide meaningful insights into the group (Cohen et al., 2021). This methodology enabled the researcher to identify correlations and patterns that may not be evident using qualitative approaches alone. The poll demonstrated that many factors, such as pedagogical approaches and curricular techniques, influence instructors' experiences and classroom effectiveness. The structured methodology of descriptive surveys allows researchers to gather data methodically, hence minimizing bias and improving the reliability of the results (Bryman,

2020). Data precision is crucial in educational research, as it significantly influences policy decisions and instructional methodologies.

The decision to employ a descriptive survey in this research was based on its ability to collect extensive quantitative data from a substantial cohort of mathematics educators, enabling a thorough examination of their attributes and experiences. This strategy enhances the validity and reliability of research findings and facilitates understanding of the educational environment, thereby contributing to the improvement of practices and policies related to curriculum implementation. Nevertheless, several subjective issues were addressed using qualitative research methodologies.

Qualitative Research

Qualitative research involves the collection and analysis of non-numeric data, such as text, audio, or video materials. This research facilitates the identification of nuanced nuances within a context or generates novel concepts for further investigation (Bhandari, 2022). Quantitative research, which collects and compiles numerical data for statistical analysis, contrasts with qualitative research. Qualitative research encompasses the examination of a phenomenon's attributes, variations, contexts of occurrence, and observable viewpoints (Philipsen & Vernooij-Dassen, 2007). It does not, however, consider their position within an objectively established causal sequence, nor does it examine their distribution or frequency. Qualitative research often uses verbal rather than numerical data (Porter, 2007). Consequently, this study included interviews and focus group discussions to collect data.

The phrase "qualitative research" may misleadingly suggest the existence of a singular, unified research tradition. Rolfe (2006) posits that achieving agreement on quality standards for qualitative research is unlikely because there is no universal theory, technique, or strategy

applicable to all qualitative research. The concept of qualitative research is contentious. Qualitative research may be defined in two primary ways: one approach focuses on the "method" of the type of data gathered and evaluated, while the other uses the terms "epistemological" and "ontological" assumptions (Porter, 2007). Nonetheless, various sub-traditions exist within qualitative research (Cresswell, 2009; Rolfe, 2006). This encompasses several methodologies, including ethnography, action research, and ethnomethodology. All sub-traditions of qualitative research possess a common set of traits, notwithstanding their distinctions. This study employed a case study design.

The objective of qualitative research is to accurately document social events in their natural contexts (Bhandari, 2022). This analysis emphasizes the reasons behind social phenomena rather than their definitions, based on individuals' unique experiences of finding meaning in everyday life (Caulfield, 2022). Qualitative research employs several modes of inquiry to examine human phenomena. These encompass ethnography, case studies, history, narrative analysis, grounded theory, and phenomenology, in contrast to logical and statistical methodologies. The researcher employed a phenomenological case study to understand the challenges faced by secondary mathematics educators.

Mixed Methods as a Research Methodology

Fetters (2016) asserts that a mixed-methods design integrates post-positivist and interpretivist perspectives to successfully address complex research issues. This method facilitates the amalgamation of quantitative and qualitative data. Moreover, it offers a robust foundation, methodological flexibility, and a deeper understanding of fundamental subjects (Maxwell, 2016). Mixed-methods research enables researchers to investigate subject themes comprehensively, facilitating the application of results to the entire community (Atta-Asiedu,

2022). The quantitative technique facilitates the collection of data from a larger number of participants, hence minimizing mistakes in the process. The qualitative technique prioritizes participants' perspectives and provides a deeper understanding of the subject matter. Qualitative data adds depth, while quantitative data provides a broader context (Dawadi, 2021).

It is feasible to integrate quantitative and qualitative data, and vice versa. Carter et al., (2014) assert that triangulation is a qualitative methodology that employs diverse methodologies or data sources to comprehend a research topic or corroborate findings by integrating information from several sources. By integrating the strengths of both methodologies while mitigating their limitations, mixed-methods design offers the optimal approach to addressing research challenges (Johnson & Onwuegbuzie, 2004). Consequently, employing mixed-methods research is essential for enhancing research instruments for data acquisition.

Integrating two approaches is superior to a single approach, as it provides deeper insights into the research topic than either qualitative or quantitative methods alone can. A mixed-methods strategy is advantageous for investigating complicated topics by integrating diverse data sources (Poth & Munce, 2020). Shorten and Smith (2017) assert that researchers frequently integrate data to enhance their understanding of a topic by examining a phenomenon from several viewpoints and employing diverse research methodologies. Consequently, the researcher employed a mixed-methods design to investigate educators' apprehensions about the introduction of CBC in mathematics.

Utilizing both qualitative and quantitative data in a single research project offers distinct advantages. The primary rationale for employing a mixed-method research approach is its enhancement of research efficacy. This indicates that researchers can broaden their investigation to an appropriate scope and extent by employing a mixed-methods research approach. For

example, when a researcher aims to comprehensively understand a phenomenon among individuals and extrapolate findings to a broader population, collecting both qualitative open-ended and quantitative closed-ended data enhances understanding of the research issue (Atta-Asiedu, 2022). Qualitative data obtained from interviews and focus group discussions might enhance the study inquiry by enabling the researcher to better understand the subject at hand. The present study sought to ascertain mathematics instructors' perspectives on the implementation of the CBC, necessitating the use of several research approaches.

The secondary benefit of employing mixed-methods research was primarily in data acquisition. The data were obtained independently, and the findings were combined, as the objective of using mixed methods in this study was to obtain distinct yet related data on the same subject to comprehensively understand the research issues (Dawida, 2021). Consequently, this study integrated quantitative and qualitative data.

The researcher also considered sample size. In addition to generalizing the data, the researcher sought to get a comprehensive grasp of the issue under investigation. The sample sizes for qualitative and quantitative research in a mixed methods study design may differ. The sample included in the qualitative study may include some individuals from the quantitative research. The researcher must consistently recognize that reviewing and interpreting data complicates the merging process. The size discrepancy should not be reverted, since one purpose is to integrate diverse data to construct a comprehensive understanding of the subject under investigation (Creswell & Plano Clark, 2018). Dawida et al. (2021) argue that using a larger sample for the quantitative component and a smaller one for the qualitative component enables researchers to obtain robust quantitative findings and thorough qualitative insights. It is essential

to select an appropriate mixed-methods research design for the study, one that is influenced by the study's demographics and sample.

Case Study

The researcher determined that the case study approach was the most effective option, given the interpretive paradigm employed in this analysis. The interpretive paradigm prioritizes understanding the social contexts in which individuals create meanings and the significance they attribute to their experiences (Creswell, 2009). This aligns seamlessly with the case study approach, which provides an in-depth analysis of a specific event in a real-world setting (Yin, 2018).

Rebolj (2013) asserts that several writers' efforts to define a case study have frequently led to ambiguity, since each new definition intensifies the issue. Flyvbjerg (2011) asserts that if a definition is necessary, it should be more comprehensive than excessively specific. Identifying a case study is essential as it differentiates the procedure from other qualitative research methodologies and imparts a unique character. Several authors have offered a comprehensive definition of case studies.

Cresswell (2009) emphasized that a case study is a comprehensive phrase utilized to investigate an individual, a group, or a phenomenon. A case study is a comprehensive description and analysis of a single occurrence, encompassing the case, its context, and the research methods (Cresswell & Poth). Rebolj (2013) defines a case study as a comprehensive analysis of a singular instance aimed at identifying variables, structures, forms, and participant interactions (theoretical objective) or assessing performance and progress (practical aim). This concept, while peculiar to social work, is equally applicable in education. He contends that a singular case study can achieve both objectives simultaneously.

Rebolj (2013) characterized a case study as a comprehensive analysis and depiction of an individual (encompassing their activities, needs, life circumstances, and history), a group (such as students with special needs or the special education department), an organization, or a particular issue, process, phenomenon, or event within an organization. A case study is defined as a comprehensive data collection and analysis of a confined system through one or more case examinations or an exhaustive investigation of a particular event, activity, or situation, as stated by Creswell (2009). Punch and Oancea (2014) describe a case as a phenomenon that can manifest inside a certain setting. A case study draws on several sources of contextually rich information and employs comprehensive data-gathering methods. In this work, a case study methodology was employed to elucidate the significant challenges encountered in implementing the competency-based curriculum (CBC) in mathematics.

Moreover, case studies illustrate the progression of a case over time through a sequence of interrelated events that transpire in a specific location and collectively characterize it. Ultimately, case studies emphasize the surrounding environment or context. Determining the boundaries of each survey unit facilitates the delineation of a case's components and its environment. Consequently, in this study, the researcher identified interconnected themes about the use of CBC by mathematics educators.

A case study, as defined by Simons (2009), is a comprehensive analysis from several perspectives of the complexity and distinctiveness of a particular project, program, policy, organization, or system in a "real-life" context. A case study should not be regarded as a standalone approach, she stated. Rather, it is a design framework capable of integrating several methodologies. Stake agrees, asserting that a case study primarily concerns the focus of examination with the evaluative instruments employed rather than a methodological choice

(Crotty, 1989). The researcher aimed to gain a comprehensive understanding of the concerns of secondary math instructors regarding the implementation of the CBC in Zimbabwe's Manicaland Province. The researcher examined the implementation experiences and practices of secondary mathematics educators in Zimbabwe using a case study. The primary objective of the case study was to highlight the instructors' concerns with the implementation of CBC. The researcher identified themes and subthemes using a case study.

Case studies enable academics to investigate the intricacies and particulars of individual experiences. This aligns effectively with the interpretative framework. The study focused on a particular cohort: mathematics educators who employ a competency-based curriculum. This methodology collected comprehensive qualitative data on participants' perspectives, convictions, and interactions (Stake, 1995). The qualitative depth was essential to understanding how educators confront problems in curriculum implementation and how their personal histories and circumstances shape their experiences.

The case study approach enables the researcher to examine several forms of material. This kind of information encompasses interviews, observations, and surveys (Yin, 2018). This amalgamation of data enhances the reliability of the outcomes. It also provides a comprehensive overview of the subject under investigation. The interpretative approach emphasizes comprehending participants' individual experiences, whereas the case study technique facilitates this by allowing participants to articulate their narratives in their own terms. Moreover, employing the case study approach within an interpretive framework acknowledges that educational contexts are intricate, with several interrelated aspects contingent on context (Creswell & Poth, 2018). The case study methodology enabled the researcher to examine the

influence of several factors on mathematics educators' behaviors, providing insights that more rigid research frameworks may overlook.

The decision to employ a case study methodology within the interpretive paradigm stemmed from the necessity to thoroughly comprehend the experiences of mathematics educators. This approach aligns with the objectives of interpretive research. It further enriches the study by illustrating the intricate realities of pedagogy and curriculum implementation overall. The case study technique ultimately enables the researcher to examine several influential aspects. This results in an improved understanding of the educational context under review.

POPULATION AND SAMPLE OF THE RESEARCH STUDY

Determining the population is an essential part of any research project, as it encompasses all individuals or elements about whom the investigation seeks to generate knowledge or draw meaningful conclusions (Creswell & Plano Clark, 2018). Clearly defining the population helps establish the study's scope and boundaries and ensures results are interpreted within the appropriate context. A sample, on the other hand, is a subset of the population selected for data collection and analysis. Because it is often impractical or impossible to study an entire population, researchers rely on samples to make inferences about the broader group. It is important to recognize this distinction, as the conclusions drawn from the sample are ultimately intended to be generalized to the entire population. Consequently, the extent to which the sample accurately reflects the population's characteristics is a critical consideration in the overall research design (Fowler, 2021).

Sampling procedures

To ensure that the study generated evidence that was both broadly representative and contextually rich, two complementary sampling procedures—random sampling and purposive sampling—were employed. The use of these procedures was informed by the mixed-methods design and the different types of evidence required to address the research questions. Random sampling was appropriate for the quantitative strand because the study sought to obtain measurable evidence from a sample that reflected the target population's characteristics and diversity. Purposive sampling was appropriate for the qualitative strand because the study also required detailed information from participants with direct knowledge and experience of implementing the competency-based curriculum (CBC) in Mathematics. Thus, the two procedures served different but complementary purposes within the study.

Random sampling was used to provide each eligible member of the relevant population with a known and, where simple random sampling was applied, equal opportunity of selection. This reduced the likelihood that the quantitative sample would be disproportionately composed of participants with particular characteristics, experiences, or viewpoints. Random selection was therefore important for limiting selection bias and enhancing the extent to which quantitative findings could reasonably be generalized to the target population, subject to the adequacy of the sampling frame, sample size, and response rate (Cohen, Manion, & Morrison, 2021). Its use was particularly relevant to the quantitative strand because the study sought to establish patterns in the implementation of CBC rather than relying solely on the experiences of participants deliberately selected by the researcher.

Purposive sampling, in contrast, was used when the study required participants with specific knowledge, experience, or responsibilities relevant to CBC implementation. Participants were deliberately selected according to predetermined inclusion criteria, such as their

involvement in implementing, supervising, or supporting CBC in Mathematics. This procedure was necessary because not every member of the wider population would possess sufficient experience or information to provide meaningful qualitative accounts of the phenomenon under investigation. Purposive sampling, therefore, enabled the researcher to obtain information-rich accounts of educators' perceptions, experiences, challenges, and practices, thereby providing the contextual depth required to explain and interpret the quantitative findings.

The combination of the two procedures was therefore methodologically deliberate rather than incidental. Random sampling broadened the breadth and potential generalizability of the quantitative evidence, while purposive sampling deepened the relevance and contextual richness of the qualitative evidence. This complementarity was particularly important in the convergent parallel mixed-methods design, in which the quantitative and qualitative strands were conducted concurrently and subsequently integrated during interpretation. Using sampling procedures appropriate to the respective strands enabled the researcher to examine CBC implementation from both a population-oriented perspective and the perspectives of participants with direct knowledge of the phenomenon.

Accordingly, the sampling strategy enhanced the credibility, validity, and usefulness of the study's findings by ensuring that participants were selected for reasons directly connected to the purposes of each research strand. Rather than assuming that a single sampling procedure could adequately address all research questions, the study recognized that different forms of inquiry require different approaches to participant selection. The resulting combination provided a stronger basis for integrating numerical patterns with participants' experiential accounts and for developing a comprehensive understanding of CBC implementation in Mathematics in Manicaland Province.

Research Settings

The study context is critical to both the population and the sample. The location of study influences data collection methods and the resultant outcomes (Johnson & Onwuegbuzie, 2004). For example, conducting research in a controlled laboratory may yield different results compared to a natural field environment. Understanding the characteristics of the research environment is essential because they may affect participant behavior and responses, thereby influencing the study's results (Creswell, 2014). The relationship among the population, the sample, and the research setting is crucial for ensuring that the results are applicable and pertinent. When study settings are intentionally chosen to align with the characteristics of the population, the results can be applied with more confidence (Creswell & Poth, 2018). This association underscores the need for a well-defined population and sample, as well as appropriate study settings, to yield robust, trustworthy research outcomes.

The research study was conducted at secondary schools in Manicaland, Zimbabwe, offering mathematics courses sanctioned by the Zimbabwe School Examination Council (ZIMSEC). The research population comprised secondary school mathematics teachers in Manicaland Province. A multitude of factors were considered in selecting schools, including operational expenses, accessibility, the provision of ZIMSEC mathematics courses, the availability of qualified mathematics instructors, and the efficiency of data collection. Conducting a research of this scale and employing case study methodology with every secondary mathematics instructor nationwide would be impractical. The researcher selected Manicaland Province among the 10 provinces for its diverse school locations, high secondary mathematics pass rate, rich cultural diversity, and well-established transportation infrastructure. By selecting secondary schools in the province of Manicaland, I visited more than half of the schools and

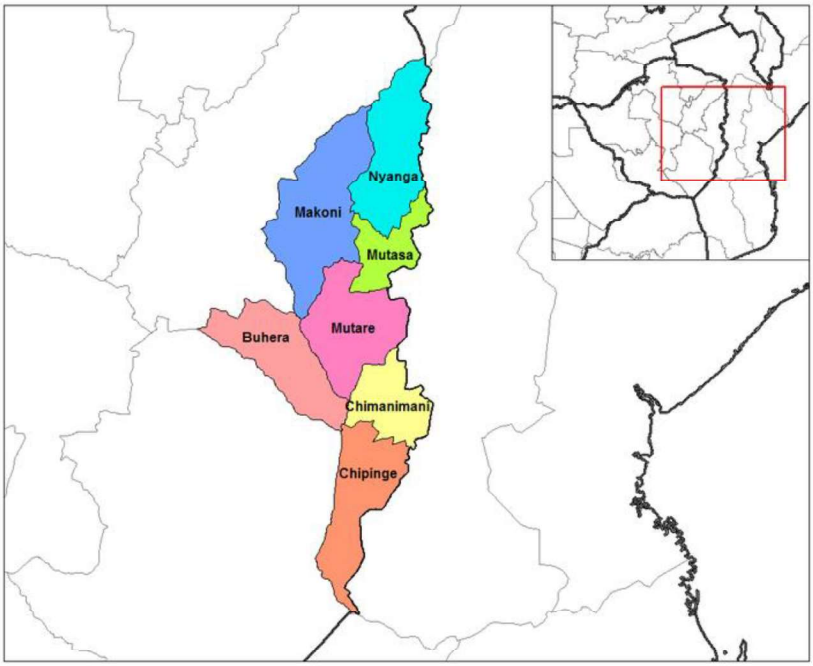
spoke with several mathematics educators. I have included the map of Manicaland Province, sourced from the Zimcricket forum (2011).

Map of Manicaland Province

A closer look at the map reveals that the province of Manicaland is subdivided into seven districts. Chipinge, Buhera, Chimanimani, Mutasa, Mutare, Nyanga, and Makoni are the respective names of these people. Each district is now overseen by two District Schools Inspectors, sometimes known as a DSI.

Fig 3

Map of Manicaland Province



Population of the study

The research population comprised all qualified mathematics teachers employed in officially registered Zimbabwean secondary schools implementing the ZIMSEC curriculum. The study targeted teachers instructing Forms Three to Six, as these levels are directly engaged in the curriculum under investigation. To obtain a manageable yet representative sample, a multistage

sampling technique was utilized. Multistage sampling divides a large population into clusters and selects samples at successive stages, which is particularly advantageous when the population is geographically dispersed (Bhandari, 2023).

The sampling process involved five hierarchical stages: research location, districts, administrators, secondary schools, and mathematics teachers. At each stage, selection decisions progressively narrowed the sample. The multistage approach was chosen for its practicality and efficiency in collecting data from large, widely distributed populations, while reducing logistical challenges. The province, districts, and schools were selected based on their relevance to the study objectives. Consistent with Creswell (2014), purposive sampling was applied at specific stages to ensure the inclusion of participants with relevant knowledge and experience, thereby enhancing the research design's cost-effectiveness and flexibility.

Sampled Schools

The researcher selected 70 schools for the study using both purposive and convenience sampling. Five mission schools, five private schools, forty council schools, and twenty government schools were used to classify the schools. To collect quantitative data, four of the five mission schools were selected, with the fifth reserved for qualitative data collection. The same principle was used in private schools as well. For the council's secondary schools, 32 were selected for quantitative data collection, while 8 were selected for qualitative data collection. In conclusion, 16 government schools were selected to collect quantitative data, whereas 4 public schools were selected to collect qualitative data.

To select the individuals who would participate in the research, the researcher was provided with the database of Manicaland Secondary Schools. After conducting an analysis, schools were selected using purposive sampling. In addition, mathematics instructors were

carefully selected from each school based on the criteria used in the investigation. In response to the researcher's invitation, the individuals who participated in the study voluntarily agreed to take part. District Schools Inspectors (DSI), including twelve school administrators and four District Schools Inspectors (DSI), were included in the study sample. The sample consisted of 140 mathematics instructors. The total number of participants in the research was 140. According to Kothari (2005), to ensure the authenticity of study outcomes, meticulous participant selection is essential. To ensure the accuracy of the information on the implementation of CBC in mathematics education in secondary schools in Zimbabwe, these individuals were selected to participate in the study. Participants were divided into three categories: those who taught mathematics, those who instructed mathematics, and those who were administrators at the institution.

District School Inspector (DSI) Sample

For this study, four District School Inspectors (DSIs) were selected to obtain genuine insights into how school administrators and math instructors implement competence-based teaching in mathematics. According to Bush and Glover (2018), DSIs play a significant role in their districts by providing direction for education. They are important sources of information because they are responsible for both establishing educational standards and monitoring schools (Moorosi, 2016). According to Hardman et al. (2016), the data collected demonstrate the genuine condition of competence-based education in mathematics at the district level. This is because of their expertise and experience with the subject.

This research was conducted by four school inspectors who specialize in Science, Technology, Engineering, and Mathematics (STEM) (Nguyen et al., 2022). Their participation in this study allowed them to provide valuable insights into the implementation of competency-based teaching in mathematics. The selection of these inspectors was deliberate, given their significant

roles in the administration of teaching and learning within the district, particularly in mathematics. This choice aligns with the findings of a 2020 study by Morosi and Saito. There is a great deal of information available to school inspectors, who are vital decision-makers. According to Oplatka and Arar's (2020) research, the material covers district-level policies, programs, and issues affecting mathematics education.

The participation of school inspectors made it possible to inquire about important aspects of the school. According to Hardman et al.'s 2020 research, these critical areas include the methodology for allocating and using resources, teacher training and support, curriculum implementation and adaptation, and assessment and evaluation procedures. As a result of their extensive expertise and close proximity to classroom activities, school inspectors can provide in-depth insights into evolving instructional strategies. In addition, they offer insights into the challenges that mathematics educators face when implementing competency-based approaches. In addition, they offer valuable insights about effective techniques for addressing deficiencies in teacher ability, as well as actions taken at the district level to promote STEM education.

The assistance they provided included extensive statistics demonstrating the challenges of transitioning from rule-based to real-world applications in competency-based mathematics instruction. (Coburn & Penuel, 2020) This lends credence to studies demonstrating the significance of educators' perspectives for understanding developments in education.

Sample of School Administrators

Twelve school leaders were selected from 70 secondary schools for this study (Moorosi & Saito, 2020). This selection was meant to demonstrate a diverse range of educational institutions. These leaders were selected for the significant role they play in the management and direction of their respective schools, aligning with research on effective school leadership (Bush & Glover, 2020). By assuming the roles of influential personalities, they ensure that math

teachers adhere to the school's educational objectives, thereby fostering a constructive learning environment (Hallinger & Lu, 2020).

Secondary school heads, in their capacity as normal monitors and controllers, are responsible for establishing academic standards and expectations, supervising teachers' performance and progress, distributing resources and aiding, and promoting school culture and community participation (Oplatka & Arar, 2020). Their management strategies significantly influence teachers' motivation and work satisfaction, curricular implementation and adjustment, opportunities for professional development, and students' outcomes and accomplishments (Day et al., 2020).

This study investigated how secondary school principals' leadership influences the implementation of a competency-based mathematics curriculum. Their perspectives provided valuable insights into challenges and opportunities at the school level, as well as methods to promote teachers' professionalism, strategies for effective resource use, and leadership styles that positively impact student learning (Coburn & Penuel, 2020). The selected school administrators were from a variety of schools, with varying numbers of enrolled students. This category includes small schools, which have the fewest pupils enrolled, medium schools, and large schools, which have a very high number of students. Additionally, the following factors will be taken into consideration when selecting the administrator: the types of locations (whether the school is located in an urban, rural, or suburban setting), the socio-economic backgrounds of the students (whether they come from families that are disadvantaged or privileged families), and the levels of academic performance (high performing, medium performing, and low performing). (Hardman et al., 2020) This diverse representation helped gain insight into the factors that influence educational attainment outcomes.

Mathematics teachers' sample

To achieve a comprehensive understanding of the implementation of the competency-based curriculum (CBC) in mathematics, 120 experienced mathematics teachers from selected schools were intentionally selected for this study (Creswell, 2014). This meticulous selection ensured that the participants had the requisite expertise and firsthand experience with CBC use. The inclusion requirements specify selecting mathematics teachers with experience at the designated schools, as well as markers and item writers. The exclusion criteria include instructors from unsampled schools and those who teach disciplines outside mathematics.

The 120 mathematics teachers were divided into three groups. 80 teachers completed structured surveys. They provide quantitative data on their experiences and perspectives (Dillman, 2007). Twenty educators participated in focus group discussions (FGD). This facilitates comprehensive discussions of challenges and achievements (Krueger & Casey, 2000). The remaining twenty educators underwent individual interviews. They offered more detailed views into their pedagogical approaches and curriculum implementation (Seidman, 2013).

Specific criteria were used to ensure the selection of competent, qualified individuals. Teaching experience was a crucial determinant. A minimum of five years of pedagogical experience was required, with a preference for those with more tenure (Harris & Sass, 2011). In addition to teaching experience, qualifications such as a diploma or degree in mathematics were also considered. Ultimately, other competencies, such as expertise in grading mathematics examinations or composing test problems, were preferred due to their profound comprehension of curricular evaluation.

Mathematics teachers with extensive experience were selected for this study due to their comprehensive understanding of the potential and challenges of implementing competency-

based curricula (Johnson, 2008). These educators may juxtapose competency-based curricula with their previous experiences with content-based curricula. Some developed effective pedagogical and assessment methodologies utilizing a content-centric curriculum. They also offered valuable insights into the requirements for teacher professional development for the new curriculum.

The mathematics teachers involved, who had previously taught under the content-based curriculum, contributed significant insights from their distinctive perspective on curriculum transfer and implementation. They might contemplate their pedagogical methodologies and modifications. They also enhanced understanding of CBC's influence on pedagogical techniques. This study sought to investigate successful teaching techniques for CBC adoption by involving experienced mathematics educators. The objective was to underscore the obstacles and opportunities associated with adopting CBC in mathematics education (NCTM, 2014). The professional development requirements and objectives of mathematics teachers for implementing CBC were examined.

Justification of the sample size

The sample size was initially determined using Yamane's (1967) formula for finite populations:

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

where n is the required sample size, N is the population size, and e is the level of sampling error. Yamane's formula provided an initial statistical estimate for the quantitative component of the study. However, the resulting figure was not treated as an inflexible requirement because the study employed a convergent parallel mixed-methods design, in which the quantitative and qualitative strands had different sampling requirements. In mixed-methods research, sampling

decisions should be consistent with the purpose of each strand and with the type of evidence required to answer the research questions (Creswell & Plano Clark, 2018).

The final sample size was 140, smaller than the 220 initially indicated by Yamane's formula because the study required different forms of evidence from different categories of participants. The quantitative component required an adequate number of mathematics teachers to generate numerical evidence on CBC implementation, while the qualitative component required information-rich participants with direct experience and relevant professional responsibilities in curriculum implementation. Purposeful sampling is appropriate in qualitative research where participants are selected because they possess knowledge or experience relevant to the phenomenon under investigation (Creswell & Poth, 2018). Consequently, the number of DSIs, school administrators, and qualitative teacher participants was determined primarily by their relevance, professional responsibilities, and ability to provide detailed information rather than by statistical proportionality.

The smaller final sample was also justified by the need to achieve depth, diversity, and manageability of data. Increasing the number of qualitative participants does not necessarily produce proportionally greater explanatory value when participants perform similar roles or provide overlapping information. Instead, qualitative sample adequacy is related to the information required to address the research questions and the richness of the data obtained (Guest, Bunce, & Johnson, 2006). In this study, DSIs provided district-level perspectives, school administrators provided school-level perspectives, and mathematics teachers provided classroom-level perspectives. This distribution enabled the researcher to examine CBC implementation at different levels of the education system and to triangulate evidence across participant groups.

Furthermore, the final sample accounted for practical considerations associated with conducting questionnaires, focus group discussions, individual interviews, transcription, coding, analysis, and member checking. A sample that is unnecessarily large could increase the volume of data without necessarily improving the explanatory value of the qualitative findings. The final sample was therefore considered appropriate because it balanced the requirements for quantitative breadth and qualitative depth, while remaining feasible within the time and resources available for the study.

Thus, Yamane's (1967) formula served as an initial statistical guide rather than the sole basis for determining the final sample. The final sample was refined in accordance with the convergent parallel mixed-methods design, the different roles of the participant groups, the purposive selection of information-rich qualitative participants, the need for contextual diversity, and the practical requirements of data collection and analysis. The adequacy of the sample was consequently judged not only by numerical size but also by its capacity to provide the breadth, depth, and range of evidence required to address the research questions (Creswell & Plano Clark, 2018; Creswell & Poth, 2018; Guest et al., 2006).

MATERIALS/INSTRUMENTATION OF RESEARCH TOOLS

Orodho (2012) defines research instruments as tools utilized for data collection, measurement, and analysis within a research study. These instruments are intended to gather information directly aligned with the research objectives and questions, ensuring that the collected data addresses the study's purpose. Various approaches may be used to collect research data, such as questionnaires, surveys, focus group discussions, interviews, observations, tests,

and assessments. The selection of a specific data collection method is determined by the study's nature and the type of information sought.

The selection of suitable research instruments is influenced by factors such as the research objectives, study design, and the type of data required. In this study, a mixed-methods research design was adopted, incorporating both qualitative and quantitative instruments to enable comprehensive data collection and analysis. Qualitative data were obtained through interviews and focus group discussions, providing in-depth insights into participants' experiences and perceptions. Quantitative data were collected using questionnaires, enabling measurement from a larger sample.

Bryman (2012) asserts that research instruments must be carefully constructed to address the research questions effectively. Furthermore, the selection of instruments is closely related to the overall research design, as different designs necessitate distinct data collection methods. Sample size is also a critical consideration; larger samples typically require instruments such as questionnaires for efficient data collection, whereas smaller samples are better suited to in-depth qualitative methods such as interviews and focus groups.

Interview Guide for Secondary Mathematics Teachers

A qualitative method was utilized to gain a comprehensive understanding of instructors' perspectives regarding the application of CBC in mathematics. By avoiding preconceptions, it facilitated understanding of how mathematics educators implemented CBC in a real classroom setting. A qualitative method is effective for understanding participants' real-life behaviors (Bryman, 2012; Creswell, 2014). Johnson and Christensen (2017) emphasize the significance of qualitative research, asserting that reality and knowledge are dynamic and contingent on temporal and spatial contexts, making it improper to generalize findings beyond the study's

subjects. Social interactive methods for data collection facilitating dialogue between the researcher and mathematics educators were employed instead of traditional inquiry methodology. This enabled the qualitative aspect of the study to reveal the diverse realities faced by math instructors concerning their attitudes and the implementation of the CBC in real classroom settings.

An interview is a talk aimed at acquiring information. During a research interview, the interviewer establishes the agenda and directs the conversation by asking the interviewee questions (Creswell, 2014). This study included interviews performed both via telephone and in person. Two focus groups were convened. Each group consisted of ten instructors. They were designed to gain a deeper understanding of the implementation of a competency-based curriculum.

A portion of the data for this study was obtained through interviews. Twenty mathematics educators and twenty administrators were interviewed. The administrators comprised 12 secondary school principals, 4 district supervisors, and 4 education inspectors responsible for overseeing STEM education. This diverse assembly of educational professionals offered valuable perspectives on implementing the CBC in mathematics.

The semi-structured interview questions were designed to elicit insights from mathematics educators regarding their perceptions and experiences with implementing the competency-based curriculum (CBC). This approach provides an in-depth examination of the challenges and successes educators encounter, offering context that quantitative data alone cannot convey (Creswell, 2014). This study aims to identify methods for enhancement by examining instructors' instructional practices, their understanding of CBC, and its implementation.

The interview technique includes demographic information to document the group's characteristics, facilitating the analysis of any trends or themes related to teaching experience, age, and gender. This data provides contextual insight into instructors' perspectives (Merriam & Tisdell, 2016). The open-ended questions enable educators to articulate their perspectives and experiences, offering a comprehensive overview of CBC implementation in mathematics courses.

To ensure the data is substantive and authentic, the interview questions were designed to elicit reflective responses from educators. Questions like "How do you instruct mathematics in your classroom?" and "What challenges have you faced..." prompt educators to provide comprehensive, narrative responses (Patton, 2002, p. 342). This data will inform strategies to enhance teacher support and development, hence improving CBC in mathematics instruction.

Focus Group Discussion (FGD)

In addition, the Focus Group Discussion (FGD) was used in the research project to gather information from mathematics educators on their perspectives on the implementation of the competency-based curriculum (CBC). Each of the twenty professors was divided into two groups of 10. According to Krueger and Casey (2000), this led to spirited conversations and fostered an environment where individuals felt comfortable sharing their views and concerns. Over the two sessions held with each group, all participants were given sufficient opportunity to participate in the conversation.

To study what instructors believe, how they teach, and the challenges they confront when teaching mathematics using the CBC framework, the questions for the focus group discussion were carefully designed. When instructors were asked

questions that invited explanation, such as "What do you think about the new competency-based curriculum in Mathematics?" and "What worries do you have...," they were able to share their genuine experiences and views (Morgan, 1997). When information was gathered in this manner, comprehensive data was obtained, which would be difficult to obtain from simply using numbers.

Obtaining data from a variety of perspectives was made easier by the focus group discussion approach. This is because distinct groups held both similar and dissimilar perspectives on the use of competency-based curricula in mathematics education. According to Denzin and Lincoln (2000), the accuracy and trustworthiness of the results are enhanced by the inclusion of a variety of perspectives. Through an analysis of conversations between the two groups, the research identified patterns and concepts that provide direction for strategies to help educators successfully implement the competency-based curriculum in mathematics classrooms.

Interview Guide for Administrators

Administrators were interviewed to deepen the researcher's understanding of their perspectives and experiences with the competency-based curriculum (CBC) in mathematics instruction. This study examined the perceptions of school administrators, district supervisors, and STEM inspectors on the implementation of CBC (Ogawa & Malen, 1991). The sample's characteristics were recorded. The acquired demographic data facilitated the identification of patterns potentially associated with particular administrator backgrounds.

During semi-structured interviews, administrators articulated their perspectives and experiences. This offered genuine insights into the challenges associated with CBC

implementation (Patton, 2002). Administrators were asked to provide thorough and meticulous solutions to the open-ended questions. The inquiries encompassed "To what extent has the district/school implemented the competency-based curriculum (CBC)?" and "What are the primary challenges...?" Merriam and Tisdell (2016). A comprehensive evaluation of the administrators' challenges, achievements, and proposals to enhance CBC implementation was conducted.

Including the administrators enhanced the validity and reliability of the findings. The administrators comprised 12 school principals, 4 district supervisory inspectors, and 4 district inspectors accountable for STEM topics. This was executed to ensure a diversity of perspectives (Creswell, 2014). Several significant factors affecting CBC implementation were highlighted in the study. The factors encompass resource allocation, teacher assistance provided, and evaluation systems. This was accomplished by examining the perspectives of school administrators (Henson, 2017).

The interview questions were designed to concentrate on the implementation of CBC, associated problems, and the necessary resources and assistance to align with the study's objectives. This strategy facilitated an examination of administrators' perceptions of CBC's efficacy and potential improvements (Wiggins & McTighe, 2005). Evaluating administrators' feedback yielded suggestions for improving CBC in mathematics instruction. Social desirability bias was minimized, as administrators could candidly express their genuine experiences and concerns, confident in the confidentiality and anonymity of their comments (Krueger & Casey, 2000). The design and execution of the interview instrument adhered to ethical norms, ensuring trustworthy, high-quality data collection.

Questionnaires for Mathematics Teachers

Creswell (2014) asserts that a questionnaire is a research instrument designed to gather self-reported data from individuals. It also provides insights into their opinions, experiences, and perspectives. Questionnaires are frequently employed in educational research because of their efficacy, adaptability, and ability to collect data from large populations. The questionnaire for mathematics educators sought to gather insights into their experiences and perspectives on implementing the competency-based curriculum (CBC). The structured format ensured that all educators responded to the same inquiries. This facilitated comparability and reliability (Fink, 2003). The survey had three components. The sections include the demographic portion, the Likert-scale questions section, and the open-ended questions section. The demographic section collected data on the instructors' gender, age, years of experience, and comprehension of the competency-based curriculum. This data was important in discerning trends associated with diverse instructor backgrounds. Comprehending teachers' backgrounds is essential for assessing the factors influencing the implementation of CBC.

Participants expressed their opinions and emotions over the implementation of a competency-based curriculum in mathematics via Likert-scale questions. The Likert-scale questions encompass inquiries such as "How familiar are you with the concept of competency-based curriculum in mathematics?" and "To what extent do you agree..." (Likert, 1932). This scaling technique facilitated trend identification and quantitative research. Participants provided comprehensive, narrative responses to the open-ended inquiries, including "What are your concerns regarding the implementation of CBC in Mathematics?" and "What mitigation measures do you propose..." (Merriam & Tisdell, 2016). This qualitative technique yielded extensive, context-rich data that illuminated the perspectives and experiences of mathematics instructors regarding the implementation of CBC.

To achieve a favorable response rate and mitigate self-selection bias, the survey was administered to 80 mathematics educators (Krueger & Casey, 2000). Educators were at ease disclosing their genuine experiences and apprehensions due to assurances of confidentiality and the anonymity of responses. Carefully crafting the survey to effectively evaluate the specified subjects improved its validity (Creswell, 2014). The consistent use of terminology and scale throughout guaranteed the survey's dependability.

The excellent data collection from a substantial sample via a questionnaire (Fink, 2003) enabled a thorough understanding of mathematics educators' experiences and perspectives about CBC implementation. Questionnaires are particularly advantageous in educational research because they can collect data from respondents dispersed across various geographic locations. The survey findings yielded critical insights into educators' apprehensions, obstacles, and recommendations. The data analysis uncovered trends that informed the development of measures to enhance CBC implementation in mathematics instruction. This research enhanced the understanding of the use of CBC in mathematics education by analyzing survey data and offering recommendations for future studies, educators, and decision-makers. The results have ramifications for curriculum creation, educational policy, and teacher preparation.

Operational Definition of Variables

Below are the variables that were made, along with their names, degrees of measurement, variations, and sources of data:

Variable 1: Teacher Familiarity with CBC (TFBC)

Teachers' self-reported familiarity with the competency-based curriculum (CBC) was assessed to gauge educators' perceptions of their knowledge and preparedness regarding this educational approach. This variable was measured at an ordinal level, reflecting the ordered

nature of responses but not assuming equal intervals between categories. A 5-point Likert scale was employed, with responses ranging from *1 = Very Unfamiliar, 2 = Unfamiliar, 3 = Neutral, 4 = Familiar, to 5 = Very Familiar,* allowing participants to indicate the degree to which they felt confident or knowledgeable about the CBC. Data for this measure were obtained from a specific survey item (Question 1a), which provided direct insight into teachers' self-assessed understanding of competency-based education principles. This information is critical for identifying gaps in familiarity and informing professional development initiatives aimed at enhancing the effective implementation of the CBC.

Variable 2: Teacher Attitude towards CBC (TAC)

Teachers' attitudes towards the implementation of the competency-based curriculum (CBC) were examined to gauge their perceptions, opinions, and overall disposition regarding this educational approach. This variable was measured at an ordinal level, reflecting the ranked nature of responses without assuming equal distances between categories. A 5-point Likert scale was used, where *1 = Strongly Disagree*, *2 = Disagree*, *3 = Undecided*, *4 = Agree*, and *5 = Strongly Agree*, allowing respondents to indicate the extent to which they support or oppose the implementation of the CBC. The data were collected through specific survey items (Question 2b), providing insights into teachers' readiness, willingness, and potential challenges in adopting competency-based education. Understanding these attitudes is essential for identifying areas that may require additional support, training, or resources to ensure successful implementation of the CBC.

Variable 3: Perceived Effectiveness of CBC (PEC)

Teachers' perceptions of the effectiveness of the competency-based curriculum (CBC) in improving student learning outcomes were assessed to understand educators' views on its impact

on student achievement and learning quality. This variable was measured at an ordinal level, reflecting the ordered nature of responses while not assuming equal intervals between categories. A 5-point Likert scale was used, with 1 = Very Ineffective, 2 = Ineffective, 3 = Neutral, 4 = Effective, and 5 = Very Effective, allowing participants to rate CBC's success in enhancing learning outcomes. Data for this measure were collected through survey items (Question 3), providing direct insight into teachers' evaluations of the curriculum's practical benefits. These perceptions are crucial for identifying CBC's strengths and weaknesses and for informing strategies to maximize its effectiveness in promoting meaningful student learning.

Variable 4: Challenges in CBC Implementation (CCI)

The challenges reported by teachers in implementing the competency-based curriculum (CBC) were analyzed to identify obstacles to effective adoption and implementation in classroom settings. This variable was measured at the nominal level, capturing distinct categories of challenges without implying any hierarchy. The survey included eight response categories, such as Lack of Infrastructure and Resources, Insufficient Professional Development, and Challenges in Measuring Competencies, among others, enabling participants to specify the particular difficulties encountered during CBC implementation. Data were collected via a survey item (Question 6), yielding valuable insights into the practical barriers educators face. Recognizing these challenges is crucial for policymakers and school administrators to develop targeted interventions, allocate resources efficiently, and establish support mechanisms that promote the successful implementation of competency-based education.

Variable 5: Mitigation Measures for CBC Implementation (MMI)

The study examined teachers' suggested mitigation measures to address challenges in implementing the competency-based curriculum (CBC) and identified potential solutions and

strategies to enhance curriculum adoption and effectiveness. This variable was measured at the nominal level, as it represents distinct categories of suggested interventions without implying any order or hierarchy. The survey included seven response categories, such as prioritizing teacher training and support, providing curriculum resources, and embracing technology, among others. Participants indicated which strategies they believed would best address the obstacles encountered in CBC implementation. Data were collected through survey items (Question 7), providing insights into practical recommendations from teachers. Understanding these proposed mitigation measures is essential for informing policy decisions, guiding professional development initiatives, and ensuring the successful and sustainable implementation of competency-based education.

Variable 6: Teacher Professional Development (TPD)

Teachers reported on the frequency and quality of professional development related to the competency-based curriculum (CBC) to understand the extent and effectiveness of capacity-building initiatives available to educators. This variable was measured at an ordinal level, reflecting the ranked nature of responses for both frequency and quality, without assuming equal intervals between categories. The frequency of professional development was measured on a 3-point scale, with 1 = Less than once per term, 2 = At least once per term, and 3 = More than once per term, while the quality of professional development was assessed on a 4-point scale, ranging from 1 = Poor to 4 = Excellent. Data for this measure were collected through survey items (Question 4), providing insight into how often teachers engage in professional development related to CBC and how they evaluate its effectiveness. This information is important for identifying gaps in training provision and for designing targeted interventions to enhance teacher preparedness and the successful implementation of competency-based education.

Variable 7: School Administrative Support (SAS)

Teachers' perceptions of school administrative support for implementing the competency-based curriculum (CBC) were assessed to understand educators' views on the role of school leadership in facilitating curriculum adoption. This variable was measured at an ordinal level, reflecting the ranked nature of responses without assuming equal distances between categories. A 5-point Likert scale was used, with 1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, and 5 = Strongly Agree, allowing teachers to indicate the extent to which they perceive administrative support as present and effective. Data were collected through a survey item (Question 5), providing insight into the level of backing, guidance, and resources that teachers receive from school management. Understanding these perceptions is crucial for identifying potential gaps in leadership support and for developing strategies that enhance administrative engagement, thereby improving the overall effectiveness of CBC implementation.

Variable 8: Teacher Subject Area (TSA)

The subject area expertise of teachers was examined to determine the specific disciplines in which educators are trained and competent, with particular emphasis on specialization in Mathematics. This variable was measured at the nominal level, categorizing teachers by subject specialization without implying any hierarchy. Assessing teachers' subject expertise is crucial for evaluating their preparedness and capacity to implement the competency-based curriculum (CBC) effectively, especially in mathematics, where specialized pedagogical skills and content knowledge are necessary to achieve targeted learning outcomes.

STUDY PROCEDURES AND ETHICAL ASSURANCE

In accordance with the University's code of conduct, this project received initial approval from the University Research Ethics Committee (UREC) prior to data collection. It is done this way to ensure ethical criteria are adhered to when conducting research with human subjects. A comprehensive study proposal, informed consent forms, and survey instruments must be submitted to the UREC for assessment as part of the approval process.

Ethical Assurances

Adherence to established ethical guidelines was fundamental to ensuring that data collection in this study was conducted honestly, with integrity, and in a trustworthy manner. The study observed key ethical principles, including protection from harm, informed consent, the right to withdraw at any time, the right to privacy and confidentiality, and the maintenance of honesty and transparency throughout the research process (American Psychological Association [APA], 2020; American Educational Research Association [AERA], 2014). Commitment to these standards was maintained throughout the study, guided by the Ethical Principles of Psychologists and Code of Conduct (APA, 2020) and the foundational ethical directives of the Belmont Report (1979), which emphasize respect for persons, beneficence, and justice in research involving human participants. Strict adherence to these guidelines aimed to protect participants' rights and welfare while ensuring that the research findings are both credible and ethically sound.

Protection from Harm

A low-risk approach was adopted to prioritize participant safety and well-being. Data collection relied on self-report methods, such as online questionnaires and in-person interviews,

which are considered low-risk because they do not expose participants to physical harm or significant psychological stress (Creswell, 2014). The data collection process was carefully designed to avoid situations that could cause discomfort, tension, or anxiety. Additional measures were implemented to ensure that participants' physical and emotional well-being remained unaffected throughout the study. These precautions enabled the study to maintain a safe environment while effectively gathering the required research data.

Informed Consent

All participants provided informed consent prior to study participation, indicating their voluntary agreement. This procedure adhered to the ethical guidelines established by the American Educational Research Association (AERA, 2014). The consent form detailed the study's objectives, the methodology, and the potential risks and benefits of participation. It also informed participants of their right to withdraw from the study at any time without negative consequences (Krueger & Casey, 2000). To further protect participants, the form guaranteed that all personal information would remain confidential and be managed with strict privacy throughout the research process. The form also included contact information for both the researcher and the University Research Ethics Committee (UREC), allowing participants to seek clarification, ask questions, or report concerns at any stage. This comprehensive process ensured that participation was voluntary, informed, and ethically protected.

Right to Personal Confidentiality

In line with the standards established by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research (1979), this study maintained participant privacy and anonymity throughout the research process. Survey responses were collected anonymously, and interview transcripts were coded to prevent any personally

identifiable information from being linked to individual participants. To further safeguard confidentiality, pseudonyms were used to refer to participants in all reports and publications resulting from the study. These procedures ensured the security of participants' identities and fostered an environment in which participants could provide honest and candid responses without fear of personal exposure.

Sincerity with Relatives in the Professional World

Following the recommendations of Merriam and Tisdell (2016), the study was conducted with honesty, transparency, and integrity. This ethical framework guided data collection, analysis, and reporting, ensuring that all procedures were conducted responsibly and that results accurately reflected participants' input. In response to the researcher's recognition of potential biases, steps were taken to mitigate their impact. In addition to the researcher's personal experience as a mathematics educator, the researcher's professional involvement in implementing the competency-based curriculum (CBC) may have influenced the researcher's perspective. Objective coding methods were utilized during data analysis to minimize researcher bias and enable systematic, impartial interpretation of responses. These practices ensured high standards of research rigor and credibility, supporting the trustworthiness and ethical soundness of the findings.

DATA COLLECTION PROCEDURES

Data collection was conducted in three sequential stages to achieve a comprehensive understanding of the research problem. The first stage involved administering questionnaires to 100 mathematics teachers, yielding quantitative data on their familiarity with, attitudes toward,

and perceptions of the competency-based curriculum (CBC). The second stage involved semi-structured interviews with 20 mathematics teachers and 20 school administrators, yielding in-depth insights into individual experiences, challenges, and perspectives on CBC implementation. The third stage consisted of a focus group discussion with 20 mathematics teachers, facilitating interactive dialogue and collective reflection on issues, challenges, and potential solutions concerning the curriculum. The integration of surveys, interviews, and focus group discussions constituted a mixed-methods approach, enabling data triangulation and supporting a more nuanced understanding of the phenomena under investigation.

Storage of Information and Safety

The confidentiality and identity of participants were carefully maintained throughout the study to uphold high ethical standards and protect sensitive data. The study posed no risk to participants' data**,** and multiple measures were implemented to ensure its security. Electronic files were stored on password-protected devices**,** while physical documents were secured in a locked cabinet, in accordance with Creswell's (2014) recommendations. These precautions minimized the likelihood of unauthorized access, disclosure, or misuse of information, thereby safeguarding participants' privacy throughout the research process and reinforcing the study's ethical integrity.

The Official Approval

Prior to data collection, ethical approval was obtained from the University Research Ethics Committee (UREC) to ensure adherence to all relevant codes of ethics and institutional guidelines. The approval process entailed a rigorous review, including the submission of a comprehensive research proposal, detailed consent forms, and the intended survey instruments. This procedure confirmed that the research design, data collection methods, and participant

protections complied with established ethical standards, thereby safeguarding participants' rights, privacy, and well-being throughout the study.

Confidentiality and anonymity are guaranteed.

Throughout the study, participants' privacy was well maintained. During the research, stringent measures were taken to ensure confidentiality and anonymity, in line with ethical standards. Given the researcher's awareness of the importance of safeguarding participants' identities, they took extensive precautions to prevent potential disclosures.

Strategies for the Protection of Data

To maintain participants' confidentiality, unique codes were assigned to each survey response. This code does not expose the participants' identities, so no one can link their responses to them. We took great care to remove any names and other personal information from the interview transcripts. Locked storage and password-protected files were used to ensure the safety of all data, whether electronic or paper-based.

DATA COLLECTION AND ANALYSIS

To gain a comprehensive understanding of the research problem, this study employed a mixed-methods approach. This strategy integrates qualitative and quantitative methods of data collection and analysis into a single approach.

Quantitative Data Collection

Quantitative data were collected using a structured questionnaire administered to 100 mathematics teachers, selected to ensure relevant and representative insights into the research problem. The instrument was developed to obtain measurable data regarding participants' experiences, perceptions, and practices related to the subject under investigation. The study also included an analysis of archival data through a systematic review of relevant documents, such as curriculum guidelines, policy documents, and other official publications. These sources provided contextual and supplementary information that supported the quantitative findings and strengthened the study's rigor through data triangulation.

Survey Instrument

The survey instrument was designed to collect comprehensive data pertinent to the study objectives. It included a section on demographic variables, such as respondents' age and years of teaching experience, to establish participant background characteristics. Additionally, the instrument included Likert-scale items rated on a 5-point scale to assess teachers' attitudes toward implementing the competency-based curriculum (CBC). The survey also included ordinal-scale questions rated on a three-point scale to evaluate teachers' perceptions of CBC's effectiveness in teaching and learning.

Qualitative Data Collection

Qualitative data were collected through multiple methods to enhance the depth and richness of the information obtained. Semi-structured interviews with 20 mathematics teachers facilitated a detailed exploration of their experiences and perspectives on implementing the competency-based curriculum. Additionally, two focus group discussions (FGDs), each with ten participants, facilitated shared dialogue and captured collective views and interactions among teachers. Document analysis was also conducted, involving a systematic review of relevant

materials such as curriculum guides and policy documents, to provide contextual support and complement the findings from the interviews and focus group discussions.

Interview Protocol

The interview protocol was designed to facilitate a comprehensive understanding of teachers' perspectives regarding the implementation of the competency-based curriculum (CBC). It consisted of open-ended questions that allowed participants to describe their experiences, challenges, and instructional practices related to CBC implementation in their own words. To ensure depth and clarity, the protocol also incorporated follow-up and probing questions, which encouraged participants to elaborate on their responses, clarify ambiguities, and provide more detailed and substantive insights. This approach enabled the researcher to capture rich, nuanced data reflecting the complexities of teachers' experiences with CBC, supporting a thorough qualitative analysis of implementation practices and challenges.

Data Analysis

After completing the self-administered survey, the quantitative data were analyzed and summarized using descriptive statistics. This involved calculating means, frequencies, and percentages to provide a clear overview of respondents' characteristics and their perspectives on the implementation of the competency-based curriculum (CBC) (Pallant, 2020). Descriptive statistics facilitated the identification of patterns, trends, and general tendencies within the dataset, making it easier to interpret the responses.

While inferential statistical techniques, such as analysis of variance (ANOVA) and regression analysis, are often used to examine relationships between variables—for example, the influence of demographic factors on CBC adoption (Field, 2018)—this study focused primarily on descriptive statistics for reporting purposes. In addition, a factor analysis was conducted to

identify the underlying components that influence CBC implementation. This included methods such as Principal Component Analysis (PCA) and Exploratory Factor Analysis (EFA), which helped simplify the data and reveal latent structures that might otherwise remain hidden (Hair et al., 2019). By using these analytical approaches, the study effectively summarized the data while uncovering key factors contributing to the successful implementation of the CBC.

Qualitative Data Analysis

The qualitative data analysis prioritized the identification, coding, and categorization of themes and patterns emerging from data collected primarily through focus group discussions and semi-structured interviews (Braun & Clarke, 2019). A systematic thematic analysis approach was implemented to maintain rigor, transparency, and alignment with the research objectives. The process commenced with data familiarization, which entailed repeated reading and review of interview and focus group transcripts to achieve a comprehensive understanding of the content. Subsequently, initial coding was conducted by assigning meaningful codes to significant data units relevant to the study's research questions.

Theme identification involved examining the coded data to detect recurring patterns and themes across participants' responses. The subsequent stage, theme refinement, consisted of reviewing, refining, and clearly defining the identified themes to ensure they accurately represented the underlying data. To enhance rigor, organization, and efficiency, qualitative data analysis software such as NVivo or Atlas.ti was utilized to manage, code, and analyze the data systematically. This structured approach enabled a transparent, replicable analysis process, supporting the extraction of meaningful insights from participants' experiences and perspectives on the implementation of the competency-based curriculum (CBC).

Quantitative Data Analysis

Descriptive statistical techniques were applied to summarize, organize, and interpret the quantitative data collected in the study. These methods included calculating measures of central tendency, such as means, and determining frequencies and percentages to identify patterns, trends, and distributions in respondents' answers. Visual representations, including pie charts and bar graphs, were used to enhance clarity and facilitate comparison of key findings, thereby providing an accessible presentation of the data.

Statistical software packages, including SPSS and R, were used to conduct the analysis, enabling efficient data management, precise computation of descriptive statistics, and effective visualization of results. The application of these tools enhanced the reliability, rigor, and transparency of the quantitative data analysis, ensuring that the findings were accurate, systematic, and replicable. The integration of robust statistical techniques with software-assisted analysis provided a comprehensive and trustworthy overview of participants' responses regarding the implementation of the competency-based curriculum (CBC).

Instrument Validation

To establish the validity and reliability of the survey instruments, they underwent supervisor review to ensure clarity, relevance, and alignment with the study objectives. After this expert evaluation, the instruments were pilot tested to identify and correct ambiguous or unclear items before full-scale administration. A multi-item Cronbach's alpha coefficient was subsequently used to assess the internal consistency of the survey items within each construct, confirming that the instrument yielded reliable, consistent measurements of participants' responses. These procedures improved the overall quality of the data collection process and enhanced the credibility and trustworthiness of the study's findings.

Triangulation

Triangulation was used to enhance the study's validity and reliability through several complementary strategies. Data source triangulation involved collecting evidence from surveys, interviews, and document analysis, enabling cross-checking and verification of findings across diverse sources. This process ensured that conclusions were not derived from a single data type, thereby increasing their credibility. Methodological triangulation was achieved by integrating quantitative and qualitative research methods, enabling the study to address multiple dimensions of the research problem and provide a comprehensive understanding of the implementation of the competency-based curriculum (CBC). Analyst triangulation was implemented by engaging multiple researchers in the data analysis, thereby reducing individual bias and improving the consistency, objectivity, and trustworthiness of the findings. Together, these triangulation strategies resulted in a more rigorous and robust research design.

Mapping Instrumentation to Research Questions

The following table illustrates the mapping of instrumentation materials to research questions:

Table 3

Mapping of instrumentation materials to research questions

Research Question	Instrumentation
To what extent do mathematics teachers understand competency-based curriculum?	Survey (Likert-scale questions) Interviews (open-ended questions)
To what extent do mathematics teachers implement a competency-based curriculum?	Survey (Likert-scale questions) Interviews (open-ended questions)

Research Question	Instrumentation
What are the challenges faced by teachers in CBC implementation?	Interviews (open-ended questions)
How can the challenges be mitigated?	Interviews (open-ended questions)
What is the relationship between teachers' perceived effectiveness of CBC and their attitudes?	Survey (ordinal-scale questions), Regression analysis

This study explored key dimensions of teachers' experiences implementing the competency-based curriculum (CBC) using three primary constructs. The first construct, teachers' perceptions of CBC implementation, was measured using an ordinal Likert-type scale, allowing participants to indicate their level of agreement with statements regarding the curriculum's design, relevance, and practicality. The second construct, teachers' perceived effectiveness of CBC, was also assessed using an ordinal scale that captured teachers' evaluations of how effectively the curriculum supports teaching practices and enhances student learning outcomes.

The third construct, challenges encountered during CBC implementation, was examined using a qualitative approach. Data for this construct were analyzed using thematic analysis, which enabled the researcher to identify, categorize, and interpret recurring themes and patterns reflecting practical difficulties, institutional constraints, and contextual factors influencing the implementation of CBC. Together, these three constructs provided a comprehensive understanding of both the quantitative and qualitative aspects of teachers' experiences, thereby offering a holistic perspective on the implementation of the competency-based curriculum.

Role of the Researcher

As the researcher, I assumed a central and active role throughout all phases of the study, from research design to data analysis and interpretation. I was responsible for collecting and analyzing quantitative and qualitative data, ensuring that all data-gathering procedures were conducted systematically and aligned with the study's research objectives. To maintain high data quality and integrity, I carefully verified, validated, and organized all responses before analysis. In addition, I took responsibility for integrating findings from the study's quantitative and qualitative components and synthesizing the results to provide a comprehensive understanding of the research problem. This process involved interpreting statistical outcomes alongside emerging qualitative themes in order to draw well-supported conclusions. Through this integrated approach, I addressed the research questions and generated meaningful insights into the implementation and effectiveness of the competency-based curriculum (CBC), while ensuring that the study remained rigorous, transparent, and methodologically sound.

DATA PROCESSING AND ANALYSIS

The data collected for the study underwent systematic processing and analysis to ensure accuracy, consistency, and meaningful interpretation. Initially, data cleaning was conducted to identify and correct errors, eliminate inconsistencies, and address missing or incomplete responses, thereby enhancing data reliability. Subsequently, data transformation was performed by converting raw data into an appropriate format for analysis, which included coding responses, categorizing variables, and preparing the dataset for input into statistical or qualitative analysis software. In the final stage, suitable analytical techniques were applied, such as descriptive statistics for quantitative data and thematic analysis for qualitative data, to identify patterns, relationships, and insights relevant to the research objectives.

Software

Software tools were utilized to promote efficient, systematic, and rigorous data analysis. Quantitative data analysis was conducted using the Statistical Package for the Social Sciences (SPSS), which supported accurate data entry, management, and analysis. Descriptive statistical procedures, including the computation of frequencies, means, and percentages, were performed in SPSS to summarize and interpret participants' responses. Additionally, SPSS generated graphical and tabular representations, such as charts and tables, to enhance the visualization of data patterns and trends and to support clearer presentation of the results.

For qualitative data analysis, computer-assisted qualitative data analysis software (CAQDAS), specifically NVivo and Atlas.ti, was used to manage and analyze textual data from interviews, focus group discussions, and document reviews. These tools enabled systematic organization, coding, and categorization of large volumes of qualitative data. Iterative coding processes facilitated the accurate identification, comparison, and refinement of themes and sub-themes, supporting deeper interpretation of participants' views and experiences. The use of NVivo and Atlas.ti also improved transparency and consistency in the analytical process by enabling tracking of coding decisions and establishing clear links between raw data and emerging themes.

The integration of SPSS, NVivo, and Atlas.ti strengthened methodological rigor by ensuring that both quantitative and qualitative analyses were conducted in a structured, reliable, and replicable manner. Employing these software tools minimized human error, improved analytical precision, and enhanced the credibility and trustworthiness of the study's findings.

Timeline

Data collection and analysis occurred over a structured two-month period to ensure systematic and timely completion of research activities. In the second week, survey questionnaires were distributed to selected participants, and completed responses were collected to generate quantitative data on teachers' perceptions, attitudes, and experiences regarding the implementation of the competency-based curriculum (CBC). This phase facilitated the identification of broad trends and general patterns within the study population.

During weeks three and four, semi-structured interviews were conducted with selected participants to obtain in-depth qualitative data. These interviews enabled participants to elaborate on their experiences, challenges, and perspectives regarding CBC implementation, providing richer contextual information and deeper insights that complemented the quantitative findings. The use of semi-structured interview protocols ensured consistency while allowing flexibility to explore emerging issues.

Between weeks five and eight, the collected data were systematically processed and analyzed. Quantitative data were coded and analyzed using statistical software to generate descriptive statistics and identify key trends relevant to the study objectives. Qualitative data underwent thematic analysis, including transcription, coding, categorization, and interpretation of interview responses to identify recurring patterns and emerging themes. Integrating quantitative and qualitative findings enhanced the depth and robustness of the analysis and ensured alignment with the research objectives.

Data Quality Control

To ensure data quality and reliability, several measures were implemented. First, pilot testing was conducted with ten teachers from Mashonaland East Province, who participated in a preliminary trial of the survey instruments. This process helped identify ambiguities and issues in the survey questions, enabling refinements to improve clarity and ensure the tools effectively captured the intended information. Second, data validation was carried out to enhance the credibility of the findings. This involved triangulation of multiple data sources, including surveys, interviews, and document analysis, to cross-verify information and reduce the potential for bias. Additionally, member checking was employed, allowing participants to review and confirm their responses, thereby ensuring that the data accurately reflected their perspectives and experiences.

CHAPTER SUMMARY

In summary, this chapter presented a comprehensive account and rationale for the research methodologies employed to examine instructors' perspectives on implementing the competency-based curriculum (CBC). The study employed a mixed-methods approach, integrating qualitative and quantitative data collection and analysis. This methodological integration was selected to provide a holistic and in-depth understanding of the research problem by capturing both numerical patterns and detailed descriptive insights from participants.

The chapter outlined the research design, target population, sample size, and sampling procedures for selecting participants. It described the data-collection instruments, including questionnaires, interviews, and surveys, as well as the procedures used during data collection. Employing multiple instruments and data sources facilitated methodological triangulation, which

enhanced the credibility, validity, and trustworthiness of the findings. Key concepts relevant to the study were also defined to ensure conceptual clarity and consistency throughout the research process. Additionally, the chapter explained the measurement of study variables and the selection and application of appropriate statistical tests in accordance with the research objectives. Ethical considerations, study limitations, and strategies for ensuring data quality and integrity were also addressed, demonstrating adherence to established research standards and ethical practices.

In conclusion, the methodological framework adopted in this study provides a robust, systematic foundation for examining educators' perceptions of CBC implementation and the challenges it entails. It elucidates the relationship between instructors' attitudes, emotions, and perceptions of CBC effectiveness. The study's findings contribute to the expanding body of knowledge on CBC implementation and provide evidence-based insights to inform educational policy and instructional practice. These findings are particularly relevant to educators, curriculum developers, and policymakers, with the overarching aim of improving educational quality. Chapter 4 presents and analyzes the study's findings, focusing specifically on mathematics instructors' perspectives regarding CBC adoption in mathematics education.

CHAPTER 4: DATA PRESENTATION AND ANALYSIS

INTRODUCTION

This chapter presents a comprehensive analysis of data collected on the concerns of mathematics instructors in Zimbabwe regarding the implementation of the competency-based curriculum (CBC). It aims to provide an in-depth understanding of educators' perspectives and experiences as they address the pedagogical, administrative, and contextual challenges associated with this educational reform.

A mixed-methods research design was employed, integrating qualitative and quantitative approaches to ensure a holistic examination of the research problem. Qualitative data were collected through in-depth interviews and focus group discussions (FGDs), facilitating a nuanced exploration of instructors' perceptions, experiences, and attitudes toward the CBC. These methods yielded detailed insights into the specific concerns educators encounter, supporting a comprehensive understanding of the factors influencing curriculum implementation. Quantitative data were gathered through structured surveys, enabling measurement of the prevalence and intensity of identified concerns among mathematics instructors. The integration of qualitative and quantitative findings facilitated triangulation, thereby enhancing the reliability and validity of the results and offering a multidimensional perspective on the issues under investigation.

The findings are organized thematically to reflect the major patterns and trends emerging from the data. This structure highlights key challenges, perceptions, and potential strategies to address educators' concerns. Each theme is supported by both descriptive and inferential statistical analyses, ensuring that the results are evidence-based and academically rigorous. Systematic examination of these findings illuminates critical issues affecting the implementation

of CBC and offers insights that may inform policy, practice, and future research in mathematics education in Zimbabwe.

TRUSTWORTHINESS OF DATA

The rigor of this research is evident in its focus on credibility, transferability, dependability, and confirmability, which collectively provide a robust basis for the study's interpretations and conclusions. To ensure data reliability and trustworthiness, multiple strategies consistent with established qualitative research standards were employed. Lincoln and Guba (2000) identify several approaches to enhance the trustworthiness of qualitative inquiry, including triangulation, member checking, thick description, and peer review.

These strategies were integrated to ensure that the qualitative data collected were both authentic and comprehensive. Triangulation utilized multiple data sources, methods, and perspectives to cross-validate findings, thereby reducing potential bias and deepening understanding. Member checking enabled participants to review and confirm the accuracy of information obtained during interviews and focus group discussions, ensuring accurate representation of their perspectives. Thick descriptions provided detailed contextual information, allowing readers to evaluate the transferability of findings to other educational contexts. Peer review offered external evaluation of the research process and interpretations, further strengthening the study's dependability and confirmability.

The use of these combined strategies ensured that the research process was transparent, systematic, and rigorously documented. These measures enhanced the trustworthiness of the data and allowed the findings to be presented with minimal additional justification. The

following section offers a detailed overview of each strategy and its specific application within this study.

a) Triangulation

The study employed triangulation to enhance the credibility and comprehensiveness of the findings on the implementation of the Competency-Based Curriculum (CBC) in Zimbabwean mathematics classrooms. The researcher used data-source triangulation and methodological triangulation. Data-source triangulation involved collecting information from different participant groups, namely 80 educators who completed questionnaires, 20 educators who participated in individual interviews, 20 educators who participated in focus group discussions (FGDs), 12 school principals, and 8 district inspectors. Methodological triangulation was achieved through questionnaires, individual interviews, and FGDs, enabling the researcher to examine the phenomenon from both quantitative and qualitative perspectives (Creswell & Poth, 2018).

The questionnaires provided quantitative evidence on teachers' experiences and perceptions of CBC implementation, while individual interviews generated detailed accounts of teachers' experiences, including challenges related to resources, training, and curriculum implementation. FGDs provided opportunities for participants to discuss and compare their experiences, thereby identifying common concerns and additional issues that might not have emerged through individual interviews (Patton, 2015; Krueger & Casey, 2015).

The perspectives of school principals and district inspectors provided an administrative and supervisory dimension to the findings. Data from the different sources and methods were

compared to identify convergence, divergence, and complementary insights. For example, teachers' concerns about inadequate resources and professional development were also reflected in the perspectives of school leaders and district inspectors. At the same time, differences between administrative expectations and classroom realities were identified. This process strengthened the interpretation of the findings by reducing reliance on a single source or method (Merriam & Tisdell, 2016; Yin, 2018). In addition, member checking was used to enhance the credibility of the qualitative findings by allowing participants to confirm the accuracy of the information and interpretations. Overall, the combination of data-source triangulation, methodological triangulation, and member checking strengthened the credibility and validity of the study findings and provided a more comprehensive understanding of the challenges and opportunities associated with CBC implementation.

b) Member Checking

Member checking was an essential component of the research methodology in this study. This process ensured accuracy and authenticity by allowing participants to review and validate the data recorded from focus groups and interviews (Birt et al., 2016). A crucial strategy for enhancing the credibility and reliability of qualitative research findings is member verification. The researcher aimed to ensure that the data accurately reflected participants' perspectives and experiences regarding the implementation of CBC in mathematics by allowing them to review transcriptions of their input.

The interpretation of data in qualitative research can be subjective and influenced by the researcher's biases, making this stage essential (Lincoln & Guba, 1985). In this study, the researcher transcribed the recordings of interviews and focus group discussions with

mathematics instructors and school officials. Subsequently, participants were instructed to analyze these transcriptions. This method not only validated the accuracy of their statements but also allowed them to provide further information or clarify any matters that may have been overlooked in the initial interviews (Creswell & Poth, 2018). Throughout the member verification procedure, the researcher observed that all participants maintained their previous contributions.

Nevertheless, member verification was conducted via telephone; therefore, the researcher could not analyze participants' facial expressions. Furthermore, member screening mitigated the risk of misinterpreting participant remarks. The researcher mitigated potential bias arising from a single interpretation of the data by allowing elaboration on their assertions. Member checking empowered participants by granting them a voice in the study. It emphasized the collaborative essence of qualitative research by recognizing their position as co-constructors of knowledge (Birt et al., 2016).

The study's results were substantially revised based on feedback received during the member verification process. A detailed analysis of the challenges faced in implementing the CBC was facilitated by participants who provided contextual information in their responses, thereby enriching the data. Others elucidated their views, ensuring that their perspectives were accurately reflected. The researcher interpreted, *"Teachers reported inadequate resources for CBC mathematics lessons."* In response to member verification, the instructor stated, "*It is not merely a lack of materials; we do not possess any sanctioned CBC mathematics kits for secondary schools."* Our reliance on improvisation significantly constrains effective instruction in intricate subjects like Trigonometry. Ultimately, member checking enhanced collaboration and

trust between the researcher and participants, while also reinforcing the validity of the study's conclusions. This technique aligns with best practices in qualitative research, aiming to yield results that are both credible and reflective of participants' lived experiences (Merriam & Tisdell, 2016).

c) Thick Description

The concept of thick description was utilized in the study to enhance the comprehensiveness and depth of the research findings. It necessitated providing comprehensive explanations of the context, participants, and the methodologies used to collect the data. This facilitates understanding of the study and enhances the applicability of the results to other contexts (Geertz, 1973). The adoption of the CBC has constituted a significant educational reform in Zimbabwe's Manicaland Province, where the research was conducted across many high schools. Through a comprehensive depiction of the educational landscape, encompassing socio-economic conditions, cultural influences, and institutional frameworks, the researcher effectively illustrated the setting in which educators functioned. The researcher conducted comprehensive face-to-face interviews to elucidate key facts about the adoption of CBC in mathematics.

The incorporation of focus group discussions enabled the researcher to gain deeper insights into teachers' collective cultural and organizational perspectives on the implementation of CBC in Zimbabwe. This contextual information was essential for readers to comprehend the intricacies of implementing the CBC and to recognize how these elements affect mathematics teachers' experiences and challenges (Creswell & Poth, 2018). The research included a diverse cohort of participants: 140 secondary mathematics educators, 12 school administrators, and 8

district inspectors. By providing comprehensive biographies of these participants, including their backgrounds, teaching experiences, and roles within the educational system, the researcher enabled readers to understand the varied perspectives that influenced the research.

Understanding the diverse levels of teacher experience and the administrative challenges faced by school leaders enhances a thorough examination of the perception and implementation of the CBC across different contexts. The thick description employed in this study significantly enhances the transferability of the findings. By providing extensive, contextually rich data, the researcher enabled other educators, policymakers, and academics to compare the study's environment with their own contexts (Merriam & Tisdell, 2016). Insights from Zimbabwean mathematics educators' experiences can guide equivalent educational changes in other countries facing similar challenges. The detailed accounts of participants' experiences with the CBC in mathematics can serve as a benchmark for understanding how such modifications can be embraced and implemented across diverse cultural and educational settings.

d) Peer Review

According to Creswell and Creswell (2018), peer review was essential for enhancing the overall quality of the study and the reliability of its findings. To ensure that the study design, data collection tools, and analytical methodologies were relevant, rigorous, and consistent with best practices in qualitative research, the peer review process required experts in the field to assess these aspects of the research. Several specialists in mathematics education and curriculum implementation participated in the peer review process. These professionals offered a variety of perspectives on the study's design and techniques.

According to Patton (2015), the inclusion of peer reviewers in this research project serves multiple vital purposes, including preserving rigor, enhancing validity, and improving data analysis. This partnership was especially beneficial in light of the challenges encountered in implementing the CBC, which required a thorough understanding of educational practices and legislation, as well as the specific challenges faced by math instructors in Zimbabwe. The data collection instruments, such as discussion guides for focus groups and interviews, were evaluated not only by peers but also by an external perspective. It was their contributions that led to the interview questions being modified to more accurately reflect the complexity of the implementation process and the perspective of math classroom instructors. In addition, their observations enabled them to ensure that the questions posed to the participants were not only clear but also topical and capable of eliciting deep, insightful replies.

The researcher enlisted the assistance of a few specialists in the field to examine the questions for clarity, relevance, and alignment with the ongoing research. Furthermore, the preliminary themes were appraised by the peer reviewers to check for overgeneralization or a lack of subtlety. In conclusion, peers reviewed the triangulation method, sample strategies, ethical implications, and related topics. It was vital to conduct this external validation to enhance the validity of qualitative findings, as it minimized the risk of bias and misunderstanding (Birt et al., 2016). With the aid of this joint review, we ensured that the analysis was comprehensive and that the conclusions drawn from the data were adequately supported by empirical evidence. Peer reviewers, who offered a variety of interpretations or brought to light aspects of the data that could have been overlooked, were ultimately responsible for producing a more comprehensive study (Creswell & Poth, 2018).

Peer reviewers' participation contributed to the study's increased credibility. The findings gained greater credibility through the comprehensive evaluation of the analytical methods, which strengthened the substantiation of the themes and data interpretations. As a result, the conclusions gained greater credibility. As a result of this stringent screening method, the results were more indicative of participants' experiences and the wider context of CBC implementation (Merriam & Tisdell, 2016).

RELIABILITY AND VALIDITY OF DATA

Reliability is essential for research instruments. Reliability is akin to the fundamental pulse of study. In CBC Mathematics, where practical learning intersects with real-life issues, a questionnaire must consistently and accurately measure its intended objectives. In many instances, obtaining reliable data is not only advantageous. The researcher exerted considerable effort to attain both trustworthy and valid results (Creswell & Poth, 2018). The concept of dependability indicates that the instrument yields consistent results under the same settings. For example, administering the same questionnaire to a cohort of students multiple times (test-retest reliability) should yield closely aligned results. In a framework such as CBC Mathematics, which emphasizes the application of mathematical concepts in real-world contexts, having a reliable instrument is crucial for accurately assessing educators' attitudes and performance (Taber, 2018).

Internal consistency refers to the extent to which each item in a questionnaire aligns with the others. The tool was designed to assess mathematics instructors' understanding of CBC and the challenges they faced in their instruction. Cronbach’s alpha was employed; values above 0.7

typically indicate robust reliability. In our investigation, the alpha exceeded this standard, indicating robust internal consistency (Taber, 2018; Field, 2020).

Several factors can influence the reliability of such instruments. Factors such as the clarity of the questions, the contextual relevance to respondents, the total length of the questionnaire, and the variety of the sample all contribute significantly. All of these elements were meticulously evaluated in this study. The questions underwent peer review to identify any possible ambiguities (Polit & Beck, 2021). The questions were constructed clearly and concisely, avoiding complex language, so aligning seamlessly with the learning objectives of CBC Mathematics (Polit & Beck, 2021). Researchers intentionally use colloquial terminology to minimize misunderstandings. A different approach involves utilizing known scales. By using questions from earlier research (DeVellis, 2020), the questionnaire effectively combines reliability with a proven measure of consistency.

Similarly, the scenarios or circumstances presented must align with the teachers' personal experiences. When situations become overly abstract, reactions may become inconsistent (Smith et al., 2020). Consequently, the inquiries on the practical applications of mathematics were meticulously adapted to align with the Zimbabwean educational context. The other concern was the questionnaire's duration. An excessively long questionnaire may fatigue respondents, thereby compromising the reliability of their responses. Achieving a balance between complexity and conciseness was crucial, particularly when educators were required to engage in thoughtful problem-solving (Dillman et al., 2020). Ultimately, the inclusion of a diverse and substantial sample (comprising around 120 secondary mathematics educators, 12 school administrators, and 8 district inspectors) reinforced the reliability and generalizability of the study's findings. The eight district inspectors contributed to diverse perspectives.

Additionally, statistical assessments such as Cronbach's alpha, Pearson correlation, and the intra-class correlation coefficient (ICC) are incorporated (Taber, 2018). Multi-item Cronbach's alpha was utilized as evidence of the instrument's reliability. Nonetheless, CBC Mathematics is not devoid of its complexities. Occasionally, several educators may interpret the same real-life circumstance in markedly divergent ways, leading to contradictory responses (Smith et al., 2020). Additionally, there are open-ended difficulties that require deep contemplation; assessing them can easily veer off the intended path, since evaluating intricate problem-solving is not always straightforward (Johnson et al., 2020). Variability in students' comprehension of CBC Mathematics may result in differing scores when retested shortly thereafter (Field, 2020). In summary, guaranteeing the questionnaire's reliability is not only a perfunctory task. It was essential for deriving significant results on learners' interactions with context-based mathematics. Enhancing the credibility of the study involves addressing concerns such as question clarity, context relevance, and sample diversity, while using approaches like pilot testing and nuanced statistical analysis.

In this study, the researcher assessed internal consistency, particularly for the Likert-scale items. Multi-item Cronbach's Alpha (α) coefficients were employed to assess the internal consistency of the measures, including Teacher Preparedness for CBC in Mathematics. The findings indicated $\alpha = 0.82$, signifying high internal consistency, as values above 0.70 are generally considered acceptable. Statements such as "I *feel confident teaching CBC math*" and "*I possess sufficient CBC training*" had a substantial correlation. This methodology enhances our understanding of how people engage with practical mathematical challenges (Creswell & Poth, 2018).

DATA COLLECTED FROM QUALITATIVE INSTRUMENTS

The generation of codes through thematic analysis, which focused on the concerns of secondary mathematics teachers in Zimbabwe regarding the implementation of CBC in mathematics, required a thorough familiarization with the data. This was accomplished by carefully examining transcripts, field notes, and other study documentation. The third step was to begin the first coding. Labeling emergent essential concepts or phrases was a part of this process. Some examples of such concepts and phrases are "teacher preparedness," "resource shortages," and "assessment challenges."

After an iterative review, these identical codes were grouped into comprehensive, well-considered topics. For example, the association between "lack of training" and "resistance to CBC" was made possible through axial coding, which helped refine the relationships between codes. After that, core themes were identified through selective coding to answer the study questions and ensure that the teachers' concerns were addressed. While it was necessary to deploy software such as NVivo in order to sort codes, manual techniques were also used. However, it was essential to maintain both consistency and reflexivity to ensure the study's rigor. In the end, the purpose of the study was to discover a framework that could coherently represent what the instructors saw to be the difficulties associated in adopting CBC.

a) Demographic presentation for teachers who participated in face-to-face interviews

Here is a summary of the demographic information for the 20 mathematics teachers shown in the table:

Table 4.1

Gender distribution

Males	**Females**
11	9

Analysis of the table reveals that more male than female mathematics instructors participated in the face-to-face interviews. This gender imbalance among interview participants may affect the diversity of perspectives represented in the qualitative data. Although the findings offer valuable insights into the experiences and concerns of mathematics instructors, this disparity should be considered when interpreting the results, as male instructors' viewpoints may be more prominently reflected in the interview outcomes.

Table 4.2

Age groups in years

26-30	**31-35**	**36-40**	**41-45**	**46-50**	**51-55**	**56-60**
4	4	4	4	2	1	1

The data show that most participants were between 26 and 45 years old, representing early- to mid-career mathematics teachers. This age range suggests that participants have likely accumulated substantial teaching experience, enabling them to offer informed perspectives on implementing the Competency-Based Curriculum (CBC) and to actively adapt to new pedagogical approaches.

Table 4.3

Teaching Experience in Years

Below 5	**5 - 10**	**11 – 15**	**16 – 20**	**21 – 25**	**25 – 30**	**31and above**
2	4	5	5	2	1	1

Analysis of participants' teaching experience shows that most mathematics teachers have between 11 and 20 years of professional experience. This suggests that the majority are experienced educators with substantial classroom expertise who have likely encountered multiple curriculum changes throughout their careers. Their extensive experience enables them to offer informed, reflective perspectives on the challenges and opportunities of implementing the Competency-Based Curriculum (CBC).

b) Demographic presentation for Administrators (School heads and District inspectors)

This section presents the demographic characteristics of the administrators who participated in the research, offering a detailed overview of key attributes, including gender, age, and professional experience. Understanding these demographic factors provides essential context for interpreting the findings and assessing participants' perspectives. Examining the composition of the study sample enhances transparency. It enables readers to evaluate the data's representativeness and the potential influence of participants' backgrounds on their views on the implementation of the Competency-Based Curriculum (CBC).

Table 4.4

Gender Distribution of Administrators

School Heads		**District inspectors**	
Males	**Females**	**Males**	**Females**
7	5	6	2

The data reveal a higher number of male school heads than female school heads, indicating a gender imbalance in leadership positions within the sampled schools. Similarly, district inspectors exhibited a significant disparity in male and female representation.

Table 4.5

Age distribution in years

Below 25	**26-30**	**31-35**	**36-40**	**41-45**	**46-50**	**51-55**	**56-60**
0	**1**	**3**	**3**	**4**	**3**	**3**	**3**

The age distribution of participants revealed that most individuals were between 31 and 60 years old, indicating that the majority are mid- to late-career professionals. This demographic profile suggests that participants have substantial work experience and practical knowledge in educational leadership, enabling them to offer informed and reflective perspectives on implementing the Competency-Based Curriculum (CBC). Furthermore, their professional maturity is likely to shape their views on administrative challenges, decision-making processes, and strategies for supporting teachers during curriculum reforms.

Table 4.6

Administration experience in years

Below 5	**6-10**	**11-15**	**16-20**	**21-25**	**26-30**	**31 or more**
0	**1**	**3**	**3**	**4**	**3**	**3**

Regarding administrative experience, the participants demonstrated substantial expertise in educational leadership, reflecting many years of service in school management and district-level administration. Their wealth of experience enhances the credibility of the collected data, as their insights are grounded in practical knowledge and firsthand engagement with school administrative and instructional processes.

THEMATIC ANALYSIS OF QUALITATIVE DATA FROM INTERVIEWS (TEACHERS AND ADMINISTRATORS)

The following sections present an overview of the consolidated data obtained from in-person interviews. Before data collection commenced, the study's four main research questions were clearly defined to lay the foundation for the interview protocol and guide the data-gathering process. The qualitative data were organized and analyzed using a thematic approach, with themes derived directly from the research questions. This approach enabled the systematic categorization of participants' responses, ensuring alignment with the study's objectives and highlighting patterns, trends, and key insights from mathematics instructors' perspectives.

Research questions

The major research question informing the study was as follows:

What are the perceptions of mathematics teachers on the implementation of the Competency-Based Curriculum (CBC) in Mathematics?

From this broad question, some supporting questions were developed. The sub-research questions are;

(i)To what extent do mathematics teachers understand competency-based curriculum?

(ii) To what extent do mathematics teachers implement a competency-based curriculum?

(iii) What do mathematics teachers face the challenges in the implementation of a competency-based curriculum (CBC) in mathematics?

(iv) How can the challenges be mitigated?

These research questions were further highlighted as themes.

Theme 1: Teaching Mathematics in CBC

Twenty teachers shared their thoughts, and the ideas come alive as they mix a range of creative, student-focused methods with a dash of tech and practical flair. To substantiate this, one participant, coded as Teacher 1, said:

> "With the implementation of CBC in mathematics, I now use a variety of teaching methodologies ranging from demonstrations, projects, excursions, and question and answer sessions depending on the nature of the topic."

In most cases, these responses show how math can jump out of textbooks and into everyday problem-solving, even if the details sometimes repeat a core idea or two. To make math interesting and approachable, these teachers combine several strategies, such as tech-enhanced courses, group projects, and student-led research. As supported by Teacher 9, who stressed that

> "As for me, I use pair work and group work during my lessons so that students learn from other students. Through collaboration, students learn to respect other students' ideas and contributions."

All the participants emphasized the need for clear communication and practical connections to the real world, while also cultivating a mentality that embraces mistakes as opportunities for growth. Most of the time, the purpose of these tactics is to enhance students' comprehension, boost their self-assurance, and prepare them for the kinds of problem-solving situations they may encounter outside of the classroom. Therefore, the problem of teaching mathematics using a range of approaches was raised during some of the Focus Group Discussions.

Theme 2: Understanding of CBC by Mathematics Teachers

CBC is a method that, in many instances, appears to break away from conventional routines and place students at the center of the learning process. Mathematics professors provided a range of impressions as they discussed CBC. Taking everything into consideration, it appeared that all 20 participants agreed that this CBC strategy is both practical and forward-looking. Several subthemes, such as conceptual knowledge of CBC and theoretical comprehension without complete practical clarity, were developed, even though this overarching issue was the focus of the discussion. In the process of attempting to solve the problem of comprehending CBC, one of the subthemes that emerged was grounded in a conceptual understanding of CBC.

Conceptual Understanding of CBC

Based on participants' sentiments, some teachers understood the CBC conceptually. This can be seen from the quotes of some of the participants, as illustrated: Teacher 3:

> "I understand CBC as an educational approach that focuses on students mastering specific skills and competencies. As the name implies, this type of curriculum is hinged on mastering certain skills."

Alluding to this, Teacher 14 said:

> "CBC emphasizes personalized learning. Each student progresses at their own pace."

Participants' views indicated that some teachers have a conceptual understanding of CBC. A basic grasp of CBC, however, does not ensure its correct application, as theory-to-practice gaps often reveal significant obstacles that teachers must overcome to incorporate the curriculum into their teaching strategies successfully. We examined the sub-theme of theoretical comprehension without complete practical clarity due to this gap, underscoring the need for ongoing support and hands-on training to ensure that theoretical frameworks translate into meaningful educational experiences for students.

Theoretical Understanding Without Full Practical Clarity

The analysis also reveals that there may exist a theoretical understanding of CBC without a practical understanding. This is evident in the quotes below

Teacher 4:

> "CBC is mentioned, but it is not really happening in practice."

Teacher 6:

> "There is a lot of confusion about what it means, and I feel like I am just teaching the same way I always have."

These comments underscore the challenges educators face in translating concepts into effective teaching strategies, illustrating the gap between the curriculum's theoretical framework and its practical implementation in the classroom. This difference sometimes stemmed from a lack of comprehension of the practical applications of the Competency-Based Curriculum (CBC), leaving mathematics educators uncertain about how to adapt their instructional methods. Despite discussions surrounding CBC, Teacher 4 observed that its principles are not being effectively integrated into standard classroom practices. Similarly, Teacher 6's comment reflects a prevalent sentiment among mathematics educators who feel overwhelmed by the ambiguity over the curriculum's requirements.

This misconception may lead to reliance on traditional teaching approaches for mathematics, which may not align with the innovative strategies advocated by CBC. Ultimately, educators may struggle to bridge the gap between academic comprehension and practical application in the absence of adequate training and support, which can lead to missed opportunities to enhance student learning and engagement. Addressing these difficulties is crucial to ensuring that the CBC's intended benefits are realized in the classroom and fostering a more dynamic and effective learning environment. Overall, the consensus is that CBC is a dynamic and adaptable framework. It transitions from inflexible, time-constrained instruction to an approach that emphasizes skill development, practical application, and personalized pace. This strategy appears intended to enhance academic achievement while equipping learners to navigate unforeseen obstacles in the real world.

Theme 3: Implementation of Competency-Based Curriculum (CBC) in Mathematics

Both positive and negative responses were received from educators regarding the implementation of CBC in mathematics. Even though some mathematics educators are on board with its concepts, others remain skeptical about its actual influence. In the process of attempting to incorporate CBC into regular mathematics lectures, there was discussion of novel teaching approaches, unforeseen hurdles, and a few beneficial traits that emerged from this endeavor. Partial implementation, school-level gaps and inconsistencies, and full implementation are among the sub-themes that have emerged under this overarching subject.

Partial Implementation

The data analysis revealed partial implementation of CBC in schools. This is shown in the following quotes: Teacher 5:

> "I assess my students based on their mastery of skills rather than just grades."

That had also been supported by Teacher 3:

> "We have started using more collaborative learning strategies… students work together on problem-solving tasks."

According to these remarks, although some educators are making progress in adopting the Competency-Based Curriculum, the application of these principles remains uneven across classes. The fact that Teacher 5 prefers to evaluate students based on their level of mastery rather than standard grading is evidence of their development and unique learning progress. Teacher 3's inclusion of a reference to collaborative learning strategies indicates a significant shift in focus toward fostering students' critical thinking and cooperation, two crucial components of the curriculum.

The difference in the implementation of these principles, on the other hand, suggests that not all educators are either equipped or motivated to adopt CBC fully. As a result of this imperfect implementation, dissimilarities in student experiences and outcomes may occur. This is because certain kids may benefit from innovative instructional practices, while others may not receive the same kind of support or engagement. As alluded to by Teacher 10, who indicated that

"I mix both traditional and modern methods of mathematics lesson delivery."

As we delve deeper into the challenges educators face, it becomes essential to examine the school-level gaps and inconsistencies that contribute to uneven curriculum implementation. Understanding these factors will provide insight into the systemic issues that hinder the effective realization of CBC in the classroom.

School-Level Gaps and Inconsistency

The second theme highlighted gaps and inconsistencies at the school level. This theme is supported by the following statements: Teacher 8:

> "In theory, CBC is supposed to be implemented, but… I find it challenging to fit it into the rigid schedule."

Teacher 17:

> "I think CBC is just a buzzword at our school. There has not been enough support or resources to really change how we teach."

These quotations underscore the significant challenges educators face in effectively implementing the Competency-Based Curriculum (CBC) in their classrooms. Teacher 8's response highlights the challenge of integrating Competency-Based Curriculum (CBC) into existing rigid schedules that often prioritize traditional teaching methods and assessments over

innovative strategies. This rigidity can impede teachers' ability to innovate and adapt their teaching to accommodate the diverse requirements of their students.

Furthermore, Teacher 17's observation that CBC appears to be a "buzzword" underscores a critical issue: the lack of necessary resources and support for substantial change. In the absence of professional development, instructional resources, and administrative support, educators may feel ill-equipped to adapt their pedagogical approaches. Teachers may experience frustration and disengagement due to the gap between the curriculum's objectives and classroom practices, ultimately affecting students' learning.

Moving on to the next topic, we must investigate the concept of complete implementation. When one has a better understanding of the components that comprise effective CBC integration, the methods necessary to overcome these gaps and inconsistencies and to ensure that the curriculum can be effectively applied in every classroom will become clearer.

Full Implementation

A significant number of instructors have come to realize that it would be beneficial to forgo outmoded grading methodologies in favor of placing greater emphasis on the development of specific skills. The Competency-Based Curriculum (CBC) has yielded significant benefits when fully embraced. This is especially true for educators who have transitioned from the old grading system to a competency-focused approach. Because of this, educators now have a greater capacity to evaluate their pupils' comprehension and to create an atmosphere conducive to learning. One example, Teacher 11, mentioned,

> "I have observed how my students genuinely grasp the subject matter when I step away from simply assigning grades. It is centered on their learning progression, not solely on a grade."

This observation underscores the value of competency-based evaluations, which prioritize skill development over rote memorization. Teacher 8, in a similar vein, remarked,

> "Since integrating competency-based evaluations, my students have shown greater involvement in their studies. Rather than merely aiming to pass exams, they are tackling authentic issues and partnering with their peers."

This alteration boosts student participation and fosters teamwork and analytical reasoning, essential skills for today's educational demands. Teacher 20 further noted that,

> "The previous approach felt limiting. Presently, I can customize my teaching approach to accommodate students' requirements, leading to their overall improvement. It is fulfilling to observe their development of competencies that will prove invaluable outside of the classroom."

Such a viewpoint reflects a growing understanding among teachers that emphasizing competencies can create more relevant educational journeys.

Nonetheless, while some educators are effectively implementing these reforms, certain challenges remain, such as ensuring that all instructors have adequate support and resources to fully adopt the CBC values. In discussing our next issue, it is essential to confront systemic barriers that hinder CBC's full inclusion, ensuring that all students benefit from a competency-based educational experience. In conclusion, a distinct disparity existed in the use of CBC throughout mathematics classrooms. Consequently, several mathematics educators perceive CBC as a medium for group projects, adaptive feedback, and collaborative learning. Nonetheless, other challenges persist, including insufficient finance, ambiguity, and the persistent allure of traditional methods. For CBC to succeed, it is essential to implement more practical training, develop a comprehensive strategy, and pursue a broader, systemic initiative to bridge the gap between theoretical concepts and pedagogical practice.

Theme 4: Challenges related to CBC Implementation

The scarcity of fundamental resources was a persistent cause of complaint. Several educators have expressed concern that the lack of textbooks, teaching aids, and even adequate school infrastructure has significantly hindered the hands-on learning that the competency-based curriculum (CBC) program is intended to promote. The curriculum itself was the factor that contributed to the chaos that ensued. A few educators have raised concerns that the syllabus content does not always align with the intended abilities to be evaluated, and that the pressure to complete the material only makes the situation worse.

In the meantime, several educators have conceded that it is not particularly easy to construct tests that accurately measure a pupil's level of comprehension. Thus, the following sub-themes arose: Lack of suitable resources, Insufficient Teacher Training and Professional Development, Difficulty in Assessing Competencies, Large Class Sizes and Time Constraints, Resistance to Change, Teacher Readiness, and Parental and Community Misunderstanding. Following this, the subsequent section will examine each subtheme in further depth.

Lack of Adequate Resources

The shortage of resources emerged as a central sub-theme from data analysis, as exemplified in these statements: Teacher 9*:*

> "One major challenge is the lack of adequate resources. We often do not have enough textbooks or materials to support the hands-on learning that CBC requires."

School Head 7:

> "The lack of resources poses a challenge. Without proper resources, it becomes difficult for teachers to implement CBC effectively."

These remarks signify a substantial barrier to the successful implementation of the Competency-Based Curriculum (CBC). Teacher 9's anger with the lack of tools necessary for experiential learning, a fundamental principle of CBC, is distinctly evident. The shortage of resources hinders lesson delivery and, in turn, restricts students' ability to actively participate in the CBC in mathematics.

Reinforcing this viewpoint, School Head 7 underscores that inadequate resources foster an environment in which teachers struggle to implement the new pedagogical approaches mandated by the CBC. This challenge is exacerbated when resource constraints compel teachers to revert to traditional teaching methods, ultimately undermining the curriculum's aims. During Focus Group Discussions, the problem of insufficient resources was frequently highlighted as a significant concern about the adoption of CBC in Mathematics. Educators expressed a need for additional textbooks and digital resources to enhance their teaching methods and better support students.

Before progressing to the subsequent subject, it is essential to recognize that insufficient teacher training and professional development exacerbate the resource shortage. Inadequate training may impede instructors' ability to effectively utilize available resources, thereby hindering the full realization of CBC's potential in the classroom. It is crucial to address teacher readiness and resource availability to foster a climate conducive to effective competency-based learning.

Insufficient Teacher Training and Professional Development

A notable aspect emphasized by the research is the constraints in teacher training and continuous professional development. For illustration, consider the following perspectives: Teacher 3 stated, "Many of us lack training in CBC methods, which hinders effective implementation." Several educators share this apprehension; they feel insufficiently prepared for the novel methodologies of the Competency-Based Curriculum. The lack of adequate training leaves educators in uncharted territory, prompting them to revert to outdated approaches that may not align with the CBC's core principles. This may understandably result in irritation, complicating the establishment of the desired engaged classroom environment.

School Head 2 endorsed this, stating, "A considerable challenge is the insufficient training for educators regarding the specific assessment techniques mandated by CBC." The need for professional development that emphasizes both pedagogy and assessment mechanics in competency-based learning is paramount. In its absence, educators may struggle to accurately assess student progress, which is essential for tailoring instruction to individual needs. The integrity of the exam may be compromised, consequently affecting student performance.

Education Inspector 1 also remarked that, "Numerous educators lack the requisite skills to evaluate student competencies in mathematics accurately." This indicates a broader issue: educators lack the necessary resources to conduct effective CBC evaluations. If competences cannot be accurately evaluated, this may result in erroneous assessments of student capability, perhaps leading to inappropriate learning techniques or assistance. Addressing inadequate teacher training and development is essential for the success of the CBC. Prior to proceeding, we must consider the challenges of evaluating competencies, which are essential for assisting

educators in enhancing their abilities and effectively implementing competency-based methodologies.

Difficulty in Assessing Competencies

Difficulties in gauging competencies emerged as another significant theme. Teacher 9 put it this way:

> "It is difficult to measure competencies accurately when the tools we have are not aligned with the curriculum goals."

This is a barrier, and a pretty big one at that. Essentially, if the assessment tools do not match the competencies in the curriculum, how can teachers know what students really understand? When that happens, teachers might end up relying on methods that are not quite right, which can skew their view of students' abilities and make it harder to plan lessons effectively.

School Head 6 agreed, noting,

> "Teachers are unsure how to create assessments that accurately reflect student understanding of mathematical concepts."

This often boils down to a lack of proper training and resources, leaving teachers feeling ill-prepared. This uncertainty affects not only assessment but also targeted support. If mathematics teachers struggle to pinpoint exactly where students need help, it can ultimately negatively impact learning.

In addition, a significant issue for mathematics teachers when implementing the Competency-Based Curriculum (CBC) was a lack of clarity regarding assessments. Consider these quotes as evidence: As School Head 11 pointed out, "The assessment criteria for CBC can

feel a bit vague." This reflected a real frustration felt by many teachers. When assessment criteria are not very specific, teachers can feel unsure about the best way to evaluate how well their students are doing. This vagueness about what actually makes a competency 'acceptable' often led to inconsistent grading and some confusion for both students and their teachers. Without clear, straight-forward guidelines, mathematics teachers might struggle to align their assessments correctly with the CBC's learning goals. Hence, that ultimately undermines the whole curriculum.

Education Inspector 2 chimed in with,

> Teachers often struggle with the shift from older assessment styles to the new competency-based assessments. It is a hurdle indeed."

Many mathematics teachers were used to traditional assessment methods focused on memorization and straight-up standardized testing. Thus, the sudden shift to competency-based assessments posed some challenges. That meant fundamentally changing how they evaluated students' understanding. Now it is about focusing on the student's ability to actually use and apply what they know. This transition can be daunting, especially for mathematics teachers who have not received sufficient training or support to implement these new assessment strategies.

Moreover, this lack of clarity has led to a sense of overwhelm among mathematics teachers. Some felt pressured to develop assessments that accurately reflect student competencies without having a clear framework to guide them. That pressure can create a cycle of anxiety and uncertainty, making it challenging for mathematics teachers to feel confident in their assessment practices. Apart from a lack of assessment techniques, participants noted the challenge of large class sizes.

Large Class Sizes and Time Constraints

Large class sizes and time constraints also stood out as challenges. As Teacher 5 put it,

"It is hard to give individual attention to students when I have so many in one classroom."

Many teachers face this issue. If class sizes are large, it is harder to cater to individual needs. Personalized learning and individualized assessments are key to competency-based frameworks, so, obviously, being unable to provide one-on-one support hinders implementation. Teachers might feel overwhelmed, learning about whole-group teaching, which, realistically, cannot address every student's needs.

> "With the curriculum being so comprehensive, teachers often feel rushed, which affects their ability to implement and assess CBC effectively."

School Head 4 elaborated. This revealed that mathematics teachers felt pressure to cover a lot in a limited amount of time. Feeling rushed can prevent them from engaging deeply with their students or thoroughly assessing competencies. A superficial understanding can result, undermining the entire competency-based curriculum approach and, in general, affecting overall student learning.

Resistance to Change and Teacher Readiness

Resistance to change was another hurdle identified. Some teachers might not readily embrace CBC's outlined changes. One school head (9) put it this way*:*

> "There is resistance from some mathematics teachers... hesitant to change their teaching practices."

This can arise from comfort with the old ways, maybe fear, or simply a reluctance to leave established routines. As these new approaches are adopted, the competency-based curriculum feels daunting to some. Such hesitancy can, and often does, divide staff. Some innovate eagerly while others cling, ultimately impacting overall CBC effectiveness.

Expanding on this, another school head (3) noted:

> "We struggle with varying levels of teacher readiness… some embrace CBC, while others find it overwhelming."

This is a clear highlight of the challenge – different experiences, different levels of readiness. Where some thrive, others feel weighed down by the adaptation required – the methods, the assessments, all of it. This inconsistency is a problem. It fragmented the CBC approach, successes here, faltering there, ultimately affecting student experiences in mathematics.

Another head (5) elaborated,

> "Teacher readiness varies so much… some are all in on CBC, others, not so much. It is clear then: diverse readiness, diverse experiences. For some, it is a breeze; others struggle under the required changes – assessment, methods, you name it."

This is an issue. This inconsistency also splits the CBC approach into successes and failures. Thus, students' experiences in mathematics suffer.

One teacher expressed excitement for CBC's potential but confessed to feeling uncertain without proper training. This sentiment captures mathematics teachers' enthusiasm while also revealing insecurity stemming from inadequate support. To some extent, mathematics teachers were eager to innovate but lacked confidence and hesitated in implementing effective practices.

Another teacher noted feeling as though they were swimming against the current. New curriculum strategies are encouraged, but the system seems to be hinged on the traditional methodologies. “CBC is not always flexible enough,” noted the teacher (7). The frustration was real. That disconnection between expectations and limitations can strain mathematics teachers, hindering their ability to deliver high-quality lessons.

One teacher (12) claimed that.

> “1 observed colleagues struggling with CBC, finding it difficult to shift from traditional methods.”

This underscores that change is not always easy or welcome. While some mathematics teachers adapted swiftly, others found the transition challenging, potentially dividing instructional practices in the same school. One teacher (6) suggested that.

> “Collaboration, for opportunities to share what works, is crucial for the success of CBC implementation in mathematics. It could really help those feeling lost.”

That emphasized community among mathematics teachers. When teachers collaborate and share experiences, a beneficial learning environment emerges, helping bridge readiness levels. Ultimately, these sentiments paint a complex picture in which teacher readiness and support are critical to CBC success. Addressing these differences is essential to a cohesive approach that elevates students' learning in mathematics. Then there are the parents and community, presenting another challenge and a misunderstanding of CBC.

Parental and Community Misunderstanding

As teacher 7 remarked: “I often encounter resistance from parents who are unfamiliar with CBC.” This highlighted some parents' lack of awareness of CBC. Thus, the goals and

benefits of CBC seemed unclear to parents and the community at large. This apprehension, without proper information and communication, had led to pushback, undermining support. A lack of parental 'on board' hindered those collaborative efforts needed for a strong learning environment.

Furthermore, School Head 12 emphasized more firmly that “Parental understanding and support are still lacking.” So, effective communication is needed to engage parents and the community. Uninformed families struggled to support their children effectively. The school-family partnership must be built. It would ensure alignment of understanding and expectations. Recognizing these challenges is, in most cases, crucial for progress. These difficulties underscore the importance of class-size management strategies and the development of effective time-management techniques to support the successful implementation of CBC in mathematics education.

Support from the administration and the government does not seem to be any better. Teachers lamented a lack of clear guidance, funding, and overall backing, which only exacerbated the situation. There was also a cultural twist. Some teachers described a kind of resistance to change from parents, students, and even fellow teachers who had long been attached to traditional methods. Some teachers raised concerns about insufficient learning accommodations for students with learning disabilities. These further sideline a group that already faces hurdles. Adding to this mix, some teachers felt that overly crowded classrooms made it nearly impossible to give students the individual attention they needed or to use technology effectively. In addition, technological barriers posed another challenge.

Technological Barriers

A few respondents noted technological barriers as problems that mathematics teachers encounter when implementing the Competency-Based Curriculum (CBC). Evidence for this is illustrated by statements such as: “Not all teachers are comfortable using digital tools for monitoring student progress,” as School Head 5 queried. This opinion reflected a significant challenge, as technology becomes ever more important in education. Although some teachers might readily use digital tools, some may feel uneasy or lack adequate training. This discomfort could impede their ability to accurately track student progress and provide prompt feedback, both of which are important in competency-based learning. As a result, mathematics teachers might miss chances to use technology to boost student learning and participation.

Teacher 17 shared this concern, noting, “Many schools lack the necessary tools, which limits our ability to enhance learning through digital means.” This pointed to a systemic problem that can greatly hinder the CBC's success. When schools lack important technological resources—like computers, software, and reliable internet access—teachers have few options for using innovative teaching methods. That resource shortage can stifle creativity and prevent mathematics teachers from adopting competency-based approaches, ultimately impacting student involvement and academic success.

Education Inspector 1 mentioned, “The gap in technology access creates disparities among schools, making it difficult to implement CBC uniformly.” This emphasized the inequalities different schools face. Some schools might have strong technological infrastructure that supported CBC implementation, but others struggled with outdated equipment or insufficient resources. This disparity can create a fragmented educational system in which students’ experiences and opportunities vary widely depending on their school’s access to technology.

School Head 6 added, “We need to prioritize professional development that focuses on integrating technology effectively into our teaching practices.” This underscores the need for targeted training that gives teachers the skills and confidence to use digital tools. Schools can empower teachers to embrace technology and improve their teaching by investing in professional development. In turn, this fosters more effective implementation of the competency-based curriculum.

It is generally important to address these technological barriers to ensure that all mathematics teachers can implement CBC effectively. By providing the necessary tools and training, schools can foster a classroom environment where teachers feel confident integrating technology, thereby enriching students' overall learning experience. Having elaborated on the challenges, it is imperative to address their mitigation.

Theme 5: Strategies for Mitigating the Challenges Related to CBC Implementation

Conversely, educators proposed many solutions to mitigate the identified difficulties. From this overarching subject, several subthemes arose, including Continuous Professional Development, Enhanced Collaboration and Mentorship, Provision of Resources and Technology Integration, and Improved Communication with Parents and Stakeholders. This section will provide specifics on each subtheme, starting with Continuous Professional Development.

Certain educators suggested establishing regular seminars and mentorship programs to enhance teacher readiness. Similarly, others contended that increased financing and collaborations with community organizations may provide essential resources and enhance school infrastructure. Alternative perspectives emphasized the need to establish informal

networks among educators to facilitate the exchange of resources and strategies. Engaging parents and local community members may influence opinions and foster genuine support for CBC by demonstrating the practical applications of mathematics in daily life. Certain educators advocate for increased project-based learning and more diverse pedagogical approaches to meet the varied needs of their pupils.

Continuous Professional Development

One promising way to ease the challenges of CBC implementation, it seems, is through continuous professional development. As Teacher 17 put it, “We should organize regular professional development workshops for teachers.” This really underscored the need to provide mathematics teachers with structured ways to sharpen their skills and build on their knowledge. Participants recommended regular workshops. Workshops are spaces where mathematics teachers can get to grips with new teaching approaches, swap stories, and learn from each other. By taking part in these sessions, teachers can feel more confident in their ability to roll out the Competency-Based Curriculum and tweak their practices to serve their students better. School Head 11 supported this, saying,

> “Ongoing professional development is essential. It is more of a journey than a single event, wouldn't you say? With educational practices always changing, teachers need to stay up-to-date on the latest teaching methods and ways to assess learning.”

This ongoing development ensured that mathematics teachers had what they needed to overcome the hurdles of the CBC, which should ultimately improve how well students learn. According to District Inspector 4,

> “Comprehensive training for all mathematics teachers… should cover both pedagogical strategies and assessment techniques.”

It highlighted the importance of taking a well-rounded approach to professional development. The idea is that this should not only be about classroom management and teaching strategies; it should also cover how to assess mathematics learning in line with CBC principles. With comprehensive training, mathematics teachers can, in most cases, feel better prepared to assess student competencies and make more accurate instructional choices. Recognizing the importance of continuous professional development opened the door to thinking about other ways to improve CBC implementation in mathematics. The next subtheme shall focus on collaboration and mentorship among mathematics teachers.

Collaboration and Mentorship

Another key solution to the CBC implementation puzzle was enhancing collaboration and mentorship. Teacher 7 emphasized that *"*Creating collaborative teacher networks can help us share resources and best practices." That highlighted the power of mathematics teachers working together. Mathematics teachers connecting to share their knowledge and experiences can be a real benefit. These networks can be an important source for innovative teaching strategies, lesson plans, and materials suited to CBC, fostering a supportive community of practice. School Head 9 drove this point home*:* "We need mentorship programs for new mathematics teachers." This reflected the need to give support to those just beginning their teaching journey. Mentorship programs can help novice teachers navigate the challenges of CBC mathematics implementation by pairing them with seasoned mathematics teachers who can offer guidance, feedback, and support. Mentorship helps new teachers build confidence and quickly develop effective practices, ensuring a smoother transition.

By prioritizing enhanced collaboration and mentorship, schools can foster an environment where teachers feel valued and supported. This sense of community does more than just strengthen individual mathematics teaching; it can also contribute to the overall success of CBC implementation. As we explore solutions, we must consider how to nurture and sustain these collaborative efforts within the educational system. Not forgetting to explore the issue of the provision of resources as a mitigation measure.

Provision of Resources and Technology Integration

A recurring idea for mitigating challenges in the CBC rollout was to blend resource provision with technology integration. School Head 2 nailed it: "Having good teaching resources and digital tools… really matters." This underscored the importance of equipping mathematics teachers with the right tools to effectively implement the Competency-Based Curriculum. Good teaching materials, such as textbooks, workbooks, digital boards, and online resources, are key to making lessons engaging and providing students with different ways to learn. If teachers did not have these things, they might struggle to teach well, which could hold students back.

In addition, School Head 6 said, "We need technology in our classrooms." This shows that new technologies are needed to improve learning. When tech is used in class, it can change how mathematics teachers teach, making lessons more engaging and relevant for students. Digital tools can help students learn at their own pace while also giving mathematics teachers useful information to teach. By focusing on bringing tech into schools, we can create a modern learning environment that supports CBC's work. Spotting the need for resources and tech sets the stage for another important part of CBC implementation in mathematics: better communication with parents and other key stakeholders.

Improved Communication with Parents and Stakeholders

Another idea that came up when looking for ways to improve CBC implementation was the need for better communication with parents and stakeholders. School Head 7 pointed out, "We need help to teach parents about CBC." This shows a big gap in understanding between schools and families. Many parents may not know what the Competency-Based Curriculum is all about or how it differs from old-school teaching. Providing parents with resources such as workshops or printed materials can help close this gap, enabling them to support their children's learning better and understand what the curriculum aims to achieve.

School Head 12 added, "We have trouble getting parents involved… Their support is super important." This highlighted the role parents play in education. When parents are involved, it creates a partnership that can boost students' motivation and success. When parents know what is going on and are actively involved, they can support learning at home, speak up for their children, help create a positive school atmosphere, and provide the resources necessary for their children's education. Better communication through regular updates, meetings, and events can strengthen these relationships and create a support system for students.

By improving communication with parents and stakeholders, schools can foster a cooperative atmosphere that supports better CBC implementation. This not only empowers teachers but also builds a sense of community that supports student success. As we explore more solutions, it is important to consider how schools can effectively engage and inform families about the mathematics curriculum and its benefits for their children. Now, let us discuss concerns raised by mathematics teachers during the Focus Group Discussion.

FOCUS GROUP DISCUSSION: OVERVIEW, INSIGHTS FROM MATH TEACHERS ON THE CBC IMPLEMENTATION

The transition to a competency-based curriculum (CBC) in mathematics has prompted significant discussion among mathematics teachers. These professionals are currently addressing both the challenges and the potential benefits of this instructional approach. To better understand their experiences, a focus group discussion (FGD) was conducted, bringing together several groups of mathematics educators, each comprising 10 participants. The primary objective of these FGDs was to provide educators with a structured platform to share the challenges they encountered, evaluate the effectiveness of the CBC, and collaboratively formulate recommendations to enhance it. Insights from these discussions provided a valuable perspective on classroom realities under the CBC, emphasizing both its strengths and the challenges faced by students and teachers. The following sections of this chapter examine the principal themes identified during the FGD sessions, such as differences in educators' knowledge, implementation gaps, specific challenges, and suggested mitigation strategies. Additionally, an analysis of participant demographic characteristics is included to contextualize the findings and evaluate the representativeness of the perspectives gathered.

Demographics of the participants

Table 4.7

Gender distribution

Males	**Females**
14	6

A total of 20 mathematics teachers participated in the focus group discussion (FGD). Of these, fourteen were male teachers, representing 70% of the participants, while six were female teachers, accounting for 30% of the group. This distribution indicates a notable gender imbalance among the participants, with male educators being the predominant voice in the discussions. Such a composition may influence the perspectives shared during the FGD, as male teachers' experiences and viewpoints are more heavily represented. In contrast, female teachers, though fewer in number, offer valuable complementary insights.

Table 4.8

Age groups in years

26-30	31-35	36-40	41-45	46-50	51-55	56-60
0	**2**	**8**	**5**	**3**	**2**	**0**

The age distribution of focus group participants shows that most were between 36 and 45 years old, with 8 aged 36–40 and 5 aged 41–45. The 31–35 and 46–50 age groups included two and three participants, respectively. Only two participants were in the 51–55 range, and none were in the 26–30 or 56–60 brackets. This distribution suggests that the group consisted mainly of mid-career educators with considerable professional experience. Consequently, the perspectives shared during the discussions were shaped by extensive exposure to the classroom and administration. Although the absence of younger (26–30) and older (56–60) educators may limit the diversity of viewpoints, the predominance of mid-career participants offers valuable insights into the practical realities of implementing the Competency-Based Curriculum (CBC).

Table 4.9

Teaching experience in years

Below 5	5 - 10	11 – 15	16 – 20	21 – 25	25 – 30	31 and above
0	2	4	7	4	2	1

A more comprehensive review of the table reveals that the largest proportion of mathematics teachers were mid-career at the time of the research. A significant majority of them have been in the profession for a considerable amount of time, roughly ranging from eleven to twenty-five years. That was wonderful, as it indicated that the participants had extensive expertise in mathematics education.

Thematic analysis based on focus group discussion

The following was data collected from focus group discussions. The data was also organized around themes. The teachers were numbered using the letters of the alphabet for easy reference.

Theme 1: General Understanding with Practical Gaps

Mathematics educators widely understand the concept of a competency-based curriculum; however, practical obstacles persist. This disparity highlights the challenges educators have in properly implementing CBC in their classrooms. According to Teacher B's observation, "Students now independently devise solutions, thereby enhancing their comprehension." This underscores a transition towards student-centered learning, promoting autonomy in the educational process. Teachers often promote problem-solving in line with CBC principles, emphasizing critical thinking and real-world application.

Despite understanding student-centered learning, educators can encounter challenges in implementing competency-based curriculum. Teacher K remarked, "Educators require tangible examples to comprehend the effective evaluation of competencies." This indicated a domain in which many see a lack of preparedness. Insufficient assessment guidelines may lead to inconsistency. Research indicates that effective evaluation is essential, shaping how students exhibit their talents. Educators may have difficulty creating examinations that effectively represent abilities without exemplary items, thereby compromising the program's objectives.

Furthermore, Teacher I asserted, "The efficacy of this curriculum hinges on adequate training and support for educators." This sentiment emphasizes continuous professional advancement. Research consistently demonstrates that successful professional development is crucial for enhancing instructional methods. Targeted training that addresses individual requirements enhances teachers' confidence in implementing CBC effectively. The rapid pace of curricular reform may exacerbate these disparities. Educators may not have enough time to fully grasp new subtleties, leading to a cursory understanding. Workload constraints exacerbate this issue, constraining opportunities for reflection and development. Consequently, educators may acknowledge competency-based methodologies but lack the tools and methods to implement them effectively in the classroom.

Theme 2: Implementation of CBC and Adaptation in Progress

Partial implementation and ongoing adaptation were among the first themes identified regarding mathematics teachers' use of the Competency-Based Curriculum (CBC). As teachers begin implementing the fundamental ideas of the CBC, albeit with varying degrees of success, this indicates a slow shift in their teaching approaches. An intriguing tendency was identified by

Teacher C. "Group projects and more informal peer discussions seem to be happening more often, and it sparks a real sense of teamwork." This points to a shift toward the collaborative aspect of education, which is a key component of the CBC. Teachers naturally promote collaboration by assigning group assignments, which facilitates communication and problem-solving among students. Because students study together and gain valuable social skills, some research indicates that more collaborative learning tends to support motivation and deeper comprehension.

Nevertheless, there are several problems associated with this shift to cooperation. Educators may still be figuring out how to use group projects effectively, particularly in a system that has historically placed a premium on individual performance and standardized testing. Making the switch to group projects requires thoughtful preparation and effective management. Teachers must strike a balance between curriculum requirements and teamwork. It takes a lot of work, and teachers may become self-conscious as they try to align their teaching philosophies with the CBC's.

As Teacher K put it, "Students now design budgets, or analyze survey data – things that make math more useful to them." This further highlighted the value of the CBC. This is a significant step in making math more interesting and applicable to everyday life. Teachers may help students see math as useful outside the classroom by assigning tasks that push them to apply mathematical concepts in real-world situations. This aligns with the CBC's objective of equipping students with the necessary skills to confront life's challenges.

The CBC is still only partially implemented despite these positive developments, as many instructors continue to face obstacles that prevent them from fully embracing it. These might

include a lack of expertise, inadequate resources, or pressure to continue using conventional testing methods. Students used to more conventional teaching approaches may oppose teachers' attempts to implement innovative teaching strategies. Adapting may be more difficult due to this resistance, and both instructors and children may require more support.

Additionally, instructors must change their thinking to adapt to the CBC. To adapt their teaching methods to their pupils' needs and opinions, educators must be more adaptable. This adaptability is crucial for a classroom setting that prioritizes student engagement and skill acquisition. According to research, instructors often achieve greater success in student learning when they can base their instructional judgments on what their pupils require.

Theme 3: Challenges Faced by Mathematics Teachers in the Implementation of CBC in Mathematics

By consolidating various data streams, a comprehensive picture of the challenges associated with CBC deployment is created, laying the foundation for the subsequent discussion and suggestions in the next chapter.

Time and Planning Demands

Many mathematics teachers have noted that the Competency-Based Curriculum (CBC) poses an initial challenge for time management, particularly in preparing and delivering lessons. As Teacher A mentioned, the curriculum requires "more hands-on activities, which take longer to plan and execute," given its emphasis on hands-on learning. Essentially, instructors now need more preparation time as the focus shifts to a more interactive, student-centered classroom. These lesson plans frequently include hands-on activities, which, while improving student

engagement and comprehension, reduce valuable preparation time. Research indicates that successful teaching hinges on effective planning, which, in turn, directly impacts students' learning experiences.

Considering the added complexity of planning for CBC—with its focus on encouraging critical thinking and applying mathematics to real-world scenarios—it imposes an additional burden on already overburdened instructors. In agreement, Teacher M noted that "Designing a single project-based lesson can take hours." Indeed, this underscores that project-based learning, a key element of the CBC, requires careful examination of assessment strategies, resource allocation, and learning objectives.

As one might expect, the time-intensive nature of this process can breed instructor frustration and, in some instances, burnout, particularly when they are expected to manage multiple projects and lessons concurrently. Previous research has found that instructional quality and student outcomes may be negatively impacted when instructors feel overloaded with planning demands. Thus, to support teachers and ensure effective curriculum implementation, it is vital to address the time and preparation requirements associated with the CBC.

Technology and Material Shortages

Classroom management and addressing diverse learning needs stand out as other key areas where math instructors face hurdles in CBC implementation. As Teacher Q pointed out, "Giving individual attention is tough with large class sizes." This poses a significant challenge for effective CBC teaching, which emphasizes personalized learning and skill development. It can be hard for teachers to provide the one-on-one support students require to do well when

classrooms are overflowing. Research generally indicates that smaller classes often lead to better student results, allowing for more tailored teaching and improved classroom control.

A teacher's inability to fully connect with each student can, in most cases, hinder the overall learning process and somewhat diminish what CBC can offer. Teacher L mirrored this sentiment, adding, "It is hard to keep everyone engaged and on track." This reflects the challenge of maintaining student engagement in a diverse environment where students have differing comprehension levels and, of course, unique learning styles. While effective differentiation is key to meeting all learners' needs, it requires extra planning and resources that may not be readily available. Studies suggest that teachers equipped with differentiation strategies can better address students' diverse needs, thereby improving both engagement and academic achievement. Still, without adequate support and targeted training, teachers may find it difficult to implement these strategies effectively, complicating the overall CBC rollout.

Technology and Material Shortages

A final recurring theme in challenges for mathematics instructors in implementing CBC centers on technology deficits and material limitations. As Teacher M pointed out, "Not all students have access to graphing calculators or computers." This raises a substantial equity question in the implementation of CBC, as ready access to technology is certainly crucial. Modern teaching practices exist within a digital landscape, yet unequal access to tools fosters real learning disparities. Research shows that technology often boosts student engagement, especially in subjects like mathematics, where visualization tools enhance understanding. A lack of digital resources, however, can unfortunately hinder a student's engagement with the curriculum.

Misalignment with Traditional Exams

A key issue in rolling out the Competency-Based Curriculum (CBC) for mathematics teachers is its mismatch with the traditional way exams are administered. As Teacher N put it, "It is hard to make the curriculum fit with the existing exam system." This feeling is common among teachers. They are trying to teach critical thinking and problem-solving in the real world, but they also have to prepare students for tests that mostly assess how well they remember information and follow steps. Traditional exams often use multiple-choice questions and stick to a standard format that does not always align with the CBC's goals. When tests do not accurately reflect the curriculum, students might not see the point of what they are learning. This can be a problem in math, where the CBC wants students to think more deeply and use what they know in practical ways. So, teachers are stuck trying to figure out how to prep students for exams that do not fully assess their grasp of these skills.

When teachers feel they have to teach to the test, they might focus more on what will be on the exam rather than helping students truly understand the math concepts. This can run counter to what the CBC is trying to do, such as encouraging students to ask questions and think for themselves. Teachers might feel stuck between what the curriculum wants and what the exam expects. This can be frustrating and make them feel they are not doing a good enough job, especially when they are trying to help all their students while also preparing them for important tests.

To fix these issues, we need to find a better way to link the curriculum with how we test students. Ensuring the CBC aligns with the assessment methods is important so that students are tested on how well they can apply their knowledge in real situations. This means we might need

to rethink how we usually do assessments and move towards tests that show what students can really do. For example, using projects, performance tasks, and portfolios can provide a fuller picture of what students have learned and better align with the CBC's purpose.

Theme 4: Mitigation of challenges

Focus group discussions revealed key thematic areas reflecting the primary concerns, experiences, and insights of mathematics educators regarding the implementation of the Competency-Based Curriculum (CBC). These themes encompass challenges encountered in classroom practice, differences in teacher preparedness and understanding, and strategies used to address obstacles. Collectively, they provide a structured framework for analyzing and interpreting the collected qualitative data.

More Training and Continued Growth

Teachers largely voiced that improved CBC implementation hinges on more thorough training and continuous professional growth. Educators often said that initial workshops were not quite enough to equip them with the skills and confidence to embrace competency-based methods in math classes. As Teacher L noted, "Ongoing training helps teachers stay current." This feeling was common. Many felt a bit lost with the changes CBC brought, specifically when shifting from simply delivering content to truly fostering competency development. They felt the initial training was too abstract, lacked hands-on application, and provided little specific guidance for their subject. Several wanted regular follow-ups to revisit ideas, discuss problems, and learn from successful examples.

Continuous professional support was especially desired by mid-career and veteran teachers. While newer teachers often felt more at ease with student-centered learning, more experienced teachers often wanted extra time and support to adapt their established teaching styles. Teacher T's observation, "Professional development materials… can really help," spotlights a crucial need. Participants emphasized that training should include practical resources – such as sample lesson plans, assessment tools, and activity ideas – to connect theory and practice.

Several teachers specifically requested subject-specific professional development focused on math instruction. They felt that general CBC training often did not address the unique challenges of teaching math competencies, such as honing problem-solving skills or assessing conceptual understanding. There was keen interest in workshops that demonstrated competency-based math lessons, showing how to incorporate real-world relevance while maintaining rigorous mathematical content. The study also highlighted the need for diverse professional development methods. Teachers, regardless of experience, expressed needs for different support systems. Some wanted basic CBC introductions, while others sought advanced training in topics such as project-based learning or formative assessment. This indicates that a uniform strategy might not work, and support should be tailored to individual needs and implementation stages.

Teachers generally preferred ongoing, job-embedded support such as classroom coaching, peer observations, and professional learning communities rather than typical workshop formats. They noted that continuous support to refine their methods over time was more valuable than isolated events. Research supports this, showing that sustained, collaborative professional development closely connected to classroom practice is most effective (Desimone, 2009). This

consensus suggests that improving professional support systems should be a high priority for better CBC implementation. Teachers made it clear that without sufficient training and ongoing professional development opportunities, they will likely struggle to translate CBC ideas into effective classroom practice. This finding is significant for policy. Investment in sustained, thorough teacher professional development appears to be among the most critical determinants of success in implementing competency-based education reforms, underscoring its vital role.

Standardized and Accessible Resources

A significant concern voiced by teachers was the pressing need for readily available, standardized resources crafted specifically with the competency-based curriculum in mind. During interviews and focus groups, educators frequently cited the absence of suitable teaching and learning materials as a key impediment to successful CBC implementation in math classrooms. This shortage was particularly felt in under-resourced and rural schools, leading to considerable disparities in implementation quality among different areas. Teacher N's appeal for "printable activity books and worksheets adjusted to the competency-based methodology" highlights widespread dissatisfaction among teachers who currently devote substantial time to producing their teaching materials.

Many teachers reported spending 5-7 hours each week creating these resources from the ground up, time that could be better spent on lesson preparation and student support. The scarcity of standardized materials is leading to inconsistencies in how competencies are taught and graded across classrooms, undermining the curriculum's overall coherence. Teachers stressed that expertly designed, curriculum-aligned materials would not only save time but also guarantee adherence to the pedagogical principles of CBC. Teacher O's suggestion to "develop uniform

teaching materials and resources available for all schools" emphasizes yet another vital aspect of this challenge.

Resource availability now varies significantly by school's socioeconomic level and geographic location, with private and urban schools typically having greater access to learning materials. This difference creates an imbalance in which students' exposure to competency-based learning depends largely on their school's resource capacity. In most cases, standardized materials would help create a more level playing field, ensuring that every student has access to effective CBC education regardless of their school's physical location or current resources. The study revealed several specific types of resources teachers considered essential for effective CBC implementation:

Curriculum Specific Teaching Guides

Educators have noted the need for subject-specific guidelines that delineate how to implement CBC principles. They underscored that these guidelines must extend beyond mere theoretical explanations to provide concrete examples of instructional sequences, classroom activities, and assessment methods appropriate for certain grade levels.

Student activity guides

Teachers also expressed a frequent need for activity sheets, project templates, and problem-solving booklets aligned with CBC's practical approach. Such resources should aim to develop competencies while keeping mathematical rigor. It is important to bridge any gap between traditional skills practice and applied learning in these materials.

Assessment tools

Standards, competence assessment rubrics, and formative evaluation tools are urgent issues that must be addressed immediately. A significant proportion of educators reported that it was challenging to develop assessments that effectively measured students' skill development, rather than merely assessing their mastery of the material. Prepared assessment frameworks would help ensure uniformity in evaluating student learning across classrooms.

Digital Resource Repositories

A growing number of educators have expressed a need for digital platforms that offer films, modules, and downloadable resources aligned with the Competency-Based Curriculum (CBC). Educators can exchange techniques and modify classroom materials using these repositories, while maintaining compliance with curriculum criteria. It was a difficult resource challenge. To begin, all materials and textbooks continued to use content-focused techniques incompatible with the CBC's strategy. Second, there were instances in which resources did not reach rural schools; instructors reported receiving materials late in the school year. Third, there was a lack of coordination between resource production and instructor training, leaving teachers unsure how to use the resources.

Solutions proposed included:

- Government development of core CBC materials for all schools.
- Partnerships to create high-quality resources.
- School-based resource centers for teachers to access materials.

- Regular updates to materials based on feedback.

The agreement states that the supply of resources is a crucial condition for implementing CBC. In the absence of readily available information, educators have difficulty implementing competency-based approaches. The significance of this discovery lies in its demonstration of the need to invest in resource development. In addition, the difficulty reflects concerns about equality in the educational system. Uneven distribution might result in a system in which the quality of CBC implementation varies depending on the resources available to schools. To ensure that all students have equitable access to competency-based education and that the CBC is successful, this issue must be addressed.

Technological Support

The integration of tech tools into the Competency-Based Curriculum (CBC) became a key theme, with mathematics teachers seeking resources to boost access to and interest in mathematics. As Teacher Q puts it, “That is part of a wider trend of tech being important in how we teach now.” Teacher C pointed out that tools such as GeoGebra or Excel may make complex ideas easier to grasp. She noted that “Tools like GeoGebra or Excel can make complex concepts more accessible.” That underlined how important technology is for simplifying tricky math. GeoGebra, for example, is dynamic math software that lets you explore algebra and geometry interactively. That way, students can understand abstract ideas through hands-on exploration. Some studies suggest that using these tools can significantly boost understanding and interest, particularly in areas like mathematics, where seeing things helps (Quirke, Espinoza, & Sensevy, 2023). By integrating tech into their teaching, teachers can make lessons more engaging for

different learning styles. A lot of research supports this. Technology can help bridge gaps in understanding and lead to richer learning for students.

Teacher A suggested using “interactive whiteboards and projectors” to liven up lessons, which shows that we need engaging, active ways to teach. Interactive whiteboards let mathematics teachers present information in ways that grab attention and encourage teamwork. Projectors can enhance lessons by visually supporting verbal material and making complex concepts easier to understand. It has been shown that interactive technology can motivate and involve pupils, turning old-school classrooms into more team-based learning environments (Quirke, Espinoza, & Sensevy, 2023). Research shows that when students get hands-on with tech in their learning, they are more likely to remember what they learn and develop critical thinking skills (Quirke, Espinoza, & Sensevy, 2023).

Competency-Based Curriculum Design Improvements

CBC design enhancements were seen as crucial to overcoming implementation issues, as mathematics teachers noted the need for simplification and clearer assessment guidelines. Recent research and global best practices offer strong support for these ideas. Teacher M raised a key concern about the curriculum—that it needs simplification. It is a sentiment shared by many teaching math, really. As she put it, the current CBC content is "dense and overwhelming," and frankly, it just makes it tough to cover everything in the time we have.

Research backs this up: overly complex curricula can hurt teaching and learning by spreading the focus too thin. You know, Reimers (2020) touches on this. Studies from between 2020 and 2024 suggest that streamlining, which is emphasizing the core ideas, cutting out the redundant stuff, and allowing for deeper dives, is the way to go. This not only makes things more

accessible but can also help close equity gaps. You see, clearer learning paths can benefit diverse learners (Reimers, 2020). Take international case studies, such as those from Kenya and Finland. These indicate that when you combine curriculum simplification with high-quality materials, you often see improved student engagement and achievement, especially in competency-based systems (Reimers, 2020). It seems that a more focused approach is really essential to promoting the smooth implementation of CBC in mathematics.

Teacher K highlighted the need for clearer guidelines and assessment examples, pointing to a crucial area for improvement. During the discussions, Teacher K said, “There is uncertainty around effective competency assessment as a result of vague official guidance.” The literature supports this by highlighting that effective assessment requires explicit articulation of competencies, alignment with learning outcomes, and the use of well-constructed rubrics and authentic tasks (Reimers, 2020). It was generally believed that these problems could be addressed by having a stronger understanding of guidelines.

Best practices often involve providing concrete assessment tasks, such as performance-based projects, analytical exercises, and digital portfolios (Quirke et al.,2023). This can be paired with detailed rubrics to ensure clear expectations and consistent grading. Case studies from Canada and Tanzania demonstrated that clear assessment frameworks are vital for successful CBC implementation and boosting teacher confidence. The necessity for curriculum design improvements extends beyond Zimbabwe's borders. Global examples of successful CBC reforms share elements such as a focus on essential skills, flexible learning, continuous assessment, and real-world relevance. Kenya, for instance, redesigned its CBC to be more holistic and learner-centered, integrating practical skills with continuous assessment (Reimers, 2020).

Broader Implications for CBC Implementation

The survey revealed that around 83% of instructors prioritized urgent problems at the critical mid-implementation phase. This significantly reflected the notion expressed by Gautam et al. (2016) that educators often prioritize classroom management during curricular modifications. The statistics indicated a focus on logistical elements, such as lesson preparation, resource distribution, and time management, rather than the CBC's more profound changes in mathematics instruction. Significantly, mid-career educators (10-15 years) demonstrated an even greater emphasis on this practical orientation. This group appeared to encounter considerable strain in adapting the new curriculum to established patterns. They frequently contemplated personal competence ("Am I truly capable of this?") and management ("How can I possibly implement it?"), consistent with the intermediate concerns of CBAM. The research indicates that implementation support should be tailored to career stage, as mid-career educators may require more systematic support in managing the transition.

Advanced Stage Slowdown: A Collaboration and Refocusing Issue

The study identified a genuine deceleration in the progression of instructors to advanced phases of curriculum implementation. Only 12% demonstrated signs of attaining the cooperation and refocusing phases in CBAM, hence validating Al-Shabatat's (2014) notion of the "collaboration gap." This seems to stem from overarching systemic issues rather than individual shortcomings, with two primary obstacles. A significant 91% of educators reported insufficient opportunities for organized peer observation and collaborative planning. The absence of structured professional discourse and classroom collaboration led one educator to term it "islands of innovation," where isolated teachers developed competency-based methods without institutional support for expansion or enhancement. Secondly, 87% reported insufficient time for

curriculum reflection; the teaching day did not allocate time for the professional development necessary to advance beyond basic implementation.

These findings underscored an implementation plateau. Numerous educators became preoccupied with management rather than progressing towards enhanced integration. The statistics indicate that Zimbabwe's support systems failed to provide the collaborative professional learning frameworks identified by research as essential for sustaining change (Vescio et al., 2008). The disparity between urban and rural schools was pronounced; rural regions had significantly lower rates of advanced implementation, highlighting spatial inequities that compounded these issues. The investigation also uncovered an unforeseen phenomenon: "innovation exhaustion." Some educators, originally enthusiastic about competency-based curriculum ideas, grew disheartened when initial implementations of competency-based instruction produced inconsistent outcomes, compounded by insufficient troubleshooting assistance. In the absence of intentional momentum structures, even dedicated educators may default to conventional approaches, as elaborated in Datnow & Stringfield's (2000) sustainability literature.

These concerns were further intensified. The education system in Zimbabwe had distinct obstacles, mostly attributable to certain environmental factors. Teacher isolation, a persistent challenge, was exacerbated by overcrowded classrooms and insufficient resources, hindering the implementation of collaborative and reflective strategies essential to the comprehensive adoption of CBC. The study indicated that superficial compliance is insufficient; genuine transformation requires enhanced teacher training, a comprehensive revision of school schedules, elevated

expectations for teachers' professional development, and robust frameworks to foster collaborative environments essential for competency-based education.

The debate extends beyond curriculum redesign to encompass significant matters such as educator training, resource distribution, and the engagement of all stakeholders, including lawmakers and parents. Educators widely concur that for Competency-Based Curriculum (CBC) to thrive, robust systemic support is essential, including sufficient financing, infrastructure, and regulatory frameworks that encompass all educational institutions. A culture transformation is necessary, moving from rigid exam-centric approaches to an inclusive, competency-based model, with a dedication to ongoing enhancement, which involves modifying the curriculum based on consistent feedback from educators, students, and parents.

Discussions with teachers indicated that CBC might significantly transform mathematics instruction by fostering critical thinking and linking teaching to real-life applications. Simultaneously, other issues require resolution; educators frequently cited inadequate training, limited resources, unreliable evaluation techniques, and inherent resistance to change as recurring obstacles. They believed that clearer guidelines, more professional development, a streamlined curriculum, and reliable access to essential information would be highly beneficial. Rectifying these minor discrepancies might provide a more successful implementation of CBC, which, in most instances, should enhance student engagement and refine their mathematical abilities. Upon reflection, fostering collaboration among teachers, engaging parents and community stakeholders, and advocating for comprehensive institutional support appear to be crucial measures for CBC to realize its full potential in mathematics teaching.

DATA COLLECTED FROM QUANTITATIVE TOOLS

Response from Mathematics Teachers on Questionnaires

The questionnaires addressed the central research questions, focusing on teacher preparedness, instructional challenges, assessment practices, and perceptions of CBC. Responses from a broad sample of mathematics teachers enabled the identification of trends and prevalent concerns. Integration of questionnaire findings with interview and focus group data provided methodological triangulation, strengthening the credibility and dependability of the findings. The combination of quantitative and qualitative data provided a more comprehensive understanding of teachers' experiences and challenges in CBC implementation.

Demographic Information

Table 4.10

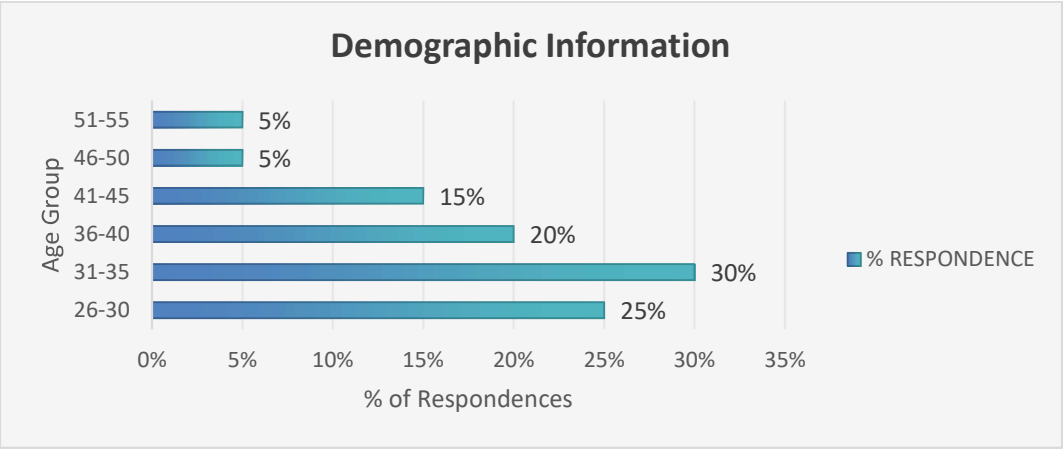
Gender Distribution

Males	50
Females	30

Of the 80 mathematics teachers who completed the questionnaires, 50 were male and 30 were female, representing 62.5% and 37.5% of the respondents, respectively. This distribution indicates a higher participation rate among male teachers, which reflects a gender imbalance in the survey sample.

Figure 4.1

Respondent by age group



Most study participants were aged 31 to 35 years, representing mid-career educators in middle-level teaching. This professional stage may have facilitated active engagement with the research and enabled the provision of insights relevant to developing more effective strategies for implementing the Competency-Based Curriculum (CBC). Participation among younger instructors was also high, likely due to their recent academic research experience and greater familiarity with study protocols. In contrast, older educators participated less frequently, potentially due to fatigue or skepticism about the likelihood that research outcomes would lead to meaningful changes in practice, which may have reduced their motivation to engage fully.

Teaching Experience

Figure 4.2

Teaching experiences bar chart

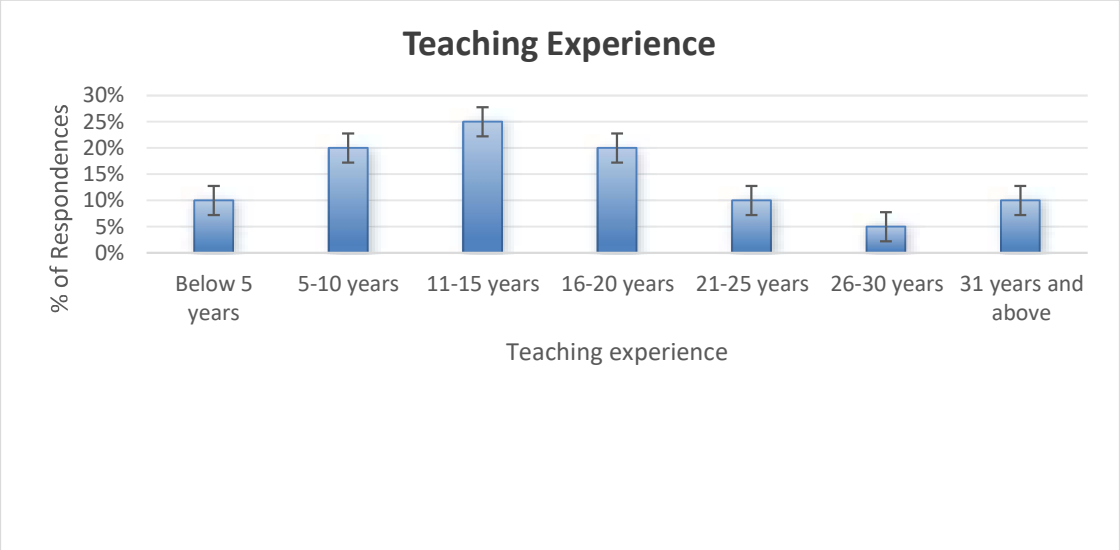
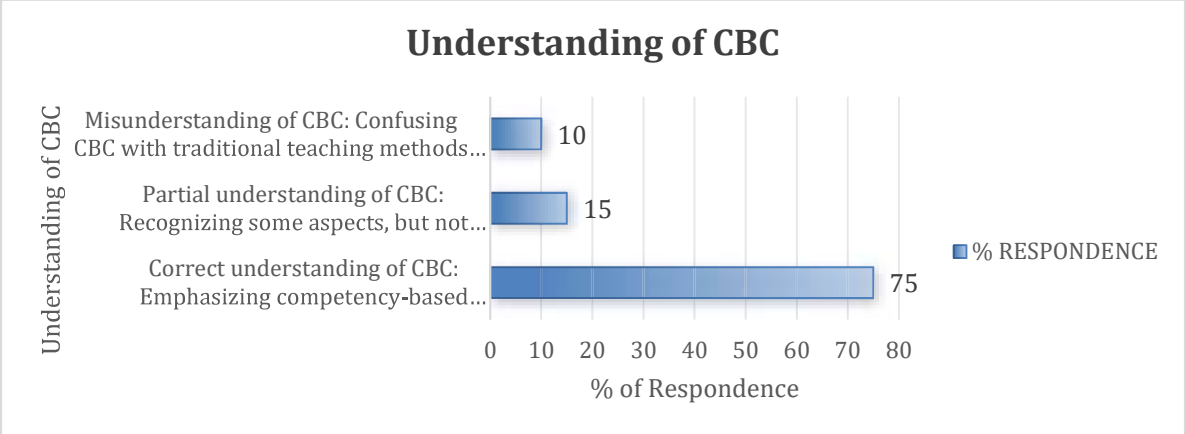


Figure 4.2 indicates that the highest proportion of instructors (25%) is within the 11- to 15-year group. This signifies a substantial cohort possessing a reasonable degree of expertise, possibly integrating conventional and modern pedagogical methods. Consequently, they are more optimistic about forthcoming improvements and anticipate greater utilization of CBC than KBC. Merely 15% possess 26 years or more of experience, indicating a scarcity of veterans, which may affect the general pedagogical methodology and flexibility within the educational institutions. The distribution of teaching experience, with 20% in the 16 to 20 years group and another 20% in the 5 to 10 years category, suggests a balanced array of perspectives and methodologies in the implementation of CBC. The 26- to 30-year age group, comprising just 5%, indicates a reduction in the number of instructors with substantial experience, which may constrain mentorship opportunities for novice educators.

Understanding of CBC

Figure 4.3

Understanding of CBC



75% of those who participated in the survey had a strong understanding of the Competency-Based Curriculum (CBC), which emphasizes competency-based learning, tailored methods, and real-world applications. This is a promising indicator, as it suggests that a significant number of people agree with CBC's objectives and beliefs. However, with relation to a more limited group, around fifteen percent, their comprehension is just partial. The full image, which includes the overall notion and its meaning, remains somewhat obscure to these folks, even though they appear to have recognized specific features of CBC. This may provide an opportunity for further learning or for the curriculum to be clarified further. Finally, about 10% of those completely misunderstand CBC. It's possible they got it confused with how things were historically taught, or they just don't understand it at all. This shows that we require specific communication or training to address these concerns.

Implementation of CBC

Table 4.11

Implementation of CBC

Implementation of CBC	Frequency Analysis
Positive implementation experiences: Reporting successful integration of CBC principles, improved student engagement, and enhanced learning outcomes.	55%

Negative implementation experiences: Expressing challenges, frustrations, and concerns about the effectiveness of CBC.	30%
Mixed or neutral implementation experiences: Reporting both positive and negative aspects, or unsure about the impact of CBC.	15%

About 55%, slightly more than half, of those polled believe the implementation of CBC has been successful, citing increased student involvement and improved academic outcomes. This indicates that CBC is viewed favorably by many educators and students, who recognize its value and its real-world applications. On the other hand, a sizeable portion, almost thirty percent, revealed problems and expressed discontent with the implementation of CBC. It is possible that they are concerned about the program's efficiency or that they are encountering difficulties implementing it. As a result, their circumstances highlight that there are still challenges to overcome to achieve efficient deployment, indicating a need for assistance and tools. The remaining fifteen percent looked uncertain about the effects of CBC or had conflicting emotions, noting both positive and negative aspects of the program. This indicates that they can see certain benefits, but they also have significant uncertainties or misconceptions that prevent them from making a definitive assessment of the program's usefulness.

Professional Development and Assistance for Mathematics Teachers

Table 4. 12

Professional Development and Assistance for Mathematics Teachers

Professional Development and Assistance	Mean	Rank
Lesson observation and feedback by a colleague	**3.00**	**1**
Observing a demonstration lesson in Mathematics at my school	**2.75**	**2**
Attending a workshop on CBC in Mathematics	**1.95**	**3**

Professional Development and Assistance	Mean	Rank
In-service training on teaching and learning Mathematics using CBC	**1.88**	**4**
Meeting one-on-one with the administrator to discuss teaching	**1.80**	**5**
Lesson observation by the district/provincial team	**1.78**	**6**

The results show the frequency with which mathematics teachers received different forms of professional development and assistance. The response scale ranged from 1 = Did not receive, 2 = Once or twice a year, 3 = Three or four times a year, 4 = Once every two months, to 5 = At least once per month. Lesson observation and feedback by a colleague had the highest mean score (M = 3.00, Rank 1), indicating that teachers received this form of support approximately three or four times a year. Observing demonstration lessons in Mathematics at my school had the second-highest mean (M = 2.75, Rank 2), suggesting that this occurred between once or twice and three or four times a year. Attending a workshop on CBC in Mathematics (M = 1.95, Rank 3) and in-service training on teaching and learning Mathematics using CBC (M = 1.88, Rank 4) were both close to once or twice a year, indicating that these formal professional development opportunities were relatively infrequent. Meeting one-on-one with the administrator to discuss teaching (M = 1.80, Rank 5) and lesson observation by the district/provincial team (M = 1.78, Rank 6) had mean scores below 2, indicating that these forms of support occurred less frequently than once or twice a year on average.

Professional Development Focus and Time Management in Teaching Mathematics

Table 4. 13

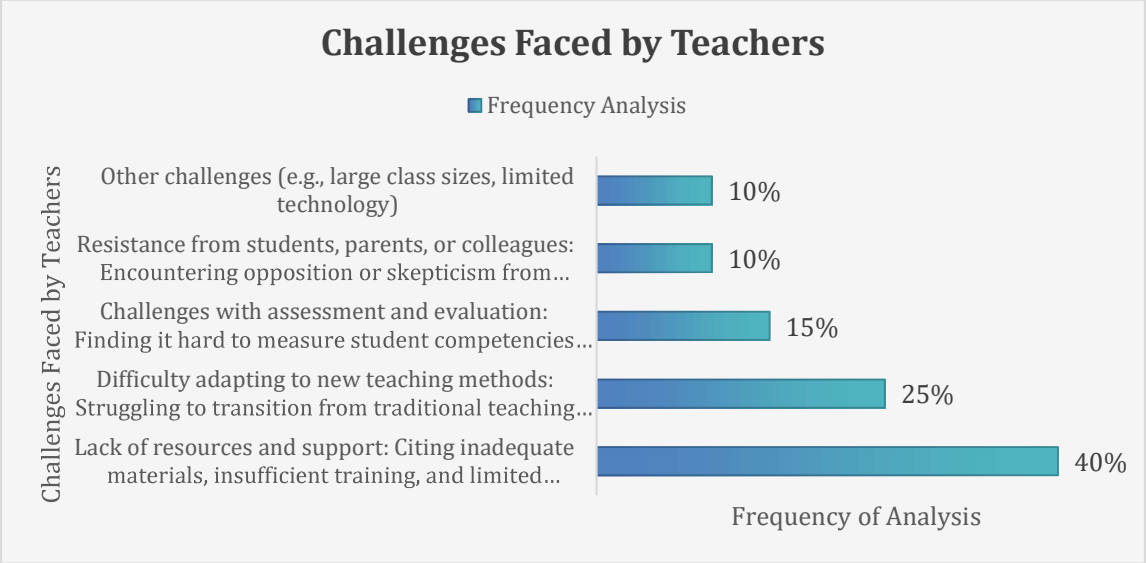
Professional Development Focus and Time Management in Teaching Mathematics

Professional Development Focus and Time Management	Mean	Rank
Developing a performance assessment is time-consuming	**4.24**	**1**
New time management technique requires more time on assessment tasks	**3.98**	**2**
More time is spent in the classroom because of CBC	**3.80**	**3**
Attending a workshop on CBC in Mathematics	**3.65**	**4**
Timetable is compressed, leaving no room for flexibility	**3.60**	**5**
Perspective on time has changed, allowing greater flexibility	**3.40**	**6**
Not much has changed in how time is spent teaching Mathematics	**3.08**	**7**

The highest mean was recorded for developing performance assessment, which was time-consuming (M = 4.24, Rank 1), followed by the need for a new time-management technique that requires more time for assessment tasks (M = 3.98, Rank 2). Spending more time in the classroom because of CBC also received a relatively high mean (M = 3.80, Rank 3). Given that higher mean scores indicate greater agreement, these results suggest that time demands associated with CBC were a significant concern for teachers. In particular, the mean of 4.24 indicates that teachers generally agreed strongly that developing performance assessments was time-consuming. Similarly, the mean of 3.80 indicates that teachers experienced increased classroom time demands under CBC. These results suggest that the implementation of CBC has substantially affected teachers' use of instructional time, particularly through assessment-related activities.

Challenges faced by teachers

Figure 4.4



Approximately 40% of teachers identified inadequate resources and support as their primary concern, including limited teaching materials, training opportunities, and administrative support. About 25% experienced difficulties shifting from traditional teaching methods to CBC-aligned approaches, indicating a need for targeted professional development. A further 15% reported challenges in assessing competencies and learning outcomes, while 10% identified resistance from students, parents, or colleagues. The remaining 10% cited challenges such as large classes and limited access to technology. The findings highlight resource constraints, teacher preparedness, assessment challenges, and stakeholder resistance as key barriers to effective CBC implementation.

Sentimental analysis

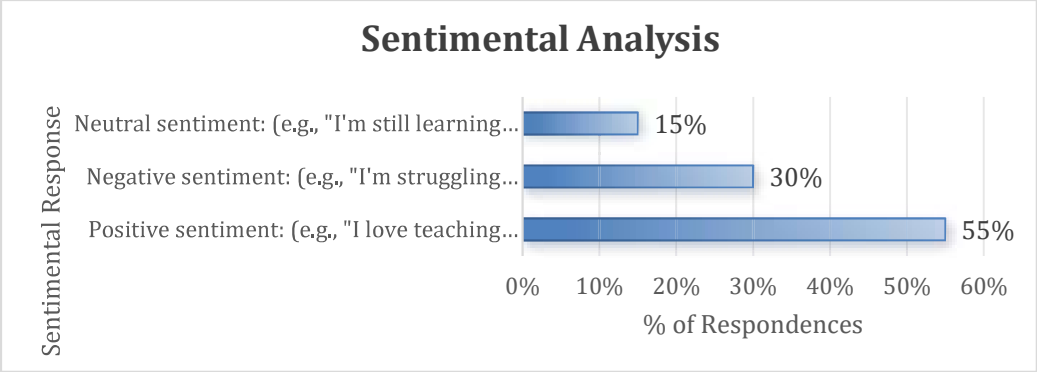
Table 4.14

Sentimental Analysis

Sentiment Response	Frequency Analysis
Positive sentiment: (e.g., "I love teaching CBC!", "It's a great approach!")	55%
Negative sentiment: (e.g., "I'm struggling to implement CBC", "It's too challenging!")	30%

Neutral sentiment: (e.g., "I'm still learning about CBC", "It's okay, I guess")	15%

Figure 4.5



The sentiment analysis shown in Figure 4.5 indicates that 55% of the replies exhibit positive sentiment. Consider remarks such as, "I am passionate about teaching CBC!" and "It is an excellent methodology!" These indicate a predominantly positive assessment of the Competence-Based Curriculum. Nevertheless, a significant 30% of comments convey negative emotion, indicating difficulties such as "I am struggling to implement CBC" or describing it as "excessively challenging!" This indicates that a significant minority is encountering genuine challenges in adjusting to or implementing the new curriculum.

Approximately 15% of the replies are categorized as neutral, including remarks such as "I am still learning about CBC" or a straightforward "It's acceptable, I suppose." This smaller section presumably comprises persons who are hesitant or still in the process of comprehending the CBC architecture. Thus, although the general perception is favorable, the significant number of educators voicing unfavorable opinions underscores the need to address the challenges they face. Effectively managing the CBC will require focused support and possibly modified implementation strategies. The data indicate a predominantly engaged teaching community,

while some obstacles must be addressed to fully capitalize on the curriculum's advantages. Typically, the context in which CBC is used is conducive to improved educational outcomes.

ANALYSIS OF QUANTITATIVE DATA

Descriptive statistics were used to analyze the questionnaire data. Calculations were performed to determine the data's mean scores, which were then used to synthesize and highlight the most important aspects of the data. Please find the analysis below.

Knowledge about CBC

How familiar are you with the concept of competency-based curriculum in mathematics?

The mean score for this question ranged from just 2.96 to 4.13, with 4.13 being the highest possible score. It is assumed that rank 1 is more popular, while rank 5 is the least popular.

Table 4.15

Knowledge about CBC

Item	Mean score	Value
CBC involves the use of learner-centred approaches	4.13	1
Competencies are individual qualities	3.3	2
Competencies are behavioural pieces	3.2	3
Knowledge about CBC is critical to teaching mathematics	3.18	4
Competencies are behavioural outcomes	2.96	5

The table illustrates educators' understanding and attitudes toward the Competency-Based Curriculum at present. For the statement "CBC involves the use of learner-centered approaches,"

respondents gave it a high mean score of 4.15, indicating they strongly appreciate CBC's student-centeredness. In addition, we see that concepts such as "Competencies are individual qualities" (3.3) and "Competencies are behavioral pieces" (3.2) receive rather high ratings; these scores indicate a broad understanding of the distinct nature of skills. However, scores that are somewhat lower in relation to assertions such as "Knowledge about CBC is critical to teaching mathematics" (3.18), and "Competencies are behavioural outcomes" (2.96), may suggest that there is a degree of ambiguity or that there are certain conceptual gaps. In conclusion, although educators appear to have a good understanding of the primary learner-centered philosophy that underpins CBC, it would be advantageous to increase conceptual clarity about what competences are and how to apply them, particularly in subject areas such as mathematics.

Table 4.16

Professional development focus and time management in teaching mathematics

Item	**Mean score**	**Value**
Developing performance assessment time consuming	4.24	1
New time management technique required	3.98	2
More time in the classroom because of CBC	3.8	3
Attending workshop on CBC in Mathematics	3.65	4
Timetable compressed leaving no room for flexibility	3.51	5
Perspective changed, now more flexible in teaching	3.4	6
Not much has changed on how I spend time	3.1	7

Within the context of the Competency-Based Curriculum (CBC), the table summarizes educators' perspectives on time management. It is important to note that the view that "Developing performance assessment is time-consuming" received the highest score (mean: 4.24), indicating that it is a significant obstacle. The statistics also indicate a perceived need for "New time management techniques," as well as the experience of spending "More time in the classroom because of CBC." In essence, it appears that CBC is imposing additional time obligations, requiring instructors to adjust their routines and instructional methods.

Both attending CBC mathematics seminars and having compact timetables that leave little room for flexibility led to mediocre outcomes; these factors, along with others, highlight the frustration teachers face when adjusting to the new curriculum. A lower rating was seen for comments such as "Perspective changed, now more flexible in teaching" and "Not much has changed on how I spend time." This is an interesting observation. This suggests that although some educators are adapting to the new environment, many continue to struggle to adjust to it effectively. As a whole, the findings indicate a need for improved time-management support and opportunities for professional development to facilitate a seamless transition to CBC.

Table 4.17

Mathematics teachers' concerns pertaining to the implementation of CBC

Item	**Mean score**	**Rank**
Lack of infrastructure and resources	3.6	1
Insufficient professional development and training	3.48	2
Big class enrolment	3.23	3

Challenges in measuring competencies	3.13	4
Uniformity and standardization	2.43	5
Parental support and involvement	2.25	6
An excessive amount of content	2.24	7
Time limits	2.15	8

According to the findings, several obstacles must be overcome before successful educational methods can be implemented. The most prominent of them, as indicated by the responses, is the "Lack of ICT tools," which received a mean score of 3.65. Especially in this more digitalized era, it is important to note that this high score implies substantial consequences for teaching and learning. This should be taken into consideration. Next in line are deficiencies in "Lack of proper classroom facilities" and "know-how about Competency-Based (CB) approaches," indicating issues with both the teaching methodology and the physical infrastructure.

The items "Inadequate teaching and learning materials" and a "High teacher-student ratio" are ranked slightly lower, although they remain extremely significant. In summary, these findings point to the urgent need for concerted efforts to strengthen digital infrastructure, provide comprehensive teacher training, and create better classroom environments. In conclusion, these approaches have the potential to significantly improve the efficiency of schooling.

Table 4.18

Challenges on the implementation of CBC

Item	Mean score	Rank
Lack of ICT tools	3.65	1
Lack of proper classroom facilities	2.99	2
The know how about CB approaches	2.7	3
Inadequate teaching and learning materials	2.44	4
High teacher student ratio	2.14	5

The implementation of Competency-Based (CB) education encounters several challenges, as seen in the table. Inadequate access to digital technology, as reflected in a mean score of 3.65 for "Lack of ICT tools," is a significant obstacle in contemporary classrooms. Infrastructural deficiencies are also significant; the "Insufficient classroom facilities" scores 2.99, indicating that these inadequacies adversely affect teaching and learning. A score of 2.7 for limited knowledge of CB techniques indicates a necessity for targeted professional development for educators. Although "Inadequate teaching and learning materials" (2.44) and a "High teacher-student ratio" (2.14) are less critical, they remain significant issues. The successful implementation of CB techniques necessitates investment in digital resources, enhanced learning environments, and superior teacher training; the research consistently underscores these requirements.

Table 4.19

Mitigation of challenges on the implementation of CBC

Item	**Mean score**	**Rank**

Considering more funding to education	5.16	1
Developing authentic assessment tools	4.78	2
Vibrant stakeholder engagement	4.38	3
Infrastructure development	3.68	4
Embracing technology	3.28	5
Availing curriculum resources	2.34	6
Prioritising teacher training and support	2.28	7

An analysis of the data reveals that "Increased funding for education" is perceived as the most significant issue, with a substantial consensus that financial investment is essential for improvement. Following closely are "Improved methods for assessing student progress" and "Engaging all stakeholders," indicating a desire for education that is both effective and equitable. Initiatives such as "Constructing educational institutions" and "Implementing innovative technology" are significant, however may not be perceived as immediately pressing. Notably, "Acquiring learning materials" and "Educating teachers" rank lowest on the list. The events that occur within the classroom. This may necessitate reminding individuals of the significance of educators and resources if we aim to effectively reform education.

IN-DEPTH ANALYSIS OF THE DATA COLLECTED

(i) Factor analysis for teachers' understanding and implementation of CBC

Factor analysis identified key underlying factors that influenced teachers' understanding and implementation of the Competence-Based Curriculum (CBC). Here's an interpretation of these factors:

Factor 1: Pedagogical Knowledge

Teachers' pedagogical knowledge is a foundational element in their capacity to understand and implement the Competency-Based Curriculum (CBC). This knowledge informs how teachers interpret curriculum goals and translate them into effective classroom practices. A comprehensive understanding of CBC principles is essential for effective implementation. Teachers who thoroughly understand the objectives, structure, and expectations of CBC are better prepared to design learner-centered activities and assess competencies accurately. Teaching experience is also a significant factor. Experienced teachers typically possess extensive knowledge of instructional methods, enhancing their ability to adapt to curriculum changes and implement the CBC effectively across diverse classroom settings. Age is another relevant factor. Older teachers often have broader exposure to multiple educational frameworks and instructional strategies, which can lead to a deeper understanding of pedagogical practices and curriculum implementation. In summary, greater teaching experience and age are associated with a better understanding of competency-based learning, which, in turn, positively influences the implementation of the Competency-Based Curriculum.

Factor 2: Implementation Support

This factor underscores the need for systematic support to ensure the effective implementation of the Competency-Based Curriculum (CBC). Robust support structures enable teachers to translate curriculum objectives into meaningful classroom practices. Experience with

implementation is crucial in this context. Teachers who have actively applied CBC in their classrooms develop greater familiarity and confidence with its methodologies, resulting in enhanced teaching and learning outcomes. Institutional support is also essential. Administrative support, continuous professional development, and mentorship provide teachers with guidance and motivation, enabling them to adapt more effectively to CBC practices and address emerging challenges. Resource availability significantly affects CBC implementation. Access to suitable teaching materials, technology, and professional development opportunities strengthens teachers' ability to plan, deliver, and assess learning activities aligned with CBC principles. In summary, a supportive environment enhances implementation efforts. Providing sufficient resources and establishing robust support structures are essential for the successful implementation of CBC.

Factor 3: Teacher Attitude

This factor encompasses the psychological and emotional dimensions that influence teachers' approaches to the Competency-Based Curriculum (CBC). Teachers' beliefs and emotions regarding the curriculum determine their perceptions of its value and the effectiveness of its implementation in the classroom. Attitude toward the CBC is a central determinant of successful implementation. Teachers who maintain a positive attitude are more likely to embrace the curriculum, dedicate effort to understanding it, and apply its principles effectively in their instructional practices. Willingness to adapt represents another critical factor. Teachers who demonstrate openness to modifying their instructional methods to align with the CBC framework are more likely to overcome challenges and achieve effective implementation.

Confidence in teaching significantly influences implementation outcomes. A strong sense of confidence reduces apprehension and uncertainty about new instructional approaches,

enabling teachers to engage with the CBC more positively and proactively. Among these factors, teachers' attitudes are quite essential. Teachers' feelings significantly impact the effectiveness of the Competency-Based Curriculum (CBC) in the classroom. A number of important factors that affect how instructors comprehend and use CBC were identified through factor analysis. It is of the utmost importance that we enhance educators' teaching methods, provide them with adequate support, and help them develop a positive attitude toward the curriculum if we want the CBC to function well. Consequently, individuals who work in education ought to concentrate on those aspects to improve the situation for educators, and, you know, ideally, this would result in improved academic performance among pupils.

Table 4.20

Factor Analysis Deep Dive

Factor 1 (Pedagogical Knowledge) appears to be a strong predictor of teachers' understanding and implementation of CBC.	
Variable	**Loading**
Understanding of CBC	0.85
Teaching Experience	0.78
Age	0.65

**These variables suggest that teachers' pedagogical knowledge is closely tied to their understanding and implementation of CBC.*

Factor 1, as shown in Table 4.20, appears to be a robust indicator of educators' understanding and use of CBC. Essentially, it suggests that educators with a solid foundation in pedagogical principles are more likely to understand and implement CBC concepts effectively. Comprehension of CBC showed a substantial loading of 0.85. This score indicates a substantial correlation between instructors' understanding of CBC and their overall pedagogical expertise. A score of 0.85 indicates that educators with robust pedagogical foundations may more easily comprehend the CBC framework, which can then be integrated into their instruction.

The teaching experience is measured at 0.78. The loading indicates a significant correlation between teaching experience and pedagogical understanding. Typically, seasoned educators have cultivated a broader array of instructional methods, enhancing their capacity to use CBC effectively. As instructors gain experience, their educational expertise broadens, enhancing their understanding of CBC. The age is 0.65. This score indicates a moderate yet significant association between age and pedagogical knowledge. Although age may influence a teacher's experience, it is less strongly correlated with the other examined characteristics. Veteran educators may offer a seasoned perspective in the classroom; nevertheless, this may not be as significant a consideration for CBC as other considerations.

The primary conclusion from the component analysis is that educators' pedagogical expertise significantly affects their understanding of CBC, and this understanding is influenced by their teaching experience and age. Investing in professional development to augment pedagogical expertise, particularly for novice educators, is essential. When educators have a deeper understanding of CBC, they can implement it more effectively, thereby enhancing student

learning outcomes. Enhancing educators' pedagogical expertise is essential to implementing competency-based methodologies in the classroom.

CHI-SQUARE Test for the relationship between teacher experience and their understanding of CBC

A chi-square test was done to examine the relationship between teacher experience and their understanding of CBC.

Table 4.21

X^2 of Teaching Experience x Understanding CBC

Teacher Experience	**Understanding of CBC**
< 5 years	40%
5-10 years	55%
11-15 years	70%
16-20 years	80%
> 20 years	90%

*$\chi 2 = 12.1, p < 0.01$

**The results indicate a significant relationship between teacher experience and their understanding of CBC.*

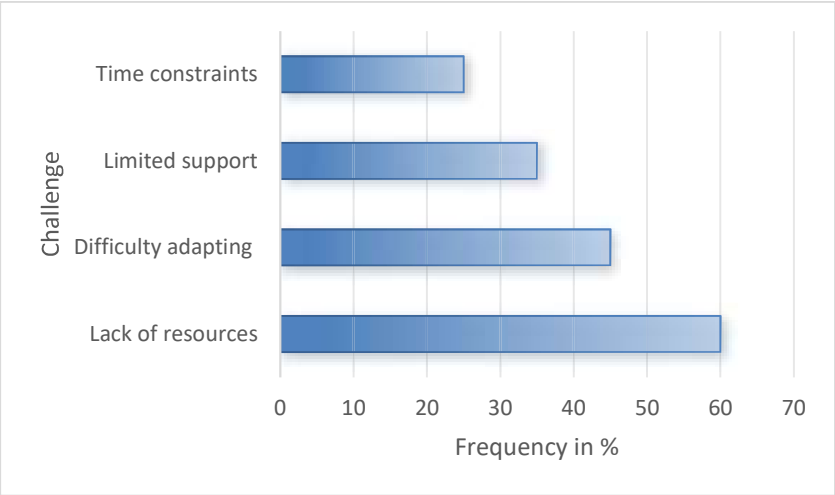
The table above clearly shows that a teacher's understanding of the Competency-Based Curriculum (CBC) often increases with years of classroom experience. The percentages indicate a clear trend: comprehension appears to increase with experience. This suggests a significant correlation between instruction duration and understanding of the curriculum's fundamental concepts. The statistical significance is established: the chi-square statistic ($\chi 2 = 12.1$) and the extremely significant p-value ($p < 0.01$) clearly indicate that the observed association between teacher experience and CBC knowledge is not attributable to random chance. The low p-value indicates a strong confidence that experience significantly influences the outcome.

This indicates that targeted professional development or training for early-career individuals may effectively bridge the comprehension gap regarding CBC. Interventions explicitly aimed at enhancing CBC comprehension might be highly beneficial for educators with fewer than 5 years of experience, a demographic with a comprehension rate of about 40%. The chi-square test results underscore the substantial significance of a teacher's experience, establishing it as a critical component in both comprehending and executing the Competency-Based Curriculum. This indicates the need to enhance novice educators' comprehension to ensure efficient curriculum implementation. Educational planners must prioritize professional development tailored for novice teachers, ensuring that all educators have the opportunity to develop the skills needed to implement the CBC effectively in their classrooms.

(i) Challenges in Implementation of CBC

Figure 4.6

Challenges in implementing CBC



The identified challenges indicate that educators require targeted support and resources to effectively implement the CBC. The researcher used NVivo to analyze statements from teachers, administrators, and inspectors, identifying prevalent themes and trends.

The primary concern, cited by 60%, was Insufficiency of Resources. This highlights a significant issue: educators lack the resources, tools, and adequate environments to implement the CBC effectively. This may impede effective teaching and adversely affect student performance. Approximately 45% experienced difficulties in adapting, indicating that several educators found it challenging to modify their instructional approaches to align with the CBC. This may be due to insufficient training or a lack of understanding of how to apply CBC in their teaching. Approximately 35% indicated Limited Support. This indicates that educators see insufficient support from their institutions or the government during the transition to the CBC. This may include insufficient opportunities for training, mentoring, or resources, leading instructors to feel uncertain and less competent in their instructional abilities. Furthermore, time constraints, reported by 25%, indicate that educators are having difficulty allocating sufficient time. They must reconcile curricular requirements, devise lesson plans, and evaluate

assignments, which may induce stress and leave them with fewer opportunities to use CBC techniques successfully in the classroom.

Consequently, an examination of teacher input revealed that educators encounter significant challenges in implementing the Competence-Based Curriculum. The identified difficulties, such as insufficient resources and assistance, indicate an urgent need for improvement for educators. Addressing these issues by providing instructors with the necessary resources, training, and enhanced administrative support might significantly improve the CBC's effectiveness. The research indicates that overcoming these challenges is essential for creating an effective learning environment aligned with the objectives of competency-based education.

Regression analysis for the relationship between teacher training, resource availability, and teacher confidence in implementing CBC

A regression analysis was conducted to examine the relationship between teacher training, resource availability, and teacher confidence in implementing CBC.

$R^2 = 0.65, F(2, 98) = 15.6, p < 0.001$

**The results indicate that teacher training and resource availability are significant predictors of teacher confidence in implementing CBC*

An R^2 value of 0.65 means the model explains 65% of the variation in teacher confidence related to CBC implementation; it's a solid chunk of the variation explained by the teacher training and resources included as predictors. Since higher R^2 indicates a good model fit, this suggests a strong relationship between these variables.

The F-statistic, $F(2, 98) = 15.6$, helps us assess the overall model's significance. Those degrees of freedom (2 and 98) correspond to predictors and observations, respectively. A significant F-statistic—and this one certainly is, being much greater than 1—tells us that something in the model is genuinely related to teacher confidence; that suggests the model is useful for prediction. The significance level ($p < 0.001$) shows very strong statistical evidence. There's less than 0.1% probability that this relationship occurred by chance; this reinforces the notion that resource availability and teacher training matter for teacher confidence in CBC implementation.

From the regression results, even without seeing the specific coefficients, one can logically infer a positive relationship between the predictors and teacher confidence. The regression analysis suggests that to boost teacher confidence in CBC, training and resources are critical; educational bodies should invest in improving training and ensuring readily available resources. Such improvements should positively affect how CBC is implemented in schools, potentially leading to better educational outcomes.

Refining the analysis

To refine the analysis, the researcher examined the relationships between specific variables.

Table 4.22

Correlation Analysis

Variable 1	**Variable 2**	**Correlation Coefficient**

Teacher Experience	Understanding of CBC	0.85
Teacher Training	Confidence in Implementing CBC	0.78
Resource Availability	Teacher Confidence	0.72
Collaboration	Teacher Confidence	0.65

The subsequent correlation analysis elucidates the relationships among numerous factors relevant to the implementation of the Competence-Based Curriculum (CBC). Significant positive associations are observed, particularly between teacher experience and understanding of CBC, between teacher training and confidence in CBC implementation, and, moreover, between accessible resources and teacher assurance. The table above displays Correlation Coefficients. Teacher Experience and Comprehension of CBC: A significant 0.85. This robust positive correlation (0.85) indicates a significant association; increased teacher experience is associated with a better understanding of the CBC. It suggests that as educators gain practical experience, their understanding of the CBC framework likely deepens.

Educator Preparation and Assurance in Executing Competency-Based Curriculum: A correlation of 0.78 indicates a robust positive relationship between these two variables. This suggests that enhanced training may directly bolster instructors' confidence in implementing CBC concepts in class. The correlation value of 0.72 indicates a robust, positive association between resource availability and teacher confidence. An increased allocation of resources is correlated with instructors' heightened confidence in the effective implementation of the CBC. Collaboration and Teacher Confidence: A correlation of 0.65 indicates a moderate-to-strong,

favorable association. This suggests that collaboration and communication among instructors enhance their confidence in implementing the CBC.

In summary, the correlation analysis has demonstrated that factors such as teacher experience, training, resource availability, and collaboration significantly enhance teacher confidence in implementing the Competence-Based Curriculum. The need to cultivate a seasoned teaching staff, deliver robust training, ensure adequate resources, and promote teacher collaboration is distinctly emphasized. By prioritizing these factors, educational stakeholders can enhance teachers' confidence, thereby potentially improving the implementation of the CBC and benefiting students.

MANOVA analysis between the understanding of CBC and teacher experience, training, and resource availability

The MANOVA (Multivariate Analysis of Variance) was conducted to examine the relationships between multiple dependent variables—teacher confidence, understanding of CBC, and collaboration—and several independent variables—teacher experience, teacher training, and resource availability.

Wilks' Lambda = 0.56, $F(6, 184) = 4.2$, $p < 0.001$

**The results indicate significant relationships between the independent variables and the dependent variables.*

The Wilks' Lambda (0.56): a measure that tests the hypothesis that the means of the dependent variables are equal across groups defined by the independent variables. A value of

0.56 suggests a notable difference in the group means of the dependent variables. Lower values indicate a more significant difference, with values closer to 0 suggesting stronger relationships.

F-statistic ($F(6, 184) = 4.2$): The F-statistic assesses the overall significance of the model. With (6, 184) degrees of freedom, an F-value of 4.2 indicates that the independent variables significantly explain the variance in the dependent variables. This suggests that at least one of the independent variables (teacher experience, teacher training, or resource availability) affects the dependent variables (teacher confidence, understanding of CBC, and collaboration).

Statistical Significance ($p < 0.001$): The p-value less than 0.001 indicates that the relationships observed are statistically significant, meaning there is less than a 0.1% chance that these relationships occurred by chance. This strong evidence supports the conclusion that teacher experience, training, and resource availability considerably influence teacher confidence, understanding of CBC, and collaboration.

Thus, MANOVA analysis highlighted the importance of teacher experience, training, and resource availability in shaping multiple aspects of teaching effectiveness, including teacher confidence, understanding of the Competence-Based Curriculum, and collaboration among educators. These results underscore the need for targeted initiatives to strengthen these independent variables and improve overall teaching quality and curriculum implementation. Ensuring that teachers receive adequate training and resources and fostering collaboration could lead to improved classroom outcomes.

Regression analysis to explore the relationship between the challenges in implementing the CBC and the key predictors

The regression analysis aims to explore the relationships between the challenges in implementing the Competence-Based Curriculum (CBC) and two key predictors: teacher training and support, and resources and infrastructure.

Table 4.23

Challenges in Implementing CBC = $\beta 0 + \beta 1$(Teacher Training and Support) + $\beta 2$(Resources and Infrastructure) + ε

Table 4.23 shows the Dependent Variable: Challenges in implementing CBC, and the Independent Variables: Teacher training and support; Resources and infrastructure. β_0: Intercept of the regression model. ϵ: Error term accounting for variability not explained by the model.

$R2 = 0.70, F(2, 98) = 15.6, p < 0.001$

***The results indicate that teacher training and support, resources, and infrastructure are significant predictors of challenges in implementing CBC.*

Table 4.23 shows that the R-squared value of 0.70 means that 70% of the variance in the challenges associated with implementing the CBC is explained by the independent variables (teacher training and support, and resources and infrastructure). This indicates a strong relationship, signifying that these predictors are substantial contributors to the challenges faced. The F-statistic evaluates the overall significance of the regression model. A value of 15.6 suggests that the model is statistically significant and explains a significant amount of variance in the challenges of implementing CBC. It indicates that at least one predictor is significantly related to the dependent variable. A p-value of less than 0.001 indicates very strong statistical significance. This implies that there is less than a 0.1% chance that the observed relationships are

due to random variation, providing strong evidence that both teacher training and support, as well as resources and infrastructure, significantly predict challenges in CBC implementation.

This regression analysis concludes that both teacher training and support, and resources and infrastructure, are significant predictors of the challenges faced in implementing the Competency-Based Curriculum (CBC). The model explaining 70% of the variance reflects its robustness, and the significant p-value corroborates the importance of the predictors in addressing challenges. Thus, these findings from the regression analysis emphasize the crucial roles of teacher training and support, along with adequate resources and infrastructure, in mitigating challenges associated with implementing the Competency-Based Curriculum. Educational stakeholders should prioritize these areas in their planning and policy-making to foster an environment conducive to the successful implementation of CBC. Investments in teacher training programs and infrastructure upgrades are likely to improve the effectiveness of educational practices and yield better outcomes in the educational system.

Mitigating challenges faced in the implementation of CBC

A group of educators shared proposals to enhance the application of CBC, but not systematically. Clarity can be enhanced by providing precise instructions for sample lesson plans, competency-based activities, and standardized evaluation rubrics. Educators should get support in developing essential skills through consistent training sessions and, at times, mentorship programs. Some suggested streamlining the curriculum and decreasing the number of skills to align with the allocated instructional time. Moreover, lessons may appear more pertinent if they incorporate real-world examples, such as environmental studies or personal finance. To address diverse learning styles and paces while offering a degree of personalized education, there

is ongoing discourse about integrating flexibility from the beginning. Moreover, collaborative projects can stimulate students' engagement and help them enhance their communication and problem-solving skills. Moreover, modern advancements, such as data science and programming, are incorporated into the curriculum, equipping students for the future labor market. Finally, it is essential to regularly update the curriculum based on input from instructors and students.

INTEGRATION OF QUALITATIVE AND QUANTITATIVE ANALYSIS

This study employed a convergent parallel mixed-methods design in which quantitative and qualitative data were collected and analyzed independently, then integrated during interpretation. The purpose of integration was not merely to determine whether the two datasets produced similar findings, but to establish how the findings converged, diverged, or complemented one another in explaining mathematics teachers' implementation of the competency-based curriculum (CBC) in Zimbabwean secondary schools. In accordance with Creswell and Plano Clark (2018), integration enabled the development of meta-inferences that could not be obtained adequately from either dataset considered in isolation.

The integration revealed substantial convergence around four major areas: resource constraints, teacher preparedness, assessment challenges, and factors affecting implementation. At the same time, some divergence was evident, particularly between teachers' reported use of learner-centered practices and the difficulties they described in consistently implementing CBC principles. The qualitative findings also complemented the quantitative results by explaining patterns that could not be adequately interpreted from numerical data alone.

Joint Display of Quantitative and Qualitative Findings

The integration of the two strands is presented in the table below. The joint display demonstrates how quantitative and qualitative findings were integrated and classified into areas of convergence, divergence, or complementarity.

Table 4.24

Joint display of quantitative and qualitative findings

Integrated theme	**Quantitative findings**	**Qualitative findings**	**Relationship**	**Integrated interpretation**
Resource availability	Lack of ICT tools was a major concern (M = 3.65), while lack of proper classroom facilities was also reported (M = 2.99).	Teachers reported shortages of textbooks, ICT equipment, calculators, geometry sets, and other classroom materials. About 60% of qualitative respondents referred to inadequate infrastructure.	Convergence	Both strands indicate that inadequate material and infrastructural resources constrain the practical implementation of CBC, particularly its emphasis on activity-based and hands-on learning.
Teacher preparedness and CBC knowledge	Knowledge about CBC was rated as moderate (M = 3.18), while insufficient professional development was a substantial concern (M = 3.48). Teacher experience was significantly associated with reported understanding of CBC ($\chi^2 = 12.1$, $p < .01$).	Interviews revealed uncertainty about CBC principles and indicated that some teachers viewed CBC as merely new terminology or a "buzzword." Participants also described training as rushed or insufficient.	Convergence and complementarity	Both strands demonstrate limitations in teacher preparedness. The qualitative data explain the quantitative pattern by showing how insufficient training translates into uncertainty about the meaning and classroom application of CBC.
Assessment of	Difficulty measuring	Teachers described difficulties in assessing	Convergence and	Both datasets identify assessment as an

competencies	competencies was reported (M = 3.13). Regression analysis indicated that training and resource-related factors were associated with implementation difficulties (R^2 = .70).	creativity and other competencies and reported pressure to "teach to the test."	complementarity	implementation challenge. Qualitative evidence adds contextual explanation by demonstrating the tension between competency-based assessment and an examination-oriented educational environment.
Teacher collaboration and support	Teacher collaboration/confidence was positively associated (r = .65). MANOVA indicated significant effects of teacher training and resource availability on CBC implementation (Wilks' Λ = .56, $p < .001$).	Focus-group participants called for mentorship programs, peer support, experience sharing, and collaborative problem-solving.	Convergence	Both strands support the importance of professional support systems. Collaboration appears to provide a mechanism for teachers to share practical strategies and strengthen confidence in CBC implementation.
Funding and institutional support	More funding for education was the highest-reported priority among proposed solutions (M = 5.16).	Participants emphasized inadequate resources, infrastructure, and institutional support and called for increased government investment.	Convergence	The two strands consistently identify financial and institutional support as central conditions for sustaining CBC implementation.
Learner-centered practices	Learner-centered approaches received a relatively high rating (M = 4.13).	Teachers described examples of group work and real-world projects being used in some classrooms. However, other participants reported difficulties developing learner-centered lesson plans and obtaining appropriate teaching aids.	Divergence and complementarity	The quantitative finding suggests relatively high self-reported use of learner-centered approaches, whereas qualitative accounts reveal practical constraints that affect consistency and quality. The divergence may therefore reflect differences between reported adoption and the

				conditions under which the practices are implemented.
Overall CBC implementation	Quantitative results indicated measurable levels of CBC implementation and identified specific implementation constraints.	Narratives portrayed implementation as uneven, with teachers experiencing uncertainty, resource shortages, and assessment pressures.	Complementarity	Quantitative findings establish the extent and pattern of implementation concerns, while qualitative findings explain how these challenges are experienced in everyday mathematics classrooms.

Areas of Convergence

The strongest convergence occurred regarding resource constraints. Quantitative results identified a lack of ICT tools (M = 3.65) and inadequate classroom facilities (M = 2.99) as important implementation concerns. These findings were reinforced by qualitative accounts in which teachers described shortages of textbooks, calculators, geometry sets, ICT equipment, and other instructional materials. The fact that approximately 60% of qualitative respondents referred to inadequate infrastructure provides contextual support for the quantitative findings. Thus, the two datasets independently point to a common structural constraint: teachers may be expected to implement a curriculum that emphasizes practical, learner-centered, and activity-based learning without consistently having the material conditions required to do so.

Convergence was also evident regarding teacher preparedness. The quantitative findings showed a moderate rating for the importance of CBC knowledge (M = 3.18) and identified insufficient professional development as a substantial concern (M = 3.48). The qualitative data provided greater explanatory depth, revealing uncertainty about the meaning and practical application of CBC, as well as reports that some training workshops were rushed or insufficient.

The significant association between teaching experience and reported understanding of CBC ($\chi^2 = 12.1$, $p < .01$), with more experienced teachers reporting higher understanding than less experienced teachers, further demonstrates that teacher preparedness is not uniform across the teaching population. Rather than interpreting experience itself as the cause of better understanding, the finding suggests the need to examine how professional exposure, training opportunities, and accumulated classroom experience interact to shape teachers' understanding of curriculum reform.

A similar pattern of convergence emerged around assessment. Quantitative data identified difficulty measuring competencies (M = 3.13), while qualitative accounts illustrated the problem through teachers' questions about how to assess creativity and other mathematical competencies. Participants also described pressure to “teach to the test.” The two strands, therefore, collectively suggest that the challenge is not simply a lack of assessment skills among teachers; it also concerns the alignment between CBC assessment expectations and the wider examination-oriented context in which teachers work. The regression finding ($R^2 = .70$) further indicates that training and resource-related factors explain a substantial proportion of variation in the implementation-related difficulties captured by the model. However, the statistical association should not be interpreted as establishing that these factors alone cause the reported assessment problems.

Convergence was further evident in the proposed mitigation strategies. Increased funding received the highest quantitative priority (M = 5.16), corresponding with qualitative calls for greater government investment and improved provision of teaching resources. Similarly, the positive relationship between teacher collaboration and confidence in CBC implementation (r =

.65) was consistent with qualitative requests for mentorship, peer learning, and collaborative problem-solving. The MANOVA result (Wilks' $\Lambda = .56$, $p < .001$) also indicates statistically significant relationships between training, resource availability, and the implementation outcomes examined in the study. Taken together, these findings suggest that CBC implementation challenges are interrelated rather than isolated: teacher development without resources may have a limited effect. At the same time, resources without adequate teacher preparation may also fail to produce consistent classroom implementation.

Areas of Divergence

Although the datasets demonstrated substantial convergence, the integration also revealed an important area of divergence concerning learner-centered practices. The quantitative findings yielded a relatively high mean for learner-centered approaches ($M = 4.13$), suggesting that teachers generally reported using them. In contrast, qualitative findings indicated that teachers continued to experience difficulties in designing learner-centered mathematics lessons and obtaining appropriate teaching and learning aids. Participants nevertheless described successful examples involving group work and real-world projects.

This divergence should not automatically be treated as a contradiction. Instead, it may indicate a difference between reported adoption and experienced implementation. A teacher may report using learner-centered strategies while simultaneously experiencing difficulties with their depth, consistency, assessment, or resource requirements. Consequently, the qualitative findings qualify rather than invalidate the quantitative result. The integrated interpretation is that learner-centered approaches are present in mathematics classrooms, but their implementation may be uneven and constrained by contextual factors.

Complementarity of the Findings

The greatest contribution of the mixed-methods design was the complementary explanatory value of the two datasets. Quantitative findings identified the magnitude or pattern of concerns, whereas qualitative evidence helped explain why those patterns existed and how they were experienced in mathematics classrooms. For example, the quantitative finding concerning insufficient professional development (M = 3.48) establishes the prominence of training as an implementation concern. The qualitative evidence adds meaning to this result by showing that teachers experienced training as insufficient, rushed, and not always adequate for translating CBC principles into classroom practice. Similarly, the quantitative evidence regarding the difficulty of measuring competencies (M = 3.13) becomes more meaningful when considered alongside teachers' accounts of uncertainty in assessing creativity and the pressure to prepare learners for examinations.

Complementarity was also apparent in relation to resource constraints. The quantitative findings indicate that ICT tools and classroom facilities were key concerns, while qualitative accounts identify the specific resources teachers lacked. This demonstrates why integration is important: the numerical findings show the pattern and relative prominence of the problem, while the qualitative findings demonstrate its practical manifestation in mathematics classrooms.

Reconciliation of Findings Through the CBAM Framework

The integrated findings can further be interpreted through the Concerns-Based Adoption Model (CBAM). The evidence suggests that teachers' concerns extend across the informational, personal, and management dimensions of curriculum implementation. Informational concerns are reflected in uncertainty about CBC principles and assessment requirements. Personal

concerns are evident in teachers' uncertainty about their capacity to implement unfamiliar approaches, while management concerns are reflected in difficulties with resources, lesson planning, assessment, and classroom implementation.

The latter CBAM concerns of consequence, collaboration, and refocusing are also visible, but appear less consistently. Teachers' requests for mentorship, collaboration, and practical support indicate a shift toward collaboration. At the same time, examples of learner-centered practices and calls for improved implementation suggest emerging attention to consequences and a refocusing. However, the persistence of informational, personal, and management concerns suggests that implementation cannot be understood as a linear progression through the CBAM stages. Teachers may experience different concerns simultaneously depending on their experience, training, and school context.

The findings can also be related to the professional, psychological, institutional, and cultural dimensions identified in Reimers' five-frame perspective. Teacher knowledge and confidence relate to the professional and psychological dimensions; resource and infrastructure shortages reflect institutional constraints; and parental uncertainty and resistance to change point to cultural factors. The integration of the datasets, therefore, demonstrates that the challenges of CBC implementation are multidimensional, involving interactions among teacher capacity, institutional conditions, assessment structures, and stakeholder expectations.

Development of Meta-Inferences

The integration of quantitative and qualitative evidence produced several overarching meta-inferences. First, the implementation challenges identified in the quantitative data are substantively supported and explained by teachers' qualitative experiences. Second, the evidence

indicates that teacher preparedness and resource availability are interconnected conditions rather than independent barriers. Third, assessment represents a particularly important implementation tension because teachers are expected to develop competencies within an educational environment that remains strongly examination-oriented. Fourth, the presence of learner-centered practices indicates that CBC implementation is underway. However, the divergence between relatively positive quantitative ratings and qualitative accounts of implementation difficulties suggests that adoption does not necessarily translate into consistent or fully developed implementation.

Overall, the integration demonstrates that the implementation of CBC in Zimbabwean mathematics classrooms is neither wholly absent nor uniformly successful. Rather, the findings portray an uneven implementation process shaped by teacher preparedness, resource availability, assessment demands, professional support, and stakeholder understanding. The quantitative strand establishes the prevalence and statistical relationships among these factors, while the qualitative strand explains their practical meaning and contextual dimensions. The joint interpretation, therefore, provides a more comprehensive account than either strand could provide independently and strengthens the credibility of the conclusions drawn from the study.

This integrated evidence supports the interpretation, through CBAM, that teachers' implementation concerns remain substantially concentrated around understanding CBC, developing confidence, and managing the practical demands of implementation, while collaboration and more advanced forms of curriculum adaptation are emerging but remain constrained by institutional and contextual conditions.

EVALUATION OF FINDINGS

This study presents an integrated analysis of Competency-Based Curriculum (CBC) implementation in Zimbabwean mathematics classrooms by synthesizing quantitative data from questionnaires with qualitative insights from interviews and focus group discussions. Integrating these sources was essential, as quantitative findings established the prevalence and intensity of teachers' concerns. In contrast, qualitative findings offered contextual explanations for how and why these concerns manifested in practice. This approach aligns with the study's mixed-methods design, which aimed to provide a comprehensive understanding of CBC implementation by integrating quantitative and qualitative evidence. The evaluation is structured around four research questions: teachers' understanding of CBC, the extent of its implementation, challenges encountered during implementation, and strategies for addressing these challenges. The findings are interpreted using the Concerns-Based Adoption Model (CBAM) and Reimers' framework, with attention to areas of convergence, divergence, and complementarity between the quantitative and qualitative evidence.

Teachers' Understanding of CBC

The findings indicate that while mathematics teachers generally possessed a conceptual understanding of CBC, this understanding did not consistently translate into practical classroom implementation. Qualitative data revealed that teachers could articulate CBC in terms of competency development, learner-centered approaches, collaboration, and personalized learning. However, some participants expressed uncertainty about applying these principles in mathematics instruction. Teachers reported that although CBC was understood theoretically, it was not always evident in classroom practice. This distinction underscores that curriculum

awareness does not equate to implementation competence. The qualitative evidence thus complements the quantitative finding that CBC knowledge was a concern, as reflected by a mean score of 3.18.

The gap between conceptual understanding and practical application was especially pronounced in learner-centered pedagogy and competency-based assessment. Teachers reported employing group work, pair work, projects, demonstrations, and other participatory methods; however, the consistent integration of these practices across mathematics classrooms varied. Additionally, teachers encountered challenges in designing assessments that accurately measured competencies. Quantitative findings highlighted difficulty in measuring competencies, with a mean score of 3.13, while qualitative evidence attributed this concern to teachers' uncertainty regarding assessment criteria and construction.

Interpreted through the lens of CBAM, these findings indicate that many teachers' concerns remained at the informational, personal, and management stages. Teachers sought greater clarity regarding CBC requirements, the impact on their professional responsibilities, and strategies for managing new teaching and assessment demands. Therefore, curriculum implementation should not be viewed solely in terms of acceptance or rejection of CBC; instead, teachers' concerns reflect varying levels of understanding, confidence, and practical experience.

Extent of CBC Implementation in Mathematics

The findings demonstrate that CBC was only partially implemented across mathematics classrooms, rather than being uniformly adopted. Qualitative evidence provided examples of teachers employing collaborative learning, competency-focused assessment, and methods that link mathematics to practical applications. Conversely, some teachers continued to blend CBC

practices with traditional instructional approaches. This pattern was further reinforced by reports of rigid timetables, insufficient resources, limited support, and challenges in adapting established teaching practices.

This finding is significant because it challenges binary characterizations of CBC implementation as either wholly successful or unsuccessful. Instead, implementation occurred along a continuum. Some teachers had begun integrating CBC principles into their mathematics instruction, while others remained constrained by contextual and professional barriers. Both quantitative and qualitative findings converge in depicting CBC implementation as uneven and highly dependent on the specific conditions faced by teachers. Quantitative results further reveal associations between teacher characteristics and CBC implementation. Teaching experience was significantly related to understanding of CBC, as indicated by a chi-square statistic of 12.1 and $p < .01$. Correlation analysis also identified a strong positive relationship between teaching experience and CBC comprehension ($r = .85$). However, these results should be interpreted as associations rather than evidence of causation. Accumulated professional experience may contribute to teachers' understanding of curriculum change, but other factors, such as training, resources, and support, also play critical roles in implementation.

Challenges Affecting CBC Implementation

The most pronounced convergence between quantitative and qualitative findings concerns the challenges affecting CBC implementation. Four major issues consistently emerged: resource constraints, inadequate teacher preparation and professional development, assessment difficulties, and time and workload pressures. Resource constraints were especially prominent. Quantitative findings identified the lack of ICT tools as a major concern, with a mean score of

3.65. Qualitative findings elaborated on this issue, citing shortages of textbooks, teaching aids, digital resources, and suitable classroom facilities. Teachers and school leaders reported that these shortages limited the practical and hands-on instructional approaches central to CBC.

Teacher preparation emerged as another persistent concern. Qualitative participants reported insufficient training in CBC pedagogy and assessment. Quantitative analysis revealed significant relationships between teacher preparation, confidence, and implementation. The correlation between educator preparation and confidence in implementing CBC was $r = .78$. In contrast, resource availability and teacher confidence were positively correlated at $r = .72$. Regression analysis indicated that teacher training and resource availability together explained a substantial proportion of the variance in teacher confidence ($R^2 = .65$). These results demonstrate that the concerns identified qualitatively reflect broader patterns observed in the quantitative data.

Assessment was identified as a particularly significant implementation challenge. Teachers reported difficulty determining whether assessment instruments effectively measured the competencies outlined by the CBC. This concern aligns with findings that teachers struggled to transition from traditional assessment practices to competency-based assessment. The issue extends beyond willingness to change and encompasses access to appropriate assessment knowledge, tools, and guidance. Large class sizes and limited instructional time further complicated the implementation of CBC. Teachers reported challenges in providing individualized attention and conducting competency-based assessments with large groups of learners. Qualitative evidence thus explains why practices such as personalized learning,

continuous assessment, and learner-centered activities are difficult to sustain, even when teachers acknowledge their importance.

Teacher Readiness, Resistance, and Concerns About Change

The findings also highlight variations in teacher readiness. Some teachers exhibited enthusiasm for CBC and had begun modifying their instructional practices, while others expressed uncertainty or continued to rely on established methods. These differences should not be interpreted solely as resistance to change. Instead, qualitative evidence indicates that hesitation often stemmed from insufficient training, limited resources, uncertainty about assessment, and challenges in aligning CBC expectations with existing school routines. This interpretation aligns with CBAM, which conceptualizes responses to educational innovation as evolving teacher concerns during the adoption process. The findings indicate that teachers' concerns ranged from understanding CBC and its implications to managing classroom demands. However, evidence of collaboration and refocusing was observed less consistently. This is significant because effective curriculum implementation requires progression beyond understanding toward evaluating outcomes and engaging in collaborative efforts to enhance practice.

Convergence, Divergence, and Complementarity of Findings

The mixed-methods integration reveals substantial convergence between the quantitative and qualitative datasets. Both approaches identified resource constraints, teacher preparedness, assessment difficulties, and other factors influencing implementation. For instance, quantitative findings established the extent of concerns regarding ICT resources and assessment. At the same

time, interviews and focus group discussions explained how these shortages impacted lesson preparation, instructional strategies, and assessment practices.

Complementarity was also evident between the datasets. Quantitative findings established relationships among teacher experience, training, resources, confidence, and implementation, while qualitative accounts provided insight into the classroom realities underlying these relationships. For example, the quantitative association between resources and teacher confidence is better understood when contextualized with teachers' descriptions of inadequate textbooks, ICT equipment, and teaching materials.

Simultaneously, the findings reveal areas of divergence. Quantitative results suggest relatively favorable perceptions of certain learner-centered aspects of CBC, while qualitative accounts indicate that teachers often combined CBC approaches with traditional methods. This divergence does not undermine either dataset; instead, it highlights a distinction between teachers' recognition or acceptance of CBC principles and their ability to apply them under current classroom conditions consistently. Integration of qualitative and quantitative results similarly notes convergence regarding resources, preparedness, and assessment, alongside divergence in learner-centered practices.

Interpretation Through CBAM

The findings strongly support interpreting CBC implementation through the Concerns-Based Adoption Model. Teachers' uncertainty about the meaning and practical requirements of the CBC reflects both informational and personal concerns. Challenges related to lesson planning, assessment, time management, and resource utilization correspond to management concerns. Evidence of teachers focusing on learner outcomes, collaborating with colleagues, and

seeking practical improvements suggests emerging concerns about consequences, collaboration, and refocusing. However, these latter stages were observed less consistently. Quantitative findings reinforce this interpretation by demonstrating significant relationships among teacher experience, training, resources, confidence, and CBC implementation. MANOVA results further indicated significant associations among the variables examined (Wilks' Lambda = .56, $F(6,184) = 4.2$, $p < .001$). Collectively, these findings suggest that teachers' concerns are multidimensional and cannot be attributed to a single factor.

Interpretation Through Reimer's 5 Frame Theory

The findings are also interpretable through Reimers' framework, which emphasizes the professional, psychological, institutional, and cultural dimensions of educational change. The professional dimension is evident in teachers' need for knowledge of CBC, pedagogical skills, and assessment competence. The psychological dimension is reflected in teachers' confidence, uncertainty, and readiness to adapt established practices. The institutional dimension encompasses resource availability, school-level support, class size, timetabling, and professional development opportunities. The cultural dimension is represented by established teaching practices and the degree to which collaboration and shared professional learning are embedded within schools. Quantitative regression analysis further supports this interpretation. Training and support, combined with resources and infrastructure, accounted for approximately 70% of the variance in challenges related to CBC implementation ($R^2 = .70$). This finding underscores that implementation challenges are not solely individual teacher issues but are also linked to the institutional conditions in which teachers work.

Overall Evaluation of the Findings

Overall, the findings indicate that CBC implementation in Zimbabwean mathematics classrooms is partial and uneven, shaped by the interplay between teacher-level and system-level conditions. The evidence does not support the conclusion that CBC is either absent or fully implemented. Rather, teachers have adopted selected CBC practices, such as collaborative learning, learner-centered approaches, and competency-oriented assessment, while continuing to face challenges in consistently translating the curriculum's broader principles into classroom practice. The central finding from the mixed-methods integration is a gap between theory and practice, as well as between policy and practice. Teachers generally recognize the key principles of CBC. However, their capacity to implement them is constrained by inadequate preparation, assessment uncertainty, resource shortages, large class sizes, limited instructional time, and insufficient institutional support. Quantitative findings illustrate the prevalence and statistical relationships among these factors, while qualitative findings provide insight into how these challenges are experienced in daily mathematics instruction.

From a CBAM perspective, teachers' concerns primarily focus on understanding CBC, building confidence, and managing the practical demands of implementation, with less consistent evidence of progress toward collaboration and refocusing. From Reimer's perspective, the findings indicate that effective curriculum reform requires alignment among professional capacity, teacher confidence, institutional support, and broader school culture. Therefore, the effectiveness of CBC implementation cannot be explained solely by teachers' attitudes; it must be understood in relation to the enabling or constraining conditions that affect teachers' ability to translate curriculum policy into classroom practice.

CHAPTER SUMMARY

This chapter has comprehensively examined the multiple challenges associated with the effective implementation of the Competency-Based Curriculum (CBC). The findings indicate that, although CBC aims to transform teaching and learning into a more learner-centered, skills-oriented process, its practical implementation faces significant obstacles. These challenges include limited stakeholder involvement, inadequate teaching and learning resources, insufficient institutional support, and gaps in teacher training and preparedness. Collectively, these factors hinder the full translation of CBC policy intentions into meaningful classroom practice.

The results further underscore the critical role of teachers and school leadership in the successful implementation of CBC. Teachers require ongoing professional development, mentorship, and practical training to deepen their understanding of CBC principles, assessment strategies, and instructional approaches. Additionally, strong administrative support and clear policy guidance are essential to ensure consistency and coherence in implementation across schools. In the absence of such support, teachers may experience uncertainty, diminished confidence, and resistance, which can negatively affect the quality of curriculum delivery.

The study also highlights the importance of adequate resource allocation in strengthening CBC implementation. Access to appropriate instructional materials, technological tools, and well-equipped learning environments is fundamental for facilitating experiential and competency-based learning. When these resources are limited or unevenly distributed, disparities in learning opportunities arise, undermining the goals of equity and inclusiveness that CBC seeks to promote. Addressing the challenges identified in this chapter and strategically applying the insights generated from this research can enable educational authorities and policymakers to

implement targeted interventions that improve teaching and learning conditions. Such interventions may enhance learner engagement, foster competency development, and increase student achievement. The findings of this study provide a robust empirical foundation for future research, policy reform, and practical initiatives to strengthen CBC implementation, advance educational practices, and promote sustainable improvements in educational quality, relevance, and equity across the education system.

Table 4.25

Summary of research questions and key findings

Research Question	**Key Finding**
To what extent do mathematics teachers understand the Competency-Based Curriculum?	Most teachers demonstrated a good conceptual understanding of CBC, with 75% showing strong understanding, 15% partial understanding, and 10% little or no understanding. However, some teachers experienced difficulties translating CBC principles into actual lesson delivery.
To what extent do mathematics teachers implement CBC?	Implementation was partial and inconsistent across schools. Only 55% of teachers reported positive implementation. Training and resource availability were significant factors influencing implementation, with the regression model explaining 65% of the variation.
What challenges are faced by mathematics teachers in implementing CBC in Mathematics?	Major challenges included inadequate resources, insufficient training, large class sizes, assessment difficulties, limited access to technology, stakeholder resistance, and misalignment between the CBC and national examinations. Training gaps and infrastructure deficits accounted for approximately 70% of the reported challenges.
What strategies are used to mitigate the challenges in the implementation of CBC?	Key strategies included continuous teacher training, increased funding, adequate teaching resources, technology integration, authentic assessment tools, clear assessment guidelines, stakeholder engagement, and stronger government support. Increased funding (M = 5.16), authentic assessment tools (M = 4.78), and stakeholder engagement (M = 4.38) were the highest-ranked strategies.

CHAPTER 5

IMPLICATIONS, RECOMMENDATIONS, AND CONCLUSIONS

INTRODUCTION

The worldwide transition to competency-based education (CBE) reflects growing recognition that conventional, content-centric curricula inadequately equip learners to meet the complexities of the 21st century. The competency-based curriculum (CBC) prioritizes learning skills, critical thinking, problem-solving, and practical application over rote memorization across many educational systems. This educational paradigm, although lauded for its capacity to improve student engagement, employability, and lifelong learning, faces significant structural, logistical, and sociocultural hurdles to implementation.

This chapter provided a comprehensive assessment of the results from quantitative and qualitative investigations about the obstacles to effective CBC implementation. The research used a mixed-methods approach, combining statistical techniques (regression analysis, factor analysis, frequency analysis) with qualitative thematic analysis to provide a comprehensive understanding of the issues encountered by educators, administrators, and policymakers. The research aimed to analyze Mathematics teachers' perceptions of implementing the competency-based curriculum (CBC). To address the aim, the study was based on four objectives. The objectives of the study were as follows:

(i) To find out the level of understanding of mathematics teachers about CBC.

(ii) To analyze the extent to which mathematics teachers are implementing CBC in Mathematics.

(iii) To find out the challenges encountered by mathematics teachers in the implementation of the competency-based curriculum (CBC) in Mathematics.

(iv) To provide possible solutions for the challenges raised.

The study also addressed the major research question regarding mathematics teachers' perceptions of the implementation of the competency-based curriculum (CBC).

The major research question was supported by four 4 sub-research questions. These were:

(i) To what extent do mathematics teachers understand competency-based curriculum?

(ii) To what extent do mathematics teachers implement a competency-based curriculum?

(iii) What are the challenges faced by mathematics teachers in the implementation of a competency-based curriculum (CBC) in mathematics?

(iv) How can the challenges be mitigated?

By addressing these objectives and questions, this chapter contributed to the broader discourse on educational policy reform**,** offering actionable insights for improving curriculum delivery and learning outcomes in Mathematics. In addition, the study highlighted several important implications for improving the implementation of CBC.

IMPLICATIONS OF THE STUDY ON MATHEMATICS TEACHERS' CONCERNS REGARDING CBC IMPLEMENTATION

The study's findings have significant implications for policymakers, curriculum writers, teacher trainers, and educators about the implementation of the competency-based curriculum (CBC) in mathematics. The following are the principal implications derived from the research inquiries:

a) Implications on Teachers' Understanding of CBC (Research Question 1)

Successful implementation of the competency-based curriculum (CBC) in Mathematics in Zimbabwe requires teachers to possess a thorough understanding of the curriculum's guiding

principles, intended learning outcomes, and recommended instructional methods. The transition from a content-driven to a competency-oriented framework constitutes a substantial transformation in the educational system, necessitating the adoption of new pedagogical practices, assessment methods, and classroom roles.

The findings indicate that mathematics educators face challenges related to professional preparedness, access to curriculum documentation, and opportunities for collaborative learning. There is also a growing need for well-structured, ongoing professional development programs that equip teachers with the skills and confidence required for effective CBC implementation. Furthermore, providing clear, accessible curriculum materials is vital for supporting teachers' planning and instructional decisions. Establishing collaborative learning environments, such as professional learning communities, enables teachers to share experiences, reflect on their practice, and develop collective strategies to address implementation challenges. Addressing these issues is crucial to achieving the objectives of the competency-based Mathematics curriculum in Zimbabwean classrooms.

(i) Professional Development Needs

The study findings indicate that many teachers have a limited understanding of the competency-based curriculum, especially regarding learner-centered pedagogy, competency-based assessment, and curriculum interpretation. This finding is consistent with previous empirical studies in Zimbabwe, which have reported inadequate teacher knowledge, skills, and preparation as key challenges in implementing the CBC (Shinda & Banda, 2024; Mareva, Gonye & Mhindu, 2025). This situation corresponds to the informational, personal, and management stages of concern described in the Concerns-Based Adoption Model (CBAM), highlighting teachers' need for increased knowledge, confidence, and support to implement the curriculum effectively.

Continuous professional development, including regular training sessions, workshops, mentorship, and collaborative learning, is therefore essential to enhance teachers' pedagogical skills, assessment practices, and understanding of differentiated instruction. This is also supported by empirical evidence showing that inadequate professional development can limit teachers' ability to translate CBC principles into classroom practice (Shinda & Banda, 2024). These results are consistent with Reimer's Five-Frame Theory, particularly the professional and psychological frames, which underscore the significance of building teacher capacity and supporting teachers' beliefs and attitudes toward educational reform. Improving teachers' competencies in implementing the competency-based curriculum may promote learner-centered instruction, increase learner engagement, and improve educational outcomes.

(ii) Curriculum Documentation

Policymakers have a critical responsibility in facilitating mathematics teachers' effective implementation of the competency-based curriculum (CBC). They should provide clear, accessible, and comprehensive curriculum materials. The study's findings indicate that teachers frequently encounter confusion and uncertainty regarding the practical application of the CBC, primarily due to insufficient or ambiguous instructional resources. This finding is consistent with previous empirical studies in Zimbabwe, which identified inadequate curriculum resources and limited teacher support as significant challenges to effective CBC implementation (Shinda & Banda, 2024; Mareva, Gonye, & Mhindu, 2025). This observation corresponds with the informational and personal stages of the Concern-Based Adoption Model (CBAM), in which educators seek concrete information about the innovation and express concern about its direct impact on their professional roles and practices. Systematic development and broad dissemination of curriculum guidelines and support documents can address these early-stage concerns. These

materials function as essential reference points, clearly articulating objectives, expected competencies, and assessment strategies, thereby equipping teachers with a robust foundation for interpreting and implementing the CBC in classroom settings.

According to Reimers' 5-Frame Theory, the provision of well-structured curriculum documents addresses both professional and institutional dimensions. Professionally, teachers gain the knowledge and resources required for effective curriculum enactment, which supports their ongoing development and confidence. Institutionally, systematic dissemination and clarity in curriculum materials promote a cohesive, supportive environment that aligns school practices with broader policy objectives. Similarly, empirical evidence from Zimbabwe suggests that shortages of textbooks, instructional materials, and other curriculum resources can hinder teachers' ability to translate CBC expectations into classroom practice (Shinda & Banda, 2024). The findings further demonstrate that consistent access to user-friendly, practical curriculum documents enables teachers to bridge the gap between theoretical intentions and classroom practice, facilitating a shift from fragmented implementation to more comprehensive and effective adoption. This process improves instructional planning and alignment with curriculum goals, ultimately enhancing the overall quality and impact of CBC implementation for learners.

(iii) Collaborative Learning

The study's findings indicate that fostering collaborative learning among teachers is essential for improving their comprehension and implementation of the competency-based curriculum (CBC). Participants noted that peer mentoring, experience sharing, and collective problem-solving were pivotal in overcoming challenges associated with CBC implementation. These practices align with the collaboration and refocusing stages of the Concern-Based Adoption Model (CBAM), in which teachers benefit from support networks and collaborative engagement

to enhance their understanding and adapt innovative practices. Consistent with Reimers' 5 Frame Theory, such collaborative efforts address both professional and cultural frames by cultivating a school culture that emphasizes ongoing professional development and the exchange of effective strategies, thereby facilitating the translation of curriculum policy into effective classroom practice.

The study underscores that effective implementation of CBC in mathematics requires an environment that supports both individual teacher development and institutional collaboration. The findings suggest that collaborative work and sustained mentorship enable teachers to better manage instructional changes, adapt to new monitoring systems, and implement learner-centered approaches. These factors correspond to the management and consequence stages of CBAM, in which shared experiences help teachers address new challenges and assess the impact of CBC on student outcomes. Furthermore, Reimers' institutional and psychological frames are strengthened, as institutional support and attention to teachers' professional needs are vital for overcoming obstacles and ensuring that CBC enhances teaching quality and student achievement in mathematics.

(iv) Instructional Strategies

The study's findings indicate that a primary challenge for mathematics educators in implementing the competency-based curriculum (CBC) is the difficulty in developing learner-centered lesson plans and utilizing appropriate teaching and learning aids. This finding is consistent with empirical studies in Zimbabwe, which have identified inadequate curriculum resources, limited teacher preparation, and difficulties in adapting to CBC requirements as important barriers to effective implementation (Shinda & Banda, 2024; Muzvondiwa & Gudyanga, 2024). This challenge aligns with several stages of the Concerns-Based Adoption Model (CBAM).

Initially, teachers are often situated at the informational and personal stages, expressing uncertainty regarding the design and delivery of CBC-aligned instruction. As they adopt new methodologies, they typically transition to the management stage, where they encounter practical difficulties related to planning, resource selection, and time management. The lack of curriculum-aligned resources intensifies these management concerns, hindering teachers' progression to the higher stages of consequence, collaboration, and refocusing, which involve evaluating learner outcomes, engaging in professional collaboration, and refining instructional practices.

In relation to Reimer's 5 Frame Theory, the findings reveal gaps within the professional frame, where teachers require ongoing professional development and access to practical resources, such as model lesson plans and instructional aids, to enhance their pedagogical skills. The challenge also extends to the institutional frame, as effective CBC implementation relies on the school's capacity to provide structural support and necessary resources. Additionally, the cultural frame is significant, since cultivating a collaborative and innovative school culture enables teachers to share strategies and learn from one another, thereby reducing isolation and uncertainty at the lower stages of concern. In summary, bridging the gap between curriculum policy and classroom practice requires addressing teachers' specific concerns at each stage of the CBAM while also considering the professional, institutional, and cultural frames described by Reimers. Supplying curriculum-aligned instructional resources and cultivating a supportive, collaborative environment will facilitate mathematics teachers' progression through the stages of concern and support the effective realization of CBC objectives in practice.

(v) Development of Instructional Materials

The study's findings indicate that the effective implementation of the competency-based curriculum (CBC) in mathematics depends on the availability of high-quality, CBC-aligned

instructional materials. Teachers identified insufficient resources, including assessment tools, teaching aids, and exemplar lesson plans, as major obstacles to effective practice. This scarcity often forces educators to revert to traditional, less effective teaching methods. These challenges correspond to the management and consequence stages of the Concerns-Based Adoption Model (CBAM). During the management stage, teachers focus on logistics, resources, and daily implementation demands; inadequate materials increase their sense of being overwhelmed and impede adaptation to new pedagogical requirements. In the consequence stage, teachers shift their attention to evaluating the impact of instruction on student learning outcomes. Without sufficient materials, teachers find it difficult to assess and support competency development, thereby undermining the objectives of the CBC.

In relation to Reimer's 5 Frame Theory, the development and provision of tailored instructional materials address the professional, institutional, and cultural frames essential for educational reform. The professional frame is enhanced when teachers have access to well-designed resources that support ongoing professional development and facilitate the adoption of innovative instructional strategies. The institutional frame is engaged when educational authorities systematically provide contextually relevant and accessible resources. The cultural frame is activated when instructional materials embody and promote a learner-centered, skills-based educational ethos, fostering educators' shared understanding of CBC principles. Aligning resource development with these frames enables Zimbabwean authorities to support teachers at each stage of concern, thereby promoting more effective CBC implementation and improved mathematics learning outcomes.

(vi) Training on Instructional Strategies

The study's findings indicate that professional development for mathematics teachers should extend beyond foundational training to encompass a broad range of learner-centered instructional strategies. These include collaborative learning, project-based methods, and technology integration. This approach supports the effective implementation of the competency-based curriculum (CBC) and corresponds with the management and consequence stages of the Concerns-Based Adoption Model (CBAM), during which teachers seek to organize, manage, and assess new instructional practices and evaluate their impact on student learning outcomes. As teachers progress through these stages, ongoing professional development and opportunities for peer collaboration are essential for adapting to new instructional demands, refining pedagogical approaches, and building confidence in facilitating active learning. The study emphasizes that pedagogical adaptability, fostered through targeted training, is critical to addressing diverse learner needs and achieving the CBC's intended outcomes in mathematics.

This focus on professional growth and instructional flexibility is closely linked to Reimer's 5 Frame Theory, particularly the professional, cultural, and psychological frames. Providing teachers with diverse instructional techniques and cultivating a school culture that prioritizes continuous learning and innovation enables professional development initiatives to foster a collaborative and supportive environment necessary for educational transformation. The professional frame is addressed by strengthening teachers' skills and competencies, while the cultural frame is engaged through the establishment of collaborative norms and shared values centered on learner-centered pedagogy. The psychological frame is activated when teachers are encouraged to take risks, experiment with new methods, and develop a sense of ownership and efficacy in curriculum implementation. Collectively, these elements establish the institutional

conditions necessary for the CBC to transition from policy to effective, sustainable classroom practice, as demonstrated by the study's findings.

b) Monitoring and Support

To facilitate the effective implementation of the competency-based curriculum (CBC) in mathematics, Zimbabwean education authorities should conduct regular and supportive school visits. These visits should focus on fostering collaborative, reciprocal relationships with mathematics teachers rather than on a fault-finding or punitive approach. This recommendation is consistent with international studies showing that instructional supervision, when accompanied by professional support and feedback, can strengthen teachers' capacity to implement curriculum reforms effectively (Tyagi, 2010; Chepkuto et al., 2018). Constructive engagement during these visits enables education officials to gain a deeper understanding of the practical challenges teachers face when implementing CBC in mathematics classrooms. This insight allows for the identification of gaps in support, resources, and training. Additionally, regular school visits offer opportunities for real-time feedback, professional guidance, and on-site support, which help mathematics teachers address instructional and assessment challenges as they arise. A supportive monitoring approach can enhance teacher confidence and promote more effective and consistent CBC implementation.

(i) Assessment of Implementation Challenges

The study's findings highlight the necessity for education authorities to establish positive and professional relationships with mathematics teachers, as these relationships form the basis for understanding and addressing the practical challenges encountered in implementing the competency-based curriculum (CBC). This strategy aligns with the stages of concern outlined in the Concerns-Based Adoption Model (CBAM), particularly the personal, management, and

consequence stages, in which teachers may experience uncertainty regarding their roles, face difficulties with classroom management and lesson planning, and seek evidence of CBC's impact on student learning. Collaborative engagement enables authorities to identify specific concerns, such as limited learner engagement or assessment challenges, and to provide targeted, context-sensitive support. Such responsive engagement reduces teachers' anxiety and resistance, while empowering them to progress through the CBAM stages with greater confidence and competence. This process ultimately contributes to more effective and sustainable CBC implementation in mathematics classrooms.

(ii) Providing Ongoing Support

The study's findings highlight the need to establish a structured, sustainable system of ongoing support for teachers implementing the competency-based curriculum (CBC) in Zimbabwe. Participants indicated that peer mentoring, professional networks, and collaborative reflection are essential for building teacher confidence and addressing practical challenges associated with CBC implementation. These findings correspond with the Concerns-Based Adoption Model (CBAM) stages of concern, particularly the collaboration and refocusing stages, during which teachers move beyond initial personal and informational concerns to actively engage with colleagues, share best practices, and collectively seek strategies to improve curriculum delivery. The provision of formal mentoring programs and the development of communities of practice by education authorities can facilitate teachers' progression through the stages of concern, transforming apprehension and uncertainty into collaborative problem-solving and innovation. This process ultimately results in more effective and consistent implementation of CBC in mathematics classrooms.

(iii) Learner-Centered Approaches

The transition from traditional, lecture-based instruction to learner-centered, active methodologies, as promoted by competency-based curriculum (CBC), aligns with the progression through the Concerns-Based Adoption Model (CBAM) stages of concern. Initially, mathematics educators encounter awareness and informational concerns as they seek to understand the principles of CBC and how it differs from previous pedagogical approaches. As educators implement active learning strategies such as group discussions, practical tasks, and real-world problem-solving, their concerns shift to the personal and management stages, where they consider the implications for established practices and classroom management. With sustained support and accumulated experience, teachers who observe positive effects on student engagement and skill development advance to the stages of consequences, collaboration, and, ultimately, refocusing. At this point, the focus shifts to optimizing student outcomes, collaborating with colleagues to enhance instructional practices, and developing innovative approaches to integrate real-world applications into mathematics instruction. This process reflects a comprehensive adoption of the CBC philosophy and a significant transformation of classroom practice.

c) Challenges Related to CBC in Mathematics

The study's findings indicate that resource constraints, particularly the lack of curriculum-aligned materials, limited professional development, and insufficient classroom resources, present significant barriers to effective CBC implementation. This finding is consistent with studies from other countries that have similarly reported inadequate instructional resources, insufficient teacher preparation, and limited professional support as barriers to the implementation of competency-based curricula (Mwangi, 2025; Kachope et al., 2026). These challenges align with those identified in the management and consequence stages of the Concerns-Based Adoption Model (CBAM), where teachers' concerns shift from personal adaptation to the practical management of the

innovation and eventually to evaluating its effects on learners. From a CBAM perspective, persistent resource shortages may prolong teachers' management concerns, as they must devote attention to obtaining, adapting, or improvising teaching materials rather than evaluating the effects of CBC on learner outcomes. Consequently, adequate resources and professional development can create conditions that enable teachers to progress from managing the practical demands of CBC towards the consequence, collaboration, and refocusing stages. According to Reimers' 5 Frame Theory, these issues intersect the institutional and professional frames, emphasizing the importance of systemic support, resource allocation, and ongoing teacher development for successful policy implementation. Addressing resource limitations through strategic planning and sustained investment is therefore essential for empowering teachers and achieving the CBC's intended improvements in learner competency and educational quality.

(i) Scarcity of Resources

Within the framework of the hands-on, learner-centered competency-based curriculum (CBC), schools in Zimbabwe encounter significant shortages of essential resources, including mathematics teaching materials, durable classroom infrastructure, and adequate digital tools. These deficiencies have resulted in a substantial reduction in practical and experiential learning opportunities, which are integral to the CBC. Limited access to critical instructional materials, such as textbooks, manipulatives, and laboratory equipment, restricts students' capacity to apply theoretical knowledge in practical contexts and impedes the development of core competencies. To address these challenges, it is imperative that the government of Zimbabwe prioritize education in budget allocations and direct investment toward enhancing teaching resources, infrastructure, and technological support. In addition to resource constraints, teacher demotivation constitutes a major concern, as insufficient support, limited incentives, and challenging working conditions

diminish teacher engagement and undermine the effective implementation of the CBC. Addressing both resource limitations and teacher motivation is essential to achieving the curriculum's learner-centered objectives and ensuring meaningful competency development among students.

(i) Teacher Demotivation

Insufficient resources for implementing the competency-based curriculum (CBC) often result in teacher frustration and subsequent demotivation. This lack of motivation may prompt educators to revert to traditional rote teaching methods, which contradict the learner-centered approach central to CBC and ultimately diminish educational quality. In addition to resource constraints, inadequate compensation has been identified as a significant factor in the demotivation of mathematics teachers, adversely affecting their instructional performance and commitment. To mitigate these challenges, the Public Service Commission of Zimbabwe is recommended to prioritize providing appropriate incentives and recognition for teachers. These measures are expected to enhance job satisfaction, increase morale, and improve retention rates among mathematics educators. Furthermore, disparities in access to resources and support present additional obstacles to the effective implementation of CBC in mathematics. Addressing these interconnected issues is crucial to creating a supportive teaching and learning environment that upholds the curriculum's learner-centered principles and improves educational outcomes.

(ii) Equity Issues

Because of resource constraints, schools in rural areas and those with inadequate funding frequently lag behind. Fortuitously, this circumstance exacerbates existing educational disparities by denying students from disadvantaged backgrounds access to the resources they need to achieve their goals, thereby widening the gap. According to this study's findings, the government and stakeholders should disclose their investments in education.

Additionally, there is a need for increased funding for mathematics education to purchase CBC mathematical textbooks and digital tools to help schools effectively implement the curriculum. Additionally, Public-Private Partnerships (PPPs) are essential to enhancing government efforts. Through collaboration with organizations, it is possible to facilitate the donation of resources that can help bridge the gap. Additionally, it is suggested that educational institutions collaborate in mathematics. To maximize the use of available mathematical resources, local schools can pool resources and expand the number of learning opportunities available to pupils.

(iii) Sizeable Class Sizes Challenge

The study elucidated the issue of large class sizes. Overcrowded classrooms hinder individualized instruction in mathematics, a crucial component. Large class sizes diminished teacher-student engagement. Mathematics educators face challenges in providing individualized attention, which can lead to student disengagement. Furthermore, overcrowding has diminished the efficacy of group work. Collaboration becomes a hurdle in overcrowded classes. Students may encounter difficulties with active engagement.

In addition to difficulties with group activities, overcrowding may complicate evaluations. Monitoring student development is more challenging in larger courses. Mathematics instructors are unable to provide essential feedback, hindering student progress. Educational institutions must comply with the prescribed teacher-student ratio of 1:30. Education officials should consider increasing teacher-student ratios by hiring more teachers and constructing additional classrooms to mitigate overcrowding and improve the learning environment.

Mathematics educators may implement customized instructional strategies for sizable classes. Mathematics instructors may tailor classroom instruction to accommodate learners'

diverse abilities, ensuring that all students receive sufficient support. Moreover, mathematics educators can facilitate collaborative learning in large courses by promoting student-led group activities. Such collaborative activities enable students to learn from one another, even in larger courses. Mathematics teachers may use rotating shifts to enhance learner-directed group activities. Implementing rotating shifts can alleviate classroom congestion, reduce class sizes, and enhance instructional focus.

(iv) Assessment Difficulties

The study noted that a substantial number of mathematics teachers have difficulty implementing competency-based and formative assessments. Thus, unreliable assessment is detrimental to the quality of education. Without proper education in assessment techniques, mathematics teachers appear to struggle to assess students appropriately, resulting in unreliable and inconsistent competency evaluations. This disparity erodes the integrity of the CBC in Mathematics. Some mathematics teachers place an extreme focus on examinations. Thus, some Mathematics teachers seem to revert to conventional testing methods that emphasize rote memorization rather than competency development when sufficient training is lacking. This shift seems to undermine the CBC's continuous assessment paradigm. Furthermore, poor assessment procedures fail to identify and support struggling students, resulting in learning gaps and inhibiting their overall academic success.

It is inherently important for authorities to engage mathematics teachers in intensive courses focused on formative assessment approaches, such as portfolios, rubrics, and observational assessments. These courses provide mathematics teachers with the abilities they need to assess competencies effectively. In addition, embracing digital assessment technology is important.

Implementing e-assessment platforms simplifies tracking learner progress, enabling mathematics teachers to monitor and promote individual student development more efficiently.

In addition to training programs, the MoPSE in Zimbabwe can also embark on mentoring programs. Thus, pairing seasoned CBC mathematics educators with those less experienced with the curriculum can provide helpful coaching on effective assessment techniques, fostering a culture of ongoing improvement in teaching methods. Secondary schools can improve the implementation of the competency-based curriculum and, as a result, achieve better educational results for all students by tackling these issues through targeted initiatives.

d) Effects of Mitigation Techniques (Research Question 4)

The successful implementation of the competency-based curriculum (CBC) in mathematics education requires a comprehensive, strategic plan that addresses the complex challenges educators and educational institutions face. This plan should account for teacher preparedness, resource availability, learner engagement, and the broader educational infrastructure. This emphasis is supported by international studies, which have identified teacher professional development, adequate resources, institutional support, and context-responsive implementation strategies as important conditions for successful CBC implementation across countries such as Kenya, Rwanda, Tanzania, and Uganda (Mwangi & Barasa, 2025; Rarieya et al., 2026). From the perspective of the Concerns-Based Adoption Model (CBAM), these strategies should address teachers' concerns at different stages of curriculum adoption, progressing from addressing informational and personal concerns to supporting management, consequences, collaboration, and refocusing. Similarly, Reimers' 5 Frame Theory emphasizes the need to address the professional, institutional, cultural, and psychological dimensions that influence curriculum implementation. The following analysis examines key mitigation strategies and their potential

implications, demonstrating how these interventions can support teachers, improve classroom practice, and enhance the effectiveness and sustainability of CBC implementation.

(i) Pre-service and In-service training of Teachers

The need for expedited pre-service and in-service teacher training programs focused on CBC in mathematics must be addressed. To cultivate a student-centered learning environment, it is vital to provide mathematics instructors with the resources they need to implement the CBC effectively. The ability to implement innovative instructional methods aligned with CBC principles is more readily available to educators with adequate training. Additionally, training improves the quality of instruction for students. Comprehensive training programs can significantly enhance mathematics instructors' understanding of CBC, ultimately leading to more effective instructional strategies. Consequently, this can lead to increased student participation and improved mathematical learning outcomes.

Additionally, training helps teachers build greater self-confidence. When mathematics teachers feel confident in their ability to deliver the curriculum, they are more likely to adopt creative teaching strategies and encourage student engagement. This sense of self-assurance helps create a livelier classroom environment, which is also beneficial for students. In addition, training stimulates continuous professional development. Continuing education ensures that mathematics educators stay up to date on the latest educational practices and technological advancements, thereby fostering a learning environment that values lifelong learning within the teaching profession. Given that knowledge is constantly evolving, mathematics educators need to engage in ongoing research and study to stay abreast of the latest developments in mathematics education and instruction.

(ii) Collaboration with Stakeholders

This study highlighted the significance of teamwork. Collaboration with stakeholders, including parents, is essential for the successful implementation of CBC. The efficacy of the competency-based curriculum (CBC) in mathematics depends on several interrelated factors. For instance, examine the crucial functions of NGOs and educational experts. Their cooperative assistance is essential for obtaining resources and effectively implementing CBC. Stakeholder participation might provide enhanced financing for schools, enabling the procurement of essential instructional materials and the technology that supports CBC methodologies. Moreover, engaging community members and parents helps cultivate a sense of educational ownership and accountability. This frequently enhances student motivation due to families' heightened involvement in their children's education.

Furthermore, mathematics education specialists can offer essential help. Confronting structural difficulties, such as excessive teacher workload, is crucial for preserving quality. Policy modifications aimed at alleviating this excessive workload can significantly enhance worker satisfaction, potentially improving teacher retention. When mathematics educators experience reduced stress, they may often allocate greater effort towards effective instruction. Systemic adjustments may provide a more streamlined curriculum, consistent with CBC principles, enabling mathematics instructors to address essential topics without undue haste. This ideally cultivates a more supportive atmosphere for both educators and students, promoting a culture of collaboration and ongoing enhancement within educational institutions.

(iii) **Teacher Preparedness**

The success and sustainability of the competency-based curriculum (CBC) in mathematics education depend on several critical factors, including teacher preparedness and continuous evaluation of the curriculum’s practical applicability. A well-trained and competent teaching

workforce is essential for effective curriculum delivery and the attainment of intended learning outcomes. Additionally, establishing a structured feedback mechanism enables teachers to communicate challenges, share insights, and recommend adjustments. This system ensures that the curriculum remains responsive to the evolving needs of mathematics educators and supports ongoing improvement in teaching and learning practices.

Ongoing research is essential for monitoring the effectiveness of CBC in improving students' mathematical competencies. Empirical evidence from such research can guide curriculum revisions, inform pedagogical strategies, and shape policy decisions, ensuring that mathematics education remains aligned with current, effective instructional approaches. These considerations highlight the importance of adopting a holistic and integrated approach to CBC implementation in mathematics. Prioritizing teacher professional development, fostering stakeholder collaboration, and enacting supportive policy reforms enable educational institutions to promote student achievement and ensure the long-term success of the curriculum.

COMPARATIVE ANALYSIS WITH EXISTING LITERATURE

The findings of this study are broadly consistent with and extend the international literature on curriculum reform and educational change. The comparison indicates that several challenges identified in this study—teacher responses to change, policy–practice gaps, assessment pressures, and inadequate resources—are not unique to the Zimbabwean context. However, the present study contributes context-specific evidence by demonstrating how these challenges interact within the implementation of the competency-based curriculum (CBC) in Mathematics, particularly in a

context characterized by rural–urban differences, resource constraints, and substantial demands placed on teachers. The comparison is presented in Table 5.1.

Table 5.1

Findings vs global studies

Study	Key Similarity with the Study	Contribution of the Study
Fullan (2015)	Teacher resistance and varying responses to educational change	Identified teacher sentiment as an important mediating factor shaping teachers' responses to CBC implementation
Levin (2008)	Existence of policy–practice gaps during educational reform	Demonstrated how rural–urban disparities influence the translation of curriculum policy into classroom practice
OECD (2018)	Assessment-related challenges and pressures experienced by teachers	Connected assessment pressures with teacher stress and reported experiences of burnout
UNESCO (2020)	Inadequate teaching and learning resources constrain curriculum implementation	Provided empirical evidence of the extent to which teachers rely on improvisation to compensate for resource shortages

Fullan (2015) provides an important basis for understanding teachers' responses to educational change, particularly how the implementation of reform can generate resistance, uncertainty, and varying levels of commitment among educators. The present study supports this general observation and extends it by demonstrating that teachers' sentiments and emotional responses to CBC can mediate their engagement with the reform. In this study, teachers' responses were not simply a matter of accepting or resisting curriculum change; they were also influenced by their experiences of preparedness, workload, resources, assessment demands, and perceived support. This suggests that teachers' emotional and attitudinal responses should be considered

alongside technical training when examining curriculum implementation. The study, therefore, adds a contextual dimension to the literature by showing how teacher sentiment can interact with practical implementation conditions in mathematics education.

The findings also correspond with Levin's (2008) discussion of the gap that can emerge between curriculum policy and its implementation in schools. Although curriculum reforms may be clearly articulated at the policy level, their translation into classroom practice is influenced by the conditions in which teachers work. The present study advances this understanding by highlighting rural–urban disparities in the implementation of CBC. Differences in access to teaching resources, infrastructure, professional support, and other institutional conditions can affect teachers' capacity to enact the curriculum as intended. Consequently, the findings suggest that implementing a common national curriculum does not necessarily yield uniform classroom experiences. Instead, the practical enactment of curriculum policy is mediated by local school contexts.

The findings further resonate with the OECD (2018), which identifies assessment as an important source of pressure within contemporary education systems. In the present study, assessment emerged not merely as a technical component of CBC implementation but as a factor contributing to teachers' workload and stress. The study, therefore, extends the assessment literature by drawing attention to the relationship between assessment requirements and teachers' well-being. Where teachers are expected to implement continuous assessment, document learner progress, and satisfy accountability requirements while simultaneously adapting to competency-based approaches, assessment can become an additional implementation burden. The findings thus indicate that assessment reform needs to be considered alongside teacher capacity, workload, and institutional support, rather than as an isolated component of curriculum reform.

The findings are similarly consistent with UNESCO (2020), which highlights resource constraints as a major challenge to educational quality, particularly in low-resource contexts. The present study provides a more specific account of how such shortages affect the everyday work of Mathematics teachers. In circumstances where appropriate textbooks, teaching aids, technological resources, or other instructional materials are unavailable, teachers may be required to improvise to maintain classroom activities. While teacher improvisation demonstrates adaptability and professional resourcefulness, the findings indicate that sustained reliance on improvisation can also increase teachers' workload and make implementation more demanding. The contribution of this study is therefore not simply to confirm the existence of resource shortages, but to demonstrate their practical consequences for the day-to-day enactment of CBC in mathematics classrooms.

An important contribution of the present study is that it brings these factors together rather than treating them as independent barriers. The findings suggest that teacher preparedness, resource availability, assessment demands, teacher sentiment, workload, and school context are interconnected dimensions of CBC implementation. For example, inadequate resources may increase teachers' workload through improvisation; increased workload may contribute to negative sentiments towards the reform; and assessment demands may further intensify these pressures. Similarly, differences between rural and urban schools may influence both the resources available to teachers and the extent to which they can access professional support. This interconnectedness provides a more comprehensive explanation of why implementing the same curriculum reform can yield different experiences across schools.

Overall, the comparison demonstrates that the study both confirms and extends existing international scholarship. It confirms that curriculum reform commonly encounters challenges associated with teacher responses, policy–practice gaps, assessment, and resources. However, it

extends previous literature by providing empirical evidence from the Zimbabwean Mathematics education context and by showing how these challenges interact at the classroom level. In particular, the study contributes to knowledge by foregrounding the role of teacher sentiment, rural–urban contextual differences, assessment-related pressures, and the burden of instructional improvisation within CBC implementation. These findings are significant because they indicate that successful curriculum reform requires more than policy formulation; it also requires sustained teacher preparation, adequate resources, context-sensitive support, manageable assessment expectations, and attention to teachers' experiences of the reform.

LIMITATIONS OF THE STUDY

Research can include errors or constraints that can affect how results are understood or how broadly the findings can be applied. These are known as limitations. These restrictions may result from several factors, such as methodological decisions, practical limitations, or constraints in the study design. Although this study offers vital insights into the implementation of a competency-based curriculum (CBC) in mathematics education, it is necessary to acknowledge several significant limitations to appropriately contextualize the findings. The limitations discussed here can be broken down into six distinct categories: geographical and contextual limitations; temporal and developmental limitations; sampling and demographic limitations; methodological limitations; analytical limitations; and generalizability limitations. Following is an explanation of each category.

Geographical and Contextual Limitations

The data for this study were collected exclusively in Manicaland, one of Zimbabwe's ten provinces. This geographical limitation may restrict the extent to which the findings reflect

challenges or experiences present in other regions of the country. For instance, urban schools may encounter issues such as overcrowded classrooms or greater access to technology, whereas rural schools may face constraints related to resources, infrastructure, or teacher availability. These regional differences can affect the relevance of the findings across Zimbabwe's varied educational contexts. Additionally, the results are most applicable to the current national education policy, teacher preparation structures, and the cultural and socioeconomic conditions that characterize mathematics instruction in Manicaland. Therefore, the context-specific nature of the findings limits their generalizability to other countries or educational systems with differing policies, infrastructure, and sociocultural factors, underscoring the importance of careful interpretation when applying these results beyond the studied region.

Temporal and Developmental Constraints

This study was conducted during the sixth year of competency-based curriculum (CBC) implementation, focusing on challenges associated with early adoption rather than mature or fully institutionalized practices. Given this timing, the study is constrained in its ability to evaluate the long-term effects of CBC on student learning trajectories, teacher adaptation, and the broader institutionalization of curriculum practices. The findings may also reflect the influence of ongoing CBC revisions and adjustments during the study period, as well as disruptions resulting from the COVID-19 pandemic, which affected both teaching and learning environments. The evolving nature of educational reforms, along with changes in resource allocation and policy, further complicates the interpretation of results. Therefore, while the study offers valuable insights into early implementation challenges, caution is warranted when generalizing these findings to predict long-term outcomes or trends.

Sampling and Demographic Limitations

The study sample showed a significant underrepresentation of private educational institutions, which accounted for only 5% of participants. In addition, the research did not include special needs educational settings, even though the experiences of mathematics teachers and learners in these environments are essential to a comprehensive understanding of the competency-based curriculum (CBC). This omission restricts the ability to identify challenges and necessary adaptations for implementing CBC in inclusive or specialized contexts.

The mathematics teacher sample was also predominantly composed of mid-career professionals with 10 to 15 years of experience, mainly from government schools in urban or suburban areas. This homogeneity among participants may have limited the diversity of perspectives and contextual challenges captured, thereby constraining the breadth and generalizability of the study's findings across Zimbabwe's full range of educational settings. The final sample composition was reviewed and confirmed for institution type, teacher experience, and school setting. However, the uneven distribution of participants across these categories remains an important limitation, as it may have influenced the range of perspectives represented in the findings.

RECOMMENDATIONS

Research recommendations are essential for bridging the gap between academic findings and their practical application in real-world contexts. They serve both as interpretive tools for study results and as guides for policymakers, practitioners, and future researchers in implementing evidence-based strategies. By providing actionable insights, these suggestions ensure that research extends beyond theoretical knowledge and directly addresses tangible problems. Additionally,

well-formulated recommendations enhance a study's credibility and relevance by demonstrating the researcher's capacity to translate empirical findings into practical measures that address existing challenges or improve current conditions. In education, research recommendations are particularly valuable for shaping curriculum design, teaching practices, and policy interventions.

This study examines the challenges mathematics teachers face in implementing the competency-based curriculum (CBC). Through a comprehensive analysis, six categories of evidence-based recommendations were developed to inform improvements in curriculum design, instructional practice, and policy implementation. These recommendations are interpreted using the Concerns-Based Adoption Model (CBAM), which elucidates teachers' stages of concern and levels of use during curriculum reform. Additionally, Reimer's five-frame theory of educational innovation and capacity building offers a broader policy perspective on how systemic support, professional development, and equitable resource allocation influence successful curriculum implementation. These frameworks connect the study's findings to both practical classroom challenges and broader structural factors influencing CBC implementation, thereby enhancing the relevance of the recommendations for improving teacher support and student learning outcomes.

1. **Establish Comprehensive Teacher Capacity-Building Programs**

Finding: The study found that mathematics educators experienced gaps in their understanding of the competency-based curriculum (CBC), particularly regarding the interpretation of competencies, the selection of appropriate teaching strategies, the assessment of competencies, and the translation of CBC principles into classroom practice.

Recommendation: The Ministry of Primary and Secondary Education (MoPSE), in collaboration with teacher-training institutions and curriculum specialists, should establish a structured National CBC Mathematics Capacity-Building Program. The program should provide compulsory

induction training for teachers who have not received adequate CBC preparation, as well as continuous professional development for practicing mathematics educators. Training should focus on competency-based lesson planning, learner-centered mathematics teaching, formative and authentic assessment, differentiation, project-based learning, and integrating practical activities into mathematics instruction.

The program should be implemented through a cascade model, beginning with national and provincial trainers who subsequently train district-based and school-based teacher teams. Each mathematics teacher should complete a specified number of CBC professional development sessions annually. Training effectiveness should be measured through pre- and post-training competency assessments, classroom observations, and teacher portfolios. A target of at least 80% of participating teachers demonstrating improved scores between pre- and post-training assessments could serve as an initial indicator of effectiveness. From the perspective of CBAM, this intervention addresses teachers' Awareness, Informational, and Personal concerns by reducing uncertainty about what CBC requires and how to implement it. It also creates a pathway towards higher levels of implementation by equipping teachers with practical knowledge and skills.

2. Strengthen and Equitably Allocate Instructional Resources

Finding: The study found that inadequate instructional resources, technological facilities, and other material conditions constrained teachers' ability to implement CBC mathematics effectively.

Recommendation: MoPSE should undertake an annual CBC Mathematics Resource Needs Assessment covering all schools. The assessment should identify shortages in textbooks, mathematical manipulatives, ICT equipment, internet connectivity, laboratory/workshop facilities where relevant, and other materials required for competency-based mathematics teaching. Based on the assessment, the Ministry should introduce a targeted resource allocation formula that

prioritizes schools with the greatest shortages, particularly disadvantaged and rural schools. Rather than distributing resources uniformly, funding should be linked to documented need. A minimum resource package for CBC Mathematics should be developed, and schools should be assessed annually against this standard.

3. Strengthen Stakeholder Engagement in CBC Mathematics

Finding: The study found that effective CBC implementation requires greater cooperation among schools, parents, communities, education authorities, and other stakeholders, particularly in addressing resource and implementation challenges.

Recommendation: Schools should establish formal CBC Mathematics stakeholder engagement structures that involve parents, school development committees, local communities, NGOs, education professionals, and relevant private-sector organizations. Each school should develop an annual stakeholder engagement plan that identifies the resources, expertise, or forms of support required for the implementation of CBC mathematics. Each school should conduct at least two stakeholder engagement meetings per year, with documented minutes, identified needs, agreed actions, and follow-up responsibilities. Schools should also maintain records of resources, expertise, or other forms of support mobilized through these partnerships. This recommendation should not treat stakeholder participation merely as fundraising. Stakeholders should also contribute through mathematics-related mentorship, career guidance, practical projects, community-based learning opportunities, and access to relevant expertise.

4. Review Workload, Curriculum Content, and Implementation Requirements

Finding: The study found that teachers experienced implementation challenges related to workload, curriculum demands, and the amount of content required to be covered within available instructional time.

Recommendation: MoPSE should undertake a systematic audit of workload and curriculum load for mathematics teachers. The audit should examine the number of curriculum competencies, available instructional periods, assessment requirements, administrative responsibilities, class sizes, and the preparation demands placed on teachers. The findings should be used to identify areas where curriculum content, assessment requirements, or administrative responsibilities can be streamlined. The Ministry should pilot any proposed changes in selected districts before national implementation.

The review should produce measurable indicators, including teacher instructional workload, available teaching time per competency, assessment load, and proportion of curriculum content realistically covered within the allocated instructional period. The results should be reviewed annually to determine whether identified workload constraints are declining. This recommendation is directly responsive to the finding rather than assuming that additional teacher training alone can resolve implementation difficulties.

5. Establish a Continuous CBC Mathematics Monitoring and Evaluation System

Finding: The study found that CBC implementation requires continuous monitoring, feedback, and support to identify implementation gaps and ensure that curriculum intentions are translated into classroom practice.

Recommendation: MoPSE should establish a standardized CBC Mathematics Monitoring and Evaluation Framework covering teacher preparedness, classroom implementation, resource availability, assessment practices, learner participation, and learner outcomes. District School Inspectors and other responsible officials should conduct structured monitoring visits using a standard observation instrument at least once per term or in accordance with an agreed national schedule. Monitoring should focus not only on compliance but also on identifying specific areas

where teachers require support. Schools should receive written feedback after each monitoring exercise that specifies identified strengths, implementation gaps, recommended actions, responsible persons, and timelines. Progress should subsequently be reviewed.

The key indicators should include the percentage of teachers demonstrating the required CBC mathematics practices, the percentage of schools meeting the established minimum resource standards, teacher participation and completion rates in professional development programs, the frequency of CBC Mathematics monitoring visits conducted by education officials, the percentage of identified implementation gaps addressed within the specified timeframe, and changes in learner participation and mathematics achievement indicators. Monitoring these indicators systematically would provide evidence of the extent to which CBC is being implemented as intended and whether identified challenges are being addressed over time. This approach would create a direct feedback loop between policy, classroom implementation, monitoring, and continuous improvement, consistent with the CBAM focus on Consequence and Refocusing concerns.

6. Establish School-Based and Inter-School Resource-Sharing Networks

Finding: The study found that resource limitations affected teachers' implementation of CBC and that teachers could benefit from greater collaboration and sharing of instructional materials and practices.

Recommendation: Each district should establish CBC Mathematics Professional Learning Networks (PLNs) comprising teachers from neighboring schools. These networks should meet at least once every month to share lesson plans, teaching materials, assessment strategies, and solutions to common implementation challenges. Schools should also establish shared resource inventories indicating materials and equipment available for temporary use by neighboring schools. Each PLN should maintain a record of network meetings and resources shared.

A practical target would be for each district to hold an average of three CBC mathematics professional learning meetings per term, with participating teachers producing or sharing at least one instructional resource or teaching strategy during each meeting. This would provide measurable evidence that collaboration is occurring rather than merely being recommended. Within CBAM, such networks support movement towards Collaboration and Refocusing by encouraging teachers to work collectively, exchange experiences, and refine their implementation practices.

Long-Term Research Initiatives

Furthermore, government agencies and educational institutions should prioritize long-term research initiatives to evaluate the effectiveness of the competency-based curriculum (CBC) in enhancing students' mathematical competence. Longitudinal studies enable a comprehensive assessment of how CBC affects students' learning trajectories, skill acquisition, and overall academic achievement. The evidence generated from these studies can inform future policy decisions, curriculum modifications, and instructional strategies, ensuring that educational reforms are grounded in empirical data rather than untested assumptions.

Additionally, schools should collaborate with universities, research institutes, and other academic organizations when conducting studies on the implementation of CBC. These partnerships can improve the quality, rigor, and credibility of research, while also providing access to specialized expertise, advanced methodologies, and analytical resources. Through such collaborations, educational institutions can generate robust findings that accurately reflect the impact of CBC on mathematics education, thereby supporting more informed decision-making and ongoing enhancements to teaching and learning practices.

Suggestions for Future Research

The findings of this study reveal several significant gaps in the implementation of the competency-based curriculum (CBC) in mathematics, highlighting the need for further academic investigation. Drawing on the theoretical frameworks discussed in Chapter 2, particularly the Concern-Based Adoption Model, which addresses stages of adoption and teacher readiness, and Darling-Hammond's professional development model, which focuses on continuous capacity building, multiple avenues for future research are identified to strengthen CBC implementation and inform broader educational reform.

First, research on teachers' pedagogical readiness for CBC in mathematics is essential to determine the extent to which educators possess the knowledge, skills, and confidence necessary to implement learner-centered teaching practices effectively. Insights into this readiness can inform the design of targeted professional development programs that equip teachers with the requisite tools for successful curriculum delivery.

Second, investigating learner-centered approaches in CBC mathematics classrooms can yield insights into the ways student engagement, critical thinking, and active participation are fostered. Such research can identify instructional strategies that promote deeper learning and ensure meaningful application of CBC principles in practice.

Third, exploring assessment practices within CBC mathematics is critical because assessment drives learning and informs instructional decisions. Research in this area can examine the design, implementation, and alignment of formative and summative assessments with competency-based objectives, ensuring accurate measurement of student learning outcomes and higher-order thinking skills.

Fourth, examining resource availability in relation to CBC implementation in mathematics is necessary to determine the extent to which schools possess adequate instructional materials,

technology, and infrastructure. This line of inquiry can identify resource gaps, inform equitable allocation, and guide policy development to support under-resourced schools.

Fifth, studying stakeholder perceptions and support for CBC in mathematics, including those of parents, educators, administrators, and policymakers, can reveal social and institutional factors that facilitate or hinder curriculum adoption. Understanding these perspectives can inform strategies for community engagement, advocacy, and collaborative decision-making.

Sixth, conducting comparative studies of CBC implementation across diverse contexts can illuminate variations in adoption, challenges, and outcomes between urban and rural schools, as well as among schools with differing levels of resources and teacher preparedness. Such studies can identify best practices and contextual adaptations necessary for successful implementation.

Finally, investigating the longitudinal impact of CBC on students' mathematical competencies is essential for assessing how competency-based approaches influence learning trajectories over time. Long-term studies can provide evidence regarding the effectiveness of CBC in enhancing mathematical skills, critical thinking, problem-solving, and readiness for real-world challenges. Collectively, research in these areas can deepen understanding of the challenges and opportunities associated with CBC in mathematics. Such investigations would contribute to evidence-based policy formulation, enhance curriculum design, and support teacher professional development, ultimately ensuring that CBC implementation achieves its goal of fostering meaningful, competency-based learning outcomes for all students.

CHAPTER SUMMARY

This study rigorously examined mathematics educators' apprehensions about implementing a competency-based curriculum (CBC) in mathematics instruction, focusing on a

principal research issue and four subsidiary questions. The results offer essential insights that enhance both theoretical comprehension and practical advancements in CBC implementation. This extensive study employed a new mixed-methods research approach to rigorously examine the many problems mathematics instructors experience in implementing the CBC. The study, utilizing quantitative surveys (n=450), regression analysis, and comprehensive qualitative thematic coding of interview material (n=85), has produced significant insights into the systemic obstacles and possible facilitators for effective CBC implementation in mathematics education.

The findings provide a persuasive account of the status of CBC implementation and outline a path for significant educational reform. This chapter consolidates the data to address the principal inquiries: What are the apprehensions of mathematics educators regarding the execution of the competency-based curriculum (CBC) in Mathematics? Upon identifying and analyzing these gaps, the chapter delineated their ramifications and presented pragmatic solutions for educational institutions and the government. The proposals were synthesized into an improved future model for mathematics teachers' execution of CBC in Zimbabwe, integrating specific enhancements to pedagogical techniques. This research has successfully outlined practical ideas to enhance the current implementation of the CBC in teaching.

Nonetheless, significant transformation, especially in perspectives and dedication, requires time, as individuals often resist leaving their comfort zones to embrace new methodologies. Given the insights and facts provided, it is essential that all stakeholders in Zimbabwe's education sector carefully evaluate and implement the recommended improvements. An enhanced mathematics implementation system will not only advance teacher training, attitudes, and the implementation of the CBC but also facilitate broader educational and national progress. This research offers a cautionary account of implementation challenges while presenting an inspirational vision for the

future of mathematics education as global education systems strive to equip pupils for a progressively quantitative, data-centric environment. The current issue is to galvanize political will, professional skill, and community involvement necessary to actualize this goal.

This study provides compelling evidence that, while the transition to competency-based mathematics education presents significant challenges, it also offers tremendous opportunities to transform mathematics teaching and learning. The findings indicate that the effective implementation of the competency-based curriculum (CBC) relies on several critical factors. Comprehensive support for teachers through targeted professional development is required to ensure they possess the skills and instructional strategies they need. Additionally, systemic alignment of policies, practices, and assessments is needed to maintain consistency and coherence throughout the education system. Sustainable resourcing is also essential to provide adequate materials, technology, and infrastructure for CBC implementation. Furthermore, collaborative engagement among all stakeholders, including educators, parents, policymakers, and the broader community, is vital for creating a supportive environment and promoting collective responsibility for the curriculum's success.

When the necessary conditions are met, the competency-based curriculum (CBC) can substantially enhance mathematics education. By connecting mathematical concepts to real-life contexts, the CBC increases the subject’s relevance and makes lessons more meaningful for students. Furthermore, the CBC promotes mathematical competence by facilitating active engagement, practice, and mastery of essential concepts. The curriculum also supports the development of higher-order thinking skills, encouraging learners to analyze, evaluate, and apply knowledge rather than rely solely on memorization. Ultimately, the CBC prepares students for

real-world problem-solving by equipping them with critical thinking, creativity, and practical skills required to address complex challenges within and beyond the classroom.

The study indicates that although implementing CBC effectively in mathematics is intricate, it is both essential and attainable with ongoing dedication from all educational partners. The findings offer a framework for enhancing CBC implementation that may guide policy choices and professional practices throughout the school sector. The effective implementation of the CBC in mathematics education depends on a collaborative effort to address recognized problems and capitalize on its potential for improvement. By cultivating a culture of cooperation, ongoing education, and strategic resource distribution, Zimbabwe can provide a transformative educational experience that equips students with the skills for success in the 21st century.

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APPENDICES

ZVISINEYI KANDODO

DATA COLLECTION TOOLS

TOOL 1: INTERVIEWS

My name is Zvisineyi Kandodo, a doctoral student at Unicaf University in Malawi. I am conducting research on Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe. This topic is relevant and important as the study will analyze mathematics teachers' concerns on the implementation of the Competence Based Curriculum (CBC) in Mathematics in Zimbabwe. Competence-based curriculum (CBC) is being implemented for the first time in the Zimbabwean educational system. It is crucial to assess the implementation itself to have a clear picture of what CBC is all about. Thus, the rationale for carrying out this study is enhanced by the need to have informed decisions pertaining to the evaluation of CBC.

Attestation

'I have read the foregoing information about this study. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions, and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without negative consequences. I consent to the use of multimedia (e.g. audio recordings, video recordings) for the purposes of my participation in this study. I understand that my data will remain anonymous and confidential unless stated otherwise. I consent voluntarily to be a participant in this study." ☐

PART A: Interview Questions for Mathematics Teachers Only

Introduction:

This interview aims to understand your experience and perception of CBC implementation in Mathematics as a teacher. Your honest responses will be used to improve the implementation of CBC.

Instructions:

Please answer all questions to the best of your ability. Your responses will be kept confidential.

Demographic Information:

Gender

Male	Female	Other

Age:

below 25yrs	26-30	31-35	36-40	41-45	46-50	51-55	56-60

Teaching Experience

below 5yrs	5-10	11-15	16-20	21-25	26-30	31and above

1. How do you teach mathematics in your classroom?

2. How do you understand the term Competency-based Curriculum (CBC)?

3. Is CBC being implemented in Mathematics at your school and in your classroom. How is it being implemented?

4. What challenges have you faced when you teach mathematics implementing the competency-based curriculum?

5. What strategies can be used to improve how your school implements the competency-based curriculum?

6. How can be the challenges you mentioned earlier be controlled?

PART B : Interview Questions for Administrators Only

Introduction:

This interview aims to understand your experience and perception of CBC implementation in Mathematics as an administrator. Your honest responses will be used to improve the implementation of CBC.

Instructions:

Please answer all questions to the best of your ability. Your responses will be kept confidential.

Demographic Information:

Gender

Male	Female	Other

Age:

below 25yrs	26-30	31-35	36-40	41-45	46-50	51-55	56-60

Administration Experience

below 5yrs	5-10	11-15	16-20	21-25	26-30	31and above

1. Is CBC being implemented at your school. How long have you been assessing and monitoring the implementation of (CBC)?

2. To what extent has the district/school successfully incorporated the competency-based curriculum (CBC)?

3. What are the principal challenges that educators and administrators encounter when monitoring and assessing teachers on the implementation of the CBC in Mathematics

4. What tools and assistance are required for the successful implementation of CBC?

ZVISINEYI KANDODO

DATA COLLECTION TOOLS

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TOOL 2: Questionnaire for Mathematics Teachers

Introduction:

This questionnaire aims to understand your experience and perception of CBC implementation in Mathematics. Your honest responses will be used to improve the implementation of CBC.

Instructions:

Please answer all questions to the best of your ability. Your responses will be kept confidential.

Demographic Information:

Tick the appropriate box.

Gender

Male	Female	Other

Age:

below 25yrs	26-30	31-35	36-40	41-45	46-50	51-55	56-60

Teaching Experience

below 5yrs	5-10	11-15	16-20	21-25	26-30	31and above

1. Knowledge about CBC

Tick your chosen response.

a) How familiar are you with the concept of competency based curriculum in mathematics?

Very Familiar 5	Familiar 4	Neutral 3	Unfamiliar 2	Very Unfamiliar 1

b) The following table has some statements with regards to knowledge about CBC. What is your opinion about the statements below. Tick your chosen response.

Statements on knowledge about CBC	**Strongly Agree 5**	**Agree 4**	**Undecided 3**	**Disagree 2**	**Strongly disagree 1**
Competencies are individual qualities (a person's mental or physical attributes).					
Competencies are "behaviour pieces" that involve skills to perform activities.					
Competencies are behaviour outcomes.					
The knowledge about the competency based curriculum is critical in planning teaching of Mathematics.					
Competency Based Curriculum involves the use of learner centred teaching approaches.					

2. Professional Development and Assistance for Mathematics Teachers

Please indicate by putting an x to show how frequently you received each of the following support for this CBC cycle					
	Did not receive	more than once per term	At least once per term	less than once per term	At least once per month

In-service training was offered to augment the teaching and learning of mathematics using the competency based approach					
Lesson observation and feedback by a colleague					
Attending a workshop on CBC in Mathematics					
Observing demonstration lesson in Mathematics at my school					
Meeting one-on-one to discuss my teaching of Mathematics with the administrator					
Lesson observation on my teaching of Mathematics by the team from the district or province					

3. Professional Development Focus and Time management in teaching of Mathematics

a) To what extent do you agree with the following statements regarding time management with regards to the implementation of CBC? Tick the corresponding box.

	Strongly Agree 5	**Agree 4**	**Undecided 3**	**Disagree 2**	**Strongly disagree 1**
In terms of how I spend my time in teaching Mathematics, not much has changed.					
My changes in time management have required me to spend more time in the classroom because of the introduction of CBC.					
Attending a workshop on CBC in Mathematics					

My new time management technique requires me to dedicate more time on assessment of tasks.					
My perspective on time has changed, allowing me to be more flexible in how I use it during my teaching of Mathematics.					
My timetable is now compressed leaving no room for flexibility.					
Developing performance assessment is time consuming					

b) **Satisfaction with Career Advancement**					
	Very pleased	**Pleased**	**Neutral**	**Displeased**	**Very displeased**
In general, how pleased are you with the guidance and professional growth you've gotten this CBC cycle					

4. Mathematics Teachers' concerns pertaining to the implementation of CBC

What are your concerns regarding the implementation of CBC in Mathematics? Tick the appropriate box.

Concerns	**Strongly Agree 5**	**Agree 4**	**Undecided 3**	**Disagree 2**	**Strongly disagree 1**
Lack of infrastructure and resources					
Insufficient professional development and training					
Challenges in measuring competencies					
Big class enrolment					
Uniformity and standardization					

Parental support and involvement					
Time limits					
An excessive amount of content					

5. Challenges on the implementation of CBC

What is the challenge you face when applying competence based approach in the teaching and learning of Mathematics? Rank the following challenges in the implementation of CBC in Mathematics from 1-5 according to your priority, 1 being the least and 5 being the highest. Indicate by putting a tick. Each rank should represent one challenge.

Challenges	1	2	3	4	5
High teacher student ratio					
Inadequate Teaching and learning materials					
The know how about the competency based approach in the teaching and learning mathematics					
Lack of proper classroom facilities					
Lack of ICT tools such as computers, laptops, ipads, smart phones etc					

6. Mitigation of Challenges on the implementation of CBC

What are the mitigation measures you suggest for the smooth implementation of CBC in Zimbabwe? Rank the following mitigating measures in the implementation of CBC in Mathematics from 1-7 according to your priority, 1 being the least and 7 being the highest. Indicate by putting a tick. Each rank should represent one mitigation measure.

Mitigation measure	1	2	3	4	5	6	7
Prioritising teacher training and support							
Availing curriculum resources							
Embracing technology							
Infrastructure development							
Vibrant Stakeholder engagement							

Developing authentic Assessment Tools							
Considering more funding to Education							

ZVISINEYI KANDODO

DATA COLLECTION TOOLS

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TOOL 3: Focus Group Discussion Questions for mathematics teachers (Duration 1 hour)

1. How do you perceive the new competency-based curriculum in Mathematics?

2. How do you implement the new competency-based curriculum in Mathematics?

3. What concerns do you have for the implementation of the competence-based curriculum in Mathematics? What major challenges did you encounter while putting the competence-based curriculum in Mathematics into practice?

4. Which materials or equipment would you think would be most useful for putting the competency-based mathematics program into practice?

5. How may the competence-based curriculum in Mathematics be improved in terms of design and development?

ALIGNMENT OF RESEARCH OBJECTIVES, RESEARCH QUESTIONS, INSTRUMENTS AND DATA ANALYSIS

The tables below align the four stated research objectives and research questions with the questionnaire sections, interview questions and focus group discussion (FGD) questions in the data collection tools. The alignment follows the instruments contained in the thesis and separates quantitative statistical analysis from qualitative thematic analysis.

Table 1. Alignment of Research Objectives, Research Questions, Questionnaire Sections and Statistical Analysis

Research Objective	Research Question	Questionnaire Section(s)	Statistical Analysis
Objective 1: To find out the level of understanding of mathematics teachers about CBC.	RQ1: To what extent do mathematics teachers understand competency-based curriculum?	Questionnaire: (a) Knowledge about CBC; (b) Statements on knowledge; (c) Professional Development and Assistance; (d) Professional Development Focus and Time Management; (e) Satisfaction with Career Advancement.	Frequencies and percentages for categorical responses; means and standard deviations for Likert-scale items. Where items form a defensible scale, a composite score may be calculated after checking internal consistency.
Objective 2: To analyze the extent to which mathematics teachers are implementing CBC in Mathematics.	RQ2: To what extent do mathematics teachers implement a competency-based curriculum?	Questionnaire: sections addressing implementation-related practice, including (c) Professional Development and Assistance and (d) Professional Development Focus and Time Management, together with relevant implementation items in the knowledge/implementation instrument.	Frequencies, percentages, means and standard deviations. Results may be presented by individual implementation indicators and, where justified, by a composite implementation measure.
Objective 3: To find out the challenges encountered by mathematics teachers in the implementation of CBC in Mathematics.	RQ3: What are the challenges faced by mathematics teachers in the implementation of a competency-based curriculum (CBC) in mathematics?	Questionnaire: (f) Teachers' concerns pertaining to CBC; (g) Challenges on implementation.	Frequencies, percentages, means and standard deviations for concern items. For the rank-order challenge items (1–5), frequencies/percentages and mean or aggregate ranks are appropriate for identifying the relative priority of reported challenges.

Objective 4: To propose solutions for the challenges raised.	RQ4: How can the challenges be mitigated?	Questionnaire: (h) Mitigation of Challenges.	Frequencies and percentages; rank-order analysis using mean or aggregate ranks for the seven mitigation measures. Quantitative results should be integrated with themes emerging from interviews and FGDs.

Table 2. Alignment of Interview Questions with Research Objectives, Research Questions and Qualitative Analysis

Interview Question	**Objective / RQ**	**Purpose / Alignment**	**Qualitative Analysis**
Mathematics Teacher Interview Q1: How do you teach mathematics in your classroom?	Objective 2 / RQ2	Explore teachers' actual mathematics teaching practices and how these relate to CBC implementation.	Thematic analysis; code teaching practices and compare emerging themes with questionnaire evidence.
Mathematics Teacher Interview Q2: How do you understand the term Competency-based Curriculum (CBC)?	Objective 1 / RQ1	Explore teachers' meanings, understanding and interpretation of CBC.	Thematic analysis; identify patterns in understanding and misconceptions, then compare with questionnaire results.
Mathematics Teacher Interview Q3: Is CBC being implemented in Mathematics at your school and in your classroom? How is it being implemented?	Objective 2 / RQ2	Obtain detailed accounts of the extent and nature of CBC implementation at school/classroom level.	Thematic analysis; categorise evidence of implementation and compare with quantitative implementation indicators.
Mathematics Teacher Interview Q4: What challenges have you faced when you teach mathematics implementing the competency-based curriculum?	Objective 3 / RQ3	Identify practical, pedagogical, resource and institutional challenges experienced by teachers.	Thematic analysis; coding, categorisation and theme development, followed by triangulation with questionnaire findings.
Mathematics Teacher Interview Q5: What strategies can be used to improve how your school implements the competency-based curriculum?	Objective 4 / RQ4	Identify teacher-generated strategies for improving CBC implementation.	Thematic analysis; develop themes around training, resources, support, collaboration and other strategies reported by participants.
Mathematics Teacher Interview Q6: How can the challenges you mentioned earlier be controlled?	Objective 4 / RQ4	Explore specific measures for controlling or mitigating the challenges identified by teachers.	Thematic analysis; compare proposed measures with questionnaire mitigation rankings and FGD themes.
Administrator Interview Q1: Is CBC being implemented at your school? How long have you been assessing and monitoring the implementation of CBC?	Objective 2 / RQ2	Obtain administrative evidence about school-level implementation and monitoring of CBC.	Thematic analysis; identify implementation and monitoring patterns and triangulate with teacher accounts.
Administrator Interview Q2: To what extent has the district/school successfully	Objective 2 / RQ2	Examine administrators' assessment of the extent of institutional CBC incorporation.	Thematic analysis; categorise reported levels/forms of implementation and compare with teacher evidence.

incorporated the competency-based curriculum (CBC)?			
Administrator Interview Q3: What are the principal challenges that educators and administrators encounter when monitoring and assessing teachers on the implementation of the CBC in Mathematics?	Objective 3 / RQ3	Identify institutional and monitoring challenges affecting CBC implementation.	Thematic analysis; code recurring challenges and triangulate with teachers' questionnaire, interview and FGD evidence.
Administrator Interview Q4: What tools and assistance are required for the successful implementation of CBC?	Objective 4 / RQ4	Identify institutional support, resources and assistance required to address implementation challenges.	Thematic analysis; develop mitigation/support themes and integrate them with quantitative rankings and teacher/FGD findings.

Table 3. Alignment of Focus Group Discussion (FGD) Questions with Research Objectives, Research Questions and Qualitative Analysis

FGD Question	**Objective / RQ**	**Purpose / Alignment**	**Qualitative Analysis**
FGD Q1: How do you perceive the new competency-based curriculum in Mathematics?	Objective 1 / RQ1	Explore shared perceptions and understanding of CBC among mathematics teachers.	Thematic analysis of common and divergent perceptions; compare themes with questionnaire and interview evidence.
FGD Q2: How do you implement the new competency-based curriculum in Mathematics?	Objective 2 / RQ2	Explore classroom-level implementation practices and experiences through group interaction.	Thematic analysis of reported practices, similarities and differences; triangulate with questionnaire and interview findings.
FGD Q3: What concerns do you have for the implementation of the competence-based curriculum in Mathematics? What major challenges did you encounter while putting the competence-based curriculum in Mathematics into practice?	Objective 3 / RQ3	Generate collective discussion of concerns and major implementation challenges.	Thematic analysis; identify recurring challenge themes and divergent experiences; triangulate with questionnaire and interview findings.
FGD Q4: Strategies for improving/mitigating the challenges raised during CBC implementation.	Objective 4 / RQ4	Elicit collectively generated solutions and practical mitigation measures.	Thematic analysis; group proposed strategies into themes and compare with questionnaire mitigation rankings.

FGD Q5: Further suggestions/recommendations for improving CBC implementation in Mathematics.	Objective 4 / RQ4	Provide an opportunity for participants to extend, clarify or prioritise practical recommendations.	Thematic analysis; synthesise recommendations and integrate with teacher/administrator interview evidence and quantitative findings.

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Gatekeeper Letter
Part 1: Approval Request

Institution/Organization: Ministry of Education (Manicaland)
Address: P. O. Box 146, Mutare
Date: 09-Jul-2024
Subject: Permission to conduct research

Dear Provincial Education Director (Manicaland Province)

My name is Zvisineyi Kandodo, a doctoral student at Unicaf University in Malawi.

In the context of my studies, I am conducting research on Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe.

This topic is relevant and important as the study will analyse mathematics teachers' concerns on the implementation of the Competence Based Curriculum (CBC) in Mathematics in Zimbabwe. I chose the topic on the premises that competence-based curriculum (CBC) is very new in Zimbabwe. It is the first time that CBC is being implemented in the Zimbabwean educational system. It is crucial to assess the implementation itself so as to have a clear picture of what CBC is all about. Thus, the rationale for carrying out this study is enhanced by the need to have informed decisions pertaining to the evaluation of CBC.

The study will apply a mixed methods methodology, and data collection will be conducted with the use of face to face interviews, focus group discussions and questionnaires to investigate the Teachers' Implementation of the Competence Based Curriculum in Mathematics.

Subject to approval by Unicaf Research Ethics Committee (UREC), this study will require participants to engage in face to face interviews, focus group discussions, and answer questionnaires at their respective schools for an estimated time of 1 hour. Please note that participants have the right to withdraw from the research at any time.

As such, I am kindly requesting for permission to have access to your organization's data which is relevant to the gist of the study, and recruit participants for this research. Note that in cases where the research will include underage participants, the researcher must also obtain written consent from the underage participants' legal guardians.

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Gatekeeper Letter
Part 1: Approval Request

To this end, I would be grateful if you would grant your approval for conducting this research. I wish to assure you that all data and personal information will be processed according to the code of Ethics of Unicaf University, which ensures the anonymity and confidentiality of participants. During the entire research process, no personal information of participants will be revealed, thus maintaining scientific confidentiality and anonymity.

I wish to clarify that the organization's participation will be voluntary. For any further clarifications, please do not hesitate to contact me.

Thank you in advance for your time and for your consideration of this project.

Yours Sincerely,

Student's Name: Zvisineyi Kandodo

Student's E-mail: zvisineyi.kandodo@yahoo.com

Student's Address and Telephone: +1 984 277 0516

Supervisor's Name: Dr Ernest Ampadu

Supervisor's E-mail: e.ampadu@faculty.unicaf.org

University Campus/Program: Unicaf University in Malawi: PhD Doctorate of Philosophy - Education

Research Project Title: Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe.

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Gatekeeper Letter
Part 2: Approval

This section is mandatory and should to be signed by the Gatekeeper

Student's Name: Zvisineyi Kandodo

Student's E-mail: zvisineyi.kandodo@yahoo.com

Student's Address and Telephone: +1 984 277 0516

Supervisor's Name: Dr Ernest Ampadu

Supervisor's E-mail: e.ampadu@faculty.unicaf.org

University Campus/Program: Unicaf University in Malawi: PhD Doctorate of Philosophy - Education

Research Project Title: Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe.

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I consent to the provision of access as per the letter above for the period from 09/08/24 to 30/09/24

Gatekeeper's Name: MUNYOZA AGNES

Gatekeeper's Position: PROVINCIAL EDUCATION DIRECTOR PED

Gatekeeper's Signature:

Date: 09/08/2024

PROVINCIAL EDUCATION DIRECTOR
MINISTRY OF PRIMARY
& SECONDARY EDUCATION (MOPSE)
MANICALAND
BOX 146, MUTARE
0202130063
DATE: 09/08/24

Informed Consent Form
Part 1: Briefing of Participants

Student's Name: Zvisineyi Kandodo

Student's E-mail Address: zvisineyi.kandodo@yahoo.com

Student ID #: D3400666

Supervisor's Name: Dr Ernest Ampadu

Supervisor's Email Address: e.ampadu@faculty.unicaf.org

University Campus/Program: Unicaf University in Malawi: PhD Doctorate of Philosophy - Education

Research Project Title:

Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe.

Provide a short description of the research project. To be precise, explain:

(1) what the main aim of the research project is

To investigate the objections made by mathematics teachers about the implementation of the Competency-Based Curriculum in Zimbabwe.

(2) what the participant will need to do during the data collection

The participants are divided into 3 groups. The first group will participate in an interview. The second group will participate in a focus group discussion. The last group will answer a questionnaire.

(3) where the data collection will take place

Interviews will be held at participant's schools/ over the phone. Focus group discussions will be held at selected cluster centers (or Zoom). Questionnaires will be sent to participants schools electronically or paper copy.

(4) the duration of participant's involvement in the data collection

6 weeks

(5) whether the participant will be paid

The participants will not be paid.

The above named student is committed to ensuring participant's voluntarily participation in the research project and guaranteeing there are no potential risks and/or harms to the participants.

Participants have the right to withdraw at any stage (prior or post the completion) of the research without any consequences and without providing any explanation. In these cases, data collected will be deleted.

All data and information collected will be coded (kept anonymous) and will not be accessible to anyone outside this research. Data described and included in any dissemination activities will only refer to coded and nonidentifiable information ensuring beyond the bounds of possibility participant identification.

If you have any issues or concerns about the study, please contact:

Dr Ernest Ampadu	e.ampadu@faculty.unicaf.org

I, Zvisineyi Kandodo **, ensure that all information stated above is true and that all conditions have been met.**

Date: 09-Jul-2024

Informed Consent Form
Part 2: Certificate of Informed Consent

This section is mandatory and should to be signed by the participant

Student's Name: Zvisineyi Kandodo
Student's E-mail Address: zvisineyi.kandodo@yahoo.com
Student ID #: D3400666
Supervisor's Name: Dr Ernest Ampadu
Supervisor's Email Address: e.ampadu@faculty.unicaf.org
University Campus/Program: Unicaf University in Malawi: PhD Doctorate of Philosophy - Education
Research Project Title:

Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe.

I have read the foregoing information about this study, or it has been read to me. I have had the opportunity to ask questions and discuss about it. I have received satisfactory answers to all my questions and I have received enough information about this study. I understand that I am free to withdraw from this study at any time without giving a reason for withdrawing and without any negative consequences. I consent to the use of multimedia (e.g., audio recordings, video recordings) for the purposes of my participation in this study. I understand that my data will remain anonymous and confidential, unless stated otherwise. I consent voluntarily to be a participant in this study.

Participant's Print name:

Participant's Signature:

Date:

If the Participant is illiterate:

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had an opportunity to ask questions. I confirm that the aforementioned individual has given consent freely.

Witness's Print name:

Witness's Signature:

Date:

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Data Collection Summary / Details

Student's Name: Zvisineyi Kandodo Student's ID: R1709D3400666

Start date for data collection: 08/10/24 End Date for Data Collection: 09/21/24 UREC Decision Date: 07/30/2024

A	B	C	D	E	F	G
Select the tools to be used in your study	**Select how the tools selected in column A will be administered (select one or more)**	**Select what types of questions will be included in the tools previously selected in column A (select one or more)**	**Number of Participants Participating**	**Gender of Participants**	**Age of Participants**	**Participants Consents**
Interviews ☑	☑ Face-to-face ☐ Online with camera (synchronous live discussion with camera) ☑ Audio only (synchronous live discussion without camera, i.e., via phone)	☑ Open-ended questions ☐ Close-ended questions ☐ Both open- and close-ended questions ☑ Includes section related to demographics	40	Male ☑ Female ☑	From 26 To 60	☑ Physical (completion of the actual consent form) ☐ Retrieved online (through the questionnaire for instance) ☐ Guardian Informed Consent
Focus Groups ☑	☑ Face-to-face ☐ Online with camera (synchronous live discussion with camera) ☑ Audio only (synchronous live discussion without camera, i.e., via phone)	☑ Open-ended questions ☐ Close-ended questions ☐ Both open- and close-ended questions ☐ Includes section related to demographics	20	Male ☑ Female ☑	From 30 To 60	☑ Physical (completion of the actual consent form) ☐ Retrieved online (through the questionnaire for instance) ☐ Guardian Informed Consent

A	B	C	D	E	F	G
Select the tools to be used in your study	**Select how the tools selected in column A will be administered (select one or more)**	**Select what types of questions will be included in the tools previously selected in column A (select one or more)**	**Number of Participants Participating**	**Gender of Participants**	**Age of Participants**	**Participants Consents**
Questionnaire ☑	☑ Face-to-face self – administered questionnaire ☐ Online i.e., via phone or any other platform. The researcher reads the questions to the participants ☐ Online asynchronous self – administered questionnaire (i.e., via email)	☐ Open-ended questions ☑ Close-ended questions ☐ Both open- and close-ended questions ☑ Includes section related to demographics	80	Male ☑ Female ☑	From 26 To 60	☑ Physical (completion of the actual consent form) ☐ Retrieved online (through the questionnaire for instance) ☐ Guardian Informed Consent
Experiments ☐	☐ Face-to-face self – administered questionnaire ☐ Online i.e., via phone or any other platform. The researcher reads the questions to the participants ☐ Online asynchronous self – administered questionnaire (i.e., via email)	☐ Open-ended questions ☐ Close-ended questions ☐ Both open- and close-ended questions ☐ Includes section related to demographics		Male ☐ Female ☐	From To	☐ Physical (completion of the actual consent form) ☐ Retrieved online (through the questionnaire for instance) ☐ Guardian Informed Consent

A	B	C	D	E	F	G
Select the tools to be used in your study	**Select how the tools selected in column A will be administered (select one or more)**	**Select what types of questions will be included in the tools previously selected in column A (select one or more)**	**Number of Participants Participating**	**Gender of Participants**	**Age of Participants**	**Participants Consents**
Tests ☐	☐ Face-to-face self – administered questionnaire ☐ Online i.e., via phone or any other platform. The researcher reads the questions to the participants ☐ Online asynchronous self – administered questionnaire (i.e., via email)			Male ☐ Female ☐	From ☐ To ☐	☐ Physical (completion of the actual consent form) ☐ Retrieved online (through the questionnaire for instance) ☐ Guardian Informed Consent
Other (i.e. observation Check list)						

UREC Decision, Version 2.0

Unicaf University Research Ethics Committee Decision

Student's Name: Zvisineyi Kandodo

Student's ID #: R1709D3400666

Supervisor's Name: Dr Marios Ioannou

Program of Study: UU-PhD-Edu-900-1

Offer ID /Group ID: O59629G61101

Dissertation Stage: DS1

Research Project Title:

Mathematics Competence Based Curriculum Implementation by Teachers: A Case Study of Secondary Schools in Zimbabwe's Manicaland Region

Comments: No comments.

Decision*: A. Provisionally approved without revision or comments

Date: 28 Apr 2023

*Provisional approval provided at the Dissertation Stage 1, whereas the final approval is provided at the Dissertation stage 3. The student is allowed to proceed to data collection following the final approval.

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Unicaf University Research Ethics Committee Decision

Student's Name:	Zvisineyi Kandodo
Student's ID #:	R1709D3400666
Supervisor's Name:	Dr Ernest Ampadu
Program of Study:	UU-PhD-Edu-900-3
OfferID / GroupID:	O76676G80417
Dissertation stage:	DS3
Research Project Title:	Teachers' Implementation of the Competence Based Curriculum in Mathematics: A case of Manicaland Secondary Schools, Zimbabwe.
Ethical conditions for approval:	No comments
Methodological recommendations:	
Decision*:	A. Approved without revision or comments
Date:	July 30, 2024

All Doctoral students are advised to check the regulations pertaining to research and General Data Protection Regulation (GDPR) of the country in which the research will take place as each country may have different restrictions on conducting research.

i. Approval from a local Research Ethics Committee (REC) or professional regulatory body such as Institutional Review Board (IRB)

ii. Approval from Ministry or public agency

*Provisional approval provided at the Dissertation Stage 1, whereas the **final** approval is provided at the Dissertation stage 3. The student is allowed to proceed to data collection following the final approval.