



**BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF SCIENCE EDUCATION
DEPARTMENT OF CURRICULUM AND EDUCATIONAL MANAGEMENT STUDIES**

**THE IMPACT OF FORMATIVE ASSESSMENT ON MATHEMATICS ACHIEVEMENT
AND MOTIVATION AMONG GRADE 7 LEARNERS IN EMPHINI CLUSTER**

BY

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS OF THE MASTER OF SCIENCE NCE EDUCATION DEGREE IN
MEASUREMENT, ASSESSMENT AND EVALUATION**

JANUARY 2025

APPROVAL FORM

The undersigned certify that they have read and recommend to Bindura University of Science Education for acceptance, a research project entitled: *The Impact of Formative Assessment on Mathematics Achievement and Motivation among Grade 7 Learners in Emphini Cluster*. Submitted by Mamba Zinhle Nozipho B231944A in partial fulfilment of the requirements for the Master of Science Education degree in Measurement, Assessment and Evaluation.

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DECLARATION

I hereby declare that this dissertation, entitled The Impact of Formative Assessment on Achievement and Motivation in Mathematics: A Study of Grade 7 learners in four Primary schools in Manzini Region, Eswatini, is my original work and has not been submitted for any other degree or qualification at any other institution. This work has been conducted in accordance with the principles of academic integrity and ethical research practices.

All sources of information and data used in this dissertation have been appropriately acknowledged and referenced. I confirm that I have adhered to the guidelines set forth by Bindura University of Science Education regarding the conduct of research and the presentation of academic work.

I understand that any breach of these principles may result in disciplinary action in accordance with the university's policies on academic misconduct.

Signed



Date: 22 January 2025

This research work was undertaken under the supervision of Dr. D. Dziva

Signed



Date: 23 January 2025

DEDICATION

To my family, whose unwavering support and encouragement have been my guiding light throughout this journey? Your belief in my dreams has inspired me to reach for the stars.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks to everyone who supported me throughout my research.

First of all, I would like to sincerely thank my participants for their cooperation and willingness to share their insights, which were invaluable to this study. Your contributions have greatly enriched my work. I also thank the parents and school principals who gave me permission to conduct this research. Your support was essential in facilitating my access to the necessary resources.

Special thanks to my supervisor whose guidance and unwavering support was instrumental in meeting the challenges of this research process. Your expertise and encouragement helped shape my work in meaningful ways. To my family, I cannot thank you enough for your time, patience, love, support and sacrifices. Your belief in me has been a constant source of motivation and I really couldn't have done it without you.

Last but not least, I would like to thank my friends and colleagues who have constantly inspired me and encouraged me to persevere and strive for excellence. Your camaraderie makes this journey even more rewarding.

Thank you all for being a part of this important chapter in my life.

ABSTRACT

This study investigated the formative assessment practices influenced both achievement and motivation of Grade 7 learners in Mathematics within the Emphini Cluster of the Manzini region in Eswatini. Employing a mixed-methods approach grounded in a constructivist paradigm, the research utilizes a convergent parallel case study design, involving a sample of 10 Mathematics teachers and 185 learners. Data collection methods included questionnaires, structured interviews, and observation checklists, enabling a comprehensive analysis of both quantitative and qualitative data. Data was presented in frequency tables, pie charts and data from interview was analyzed thematically and data from observation analyzed in content analysis. The findings revealed the dual impact of formative assessment, evidenced by improved problem-solving skills and higher test scores among those who receive regular feedback and engage in self-assessment practices. Making it relevant and significant in the field of education. Specific formative assessment strategies, such as peer assessments and interactive quizzes, foster a more engaging learning environment, thereby increasing learner motivation. Despite the positive outcomes, the study identified several barriers to effective implementation, including time constraints, resource limitations, and overcrowded classrooms. Recommendations for overcoming these challenges include the integration of technology, the incorporation of learner feedback in assessment processes, and the utilization of diverse formative assessment methods. This research contributes to the understanding of formative assessment's role in Mathematics education and offers practical recommendations for educators aiming to enhance learner achievement and motivation. The findings underscore the necessity of a systematic approach to formative assessment implementation, which can positively influence both academic performance and learner motivation in Mathematics education

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CHAPTER ONE

THE PROBLEM AND ITS CONTEXT

1.0 Introduction

This chapter established the foundation and framework for the study. It introduces the research context and structure by presenting the background information, identifying the research problem, and outlining the study's organizational framework. The chapter serves as an orientation to the scope of the investigation by detailing the research objectives and questions that guided the study. Additionally, it provides justification for the research through the significance section, acknowledges the study's boundaries through limitations and delimitations, and clarifies key terminology essential for understanding the research context. Through these components, Chapter 1 provides readers with the necessary context to understand the investigation into formative assessment's influence on Grade 7 mathematics achievement and motivation.

1.1 Background to the Study

Mathematics is a foundational, critical and high proficiency subject linked to academic achievement and career success, enhanced problem-solving skills, and greater future earning potential. Globally a high number of learners struggle to attain the OECD 69 %average, resulting in poor academic performance and widening achievement gaps (Smith & Jones, 2021). Effective Mathematics teaching requires a balanced assessment approach that includes diagnostic, formative, and summative assessment.

Majola (2014) defines assessment as a process of observing information that informs decisions about learners, curricula, and educational policies. Mkhwanazi (2014) argues that assessment is a continuous, planned process of identifying, gathering, and interpreting information regarding learners' performances. Formative assessment operates within a short cycle tied to classroom activities and plays a key role in this process by providing teachers with feedback on learners' progress, motivating learners, and assessing readiness for future learning as well as instruction adjustment.

The practical application of formative assessment has been explored in various international contexts. For instance, Johnson et al. (2015) conducted a qualitative study in Sweden that revealed many teachers focused on traditional, teacher-centered approaches, limiting learner engagement and the effectiveness of formative assessments. Similarly, Wylie & Lyon (2015) found that in the United States, educators often lacked the training necessary for effective formative assessment implementation, leading to inconsistent practices. In New Zealand, Hattie

& Timperley (2017) highlighted the essential role of feedback but noted that many formative assessments did not provide specific, actionable feedback, causing frustration among learners. Similar challenges have been observed across Africa, with studies in Malawi, by Gikandi, Morrow and Davis (2021), South Africa by Luyt (2014), Nigeria, Kenya, and Eswatini revealing that inadequate training, resource constraints, and inconsistent practices hinder the effective implementation of formative assessment.

Research in Eswatini, such as Dlamini (2019) and Maziya (2021), indicates that teachers recognize the importance of formative assessments but face significant challenges, including large class sizes and insufficient administrative support. These barriers often result in formative assessments being perceived as mere formalities rather than meaningful learning tools. The current study is grounded in Vygotsky's Social Constructivism Theory, emphasizing the significance of social interactions and cultural contexts in learning. This framework aligns with the research focus on how collaborative formative assessment practices can enhance learner learning and motivation in Mathematics. The study aims to address the issue of low Mathematics performance in the Emphini Cluster Schools of Eswatini, where only 38% of Grade 7 learners achieved basic proficiency in 2022, compared to a national average of 56%.

The researcher, an experienced Mathematics teacher, hypothesizes that ineffective formative assessment contributes to poor learner performance. Contextual challenges, including higher poverty rates and lower government education spending, further exacerbate the issue, creating significant barriers to access educational resources. Cultural attitudes that undervalue Mathematics compound these challenges, risking the entrenchment of weak learning outcomes in

the Emphini region and beyond. Addressing these issues through improved assessment practices and teacher training could foster better engagement and success in Mathematics for learners in this context.

By extending the research on formative assessment down to the primary level and homing in on a cluster of schools with recognized performance challenges, this study filled voids in the existing literature. It provided valuable insights directly applicable to strengthening instruction and learner outcomes within the given local context. The in-depth investigation of classroom assessment practices and their impact within Eswatini primary schools helped address the ongoing issue of weak Mathematics results. The researcher having gone through previous studies identified that most of the studies on the impact of formative assessment, very little included observing the teacher administering formative assessment. Mostly include questionnaires and interview guides. It was against this background that this study carried out a study on the impact of formative assessment on Mathematics achievement and motivation.

1.2 Problem Statement

Mathematics achievement among Grade 7 pupils in Eswatini, Emphini cluster schools remains critically low, with average examination results of 30% over the past five years. This persistent underperformance stems from several interconnected challenges, including the predominant use of summative assessment practices, inadequate feedback mechanisms, and limited implementation of formative assessment strategies.

The current assessment landscape in these schools presents three critical issues. First, the overemphasis on summative assessment and grade-based evaluation undermines learners' intrinsic motivation and authentic engagement with mathematical concepts. Second, the absence of specific, timely, and constructive feedback mechanisms hinders learners' ability to identify areas for improvement and take ownership of their learning process. Third, the unique challenges faced by Emphini cluster schools, including underqualified Mathematics teachers, limited educational resources, and high learner-to-teacher ratios, further compound these assessment-related issues.

While Vygotsky's zone of proximal development and self-determination theory suggest that targeted formative assessment strategies including peer assessment, self-assessment, and detailed teacher feedback can significantly enhance learner achievement and motivation, there exists a critical research gap regarding the implementation and effectiveness of these strategies within Eswatini's primary school context. Specifically, no comprehensive studies have examined how structured formative assessment practices might address the unique challenges faced by learners in the Emphini cluster, particularly in developing mathematical conceptual understanding, problem-solving abilities, and subject confidence.

This research gap becomes especially significant given the cluster's specific contextual challenges. Understanding how formative assessment strategies can be effectively implemented despite resource constraints and teacher qualification issues is crucial for developing practical, context-appropriate solutions to improve Mathematics education in these schools.

1.3 Research Objectives

This study intended to achieve the following objectives:

- 1.3.1 Examine the relationship between formative assessment practices and learner performance in mathematics.
- 1.3.2 Examine the relationship between formative assessment practices and learner's motivation in Mathematics in primary schools.
- 1.3.3 Investigate the range of formative assessment methods employed by teachers in Emphini cluster primary schools during mathematics instruction.
- 1.3.4 Identify and categorise the key barriers that hinder teachers from effectively implementing formative assessment in Mathematics in primary schools.
- 1.3.5 To suggest the strategies primary school Mathematics teachers can implement to enhance formative assessment among Grade 7 learners.

1.4 Research Questions

The study attempted to answer the following questions:

- 1.4.1 What is the relationship between of formative assessment practices on learner performance in primary school Mathematics?

- 1.4.2 How do formative assessment practices relate to learners' motivation in primary school Mathematics?
- 1.4.3 What types of formative assessment methods are predominantly used by teachers in Emphini cluster primary schools when teaching mathematics?
- 1.4.4 1.4.4 What are the key barriers that hinder teachers from effectively implementing formative assessment in Mathematics in primary schools?
- 1.4.5 What formative assessment strategies can be implemented by primary school Mathematics teachers to enhance Mathematics learning?

1.5 Significance of the Study

This study has potential significance for both research and practice regarding formative assessment and Mathematics learning within the Eswatini education system.

For Teachers: the findings will provide insights into effective formative assessment strategies to identify learners' strengths and weaknesses, inform differentiated instruction, and align assessment practices with curriculum objectives. By understanding the benefits of formative assessment, teachers in Emphini cluster schools and beyond can enhance their Mathematics teaching and contribute to improved learner achievement, motivation, and academic growth.

Research by Stiggins (2022) highlights that formative assessment practices can provide valuable data to administrators, enabling them to make informed decisions about curriculum development, instructional strategies, and resource allocation. Hence, the significance of this study for administrators lies in its potential to highlight the importance of formative assessment in promoting learner learning hence informing decision-making processes and school based educational policies aimed at enhancing learner learning outcomes in Mathematics within the Emphini cluster schools and beyond. This knowledge can guide administrators in providing adequate instructional resources and required support to facilitate effective assessment practices, ultimately improving overall school performance.

For Curriculum Developers: The findings can inform curriculum evaluation and revision, emphasizing the integration of formative assessment practices into the curriculum. Hence, creating more responsive and learner-centered curricula that address the diverse learners learning needs.

For Teacher Training Institutes: The study can contribute to the training of future teachers by emphasizing the importance of formative assessment and providing examples of best practices. It may also necessitate in-service courses to further educate current teachers on diverse formative assessment methods that promote learner learning and performance. The study will also add to the already existing body of research knowledge. Future researcher might benefit from the study as a reference source.

1.6 Assumptions of the study

- a) **Theoretical Foundation:** Grounded in social constructivist principles, which posits that knowledge is actively constructed by learners based on their experiences and interactions, this study assumes that formative assessment, when implemented effectively and aligned with best practices, can positively influence learners' Mathematics achievement and motivation by enhancing teaching and learning processes.
- b) **Generalizability:** The study assumes that the observed relationships between assessment variables (e.g., frequency, feedback type, alignment with curriculum) and learner achievement during the study period are indicative of causal effects.
- c) **Impact of Assessment:** Building on extensive research in educational assessment, such as Hattie and Timperley (2017) research which emphasized the importance of formative assessment in enhancing learner achievement. Their work highlighted the impact of formative assessment on promoting learner engagement, clarifying learning goals, and fostering self-regulation in Mathematics education.
- d) **Contextual Influences:** The study acknowledges that the socio-economic and cultural context of the Emphini cluster schools (such as poverty, lack of parental involvement in learning) may influence both assessment practices and learner achievement.

- e) **Teacher Training:** The study assumes that teachers in the Emphini cluster schools have received adequate training in implementing various assessment methods, including formative assessment strategies. However, the study will also explore teachers' perceptions of their assessment practices and any challenges they face in implementing effective assessment

- f) **Limited Stakeholder Perspectives:** The study assumes that the perspectives of Grade 7 Mathematics teachers are sufficient for understanding the impact of formative assessment on learner learning. Neglecting the input of other stakeholders, such as learners, parents, or school administrators, could limit the study's comprehensiveness and overlook valuable insights from different perspectives.

- g) **Neglect of External Influences:** the study overlooks external factors that may influence the effectiveness of formative assessment practices in Grade 7 Mathematics classrooms. By focusing solely on internal dynamics, such as teacher strategies and learner responses, the study may fail to account for broader systemic, societal, or environmental factors such as parental involvement that could impact outcomes.

1.7 Limitations of the study

The main limitation of this study was that it was undertaken at a smaller scale as a case study involving only four primary schools out of as many in the country, hence its findings cannot be generalized to other primary schools in the region, later alone, the whole country. This can only be mitigated by conducting more studies at a larger scale in future. The study also encountered some financial limitations. Money was needed for airtime to communicate with the supervisor, prepare research instruments and distribute them to the participants. For example, 185 questionnaires were printed. To mitigate this constraint the researcher had to borrow money from some family members. The time for the study was too short, just four months from proposal writing to the submission of the thesis for marking. Apart from this, the researcher had other obligations which needed her attention so she had to balance the two. To mitigate this constraint the researcher asked for an extension of the submission date from the supervisor which she was granted. She was also burning the all night candle and at times sleeping for just an hour or two per day.

1.8 Delimitations of the study

This study focused specifically on the impact of formative assessment on Mathematics achievement and motivation among Grade 7 learners in four selected primary schools in the Emphini cluster, within the Manzini region of Eswatini. The selection of these schools was intentional, aimed at providing a concentrated understanding of formative assessment practices in a specific geographical context. While this choice allows for in-depth exploration, it may limit the generalizability of the findings to other regions or educational settings in Eswatini.

The research was conducted over a four-month period, from August to November 2024. This timeframe was chosen to align with the academic calendar and facilitate effective data collection during a typical school term. Although this duration may restrict the potential for longitudinal analysis, it was deemed necessary to ensure the study's feasibility and relevance to current educational practices.

A mixed-method approach was adopted, utilizing a case study research design that involved a sample of 10 teachers and 185 learners. The use of three data collection instruments: interview schedules, observation checklists, and questionnaires, was selected to provide a comprehensive understanding of the research questions. This methodological choice enables triangulation of data, enhancing the validity of the findings while also delineating the specific context of this study.

By clearly defining these delimitations, the study aimed to focus on the nuances of formative assessment in the selected schools, acknowledging the inherent restrictions in scope while striving for meaningful insights into its impact on learner achievement and motivation.

1.9 Definition of Key Terms

The capacity of Grade 7 learners to think critically, reason logically, and solve mathematical problems, as evidenced by their scores on Mathematics assessments. This definition emphasizes the importance of assessment in determining learner understanding and skill levels within the context of the Emphini Cluster Schools (Gallagher, 2016).

Formative Assessment:

A continuous process of collecting and analyzing evidence regarding learner learning during Mathematics instruction. This approach provides timely feedback that informs teaching practices and helps enhance learner achievement, specifically tailored to the needs of Grade 7 learners in the Emphini Cluster Schools (Heidi et al., 2019).

Mathematics Achievement:

The degree of proficiency or mastery attained by learners in Mathematics, which is typically quantified through performance on standardized assessments. This measure serves as a critical indicator of educational effectiveness and learner development within the Grade 7 curriculum (Grouws, 2016).

Motivation:

The internal and external factors that drive learners to initiate, focus, and sustain efforts toward their goal of mastering Mathematics. In this study, motivation is understood as a crucial element influencing learner engagement and success in learning Mathematics among Grade 7 learners (Bhoje, 2015).

Summative Assessment:

An evaluative process that occurs at the end of an instructional period, aimed at measuring learner learning outcomes against predefined standards. In the context of Grade 7 Mathematics, summative assessments help evaluate the overall effectiveness of teaching strategies and curriculum implementation (Heidi et al., 2019).

1.10 Organization of the dissertation

This research study is composed of five chapters. Below, a snapshot discussion of each chapter is provided.

Chapter One outlines the background to the study, problem statement, objectives, research questions, significance of the study, assumptions of the study, limitations of the study, delimitations of the study, and definitions of key terms.

Chapter Two presents the theoretical framework and relevant comprehensive literature review and provides an overview of what researchers have written about formative assessment practices in national, regional and international contexts. It addresses the research questions.

Chapter Three carefully structures the research paradigm, approach and design, population, sample and sampling procedures research instruments, data generation procedures and data analysis. It also highlights data trustworthiness as well as ethical considerations.

Chapter Four presents the data obtained through interviews and questionnaires, and observation guide analyzes the data and discusses the findings in light of the research questions that guided the study.

Chapter Five presents the summary, conclusions and recommendations of the study. It concludes with recommendations for further studies and areas for the future.

1.10 Summary

The chapter introduced the background and context for the study. It established that Mathematics performance among Grade 7 learners in the Emphini cluster schools in Eswatini has been poor, with exam scores averaging 30% over the last 5 years. The study aimed to investigate the impact of formative assessment strategies on learner achievement and motivation in Mathematics, addressing the problem of poor Mathematics performance among Grade 7 learners in the Emphini cluster schools. The chapter outlined the research objectives as clearly articulated goals that focused on the relationship between formative assessment and improved learner outcomes. Specific research questions were designed to probe into how formative assessment influences Mathematics achievement and motivation among learners. The significance of the study was discussed, highlighting its potential contributions to educational practice and policy, particularly in enhancing learner performance in Mathematics. Foundational beliefs that underpin the research, termed assumptions of the study, shaped the framework and methodology. Additionally, the chapter addressed limitations of the study, identifying factors beyond the

researcher's control that could affect the findings, such as external influences on learner performance. Delimitations of the study were also specified, including the selection of specific schools and the focus on Grade 7 learners, which defined the scope of the research. Essential concepts relevant to the study were clarified in the definitions of key terms, ensuring a clear understanding of the terminology used throughout the dissertation. The succeeding chapter is on review of related literature.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.0 Introduction

In the previous chapter the problem was put into context. This chapter presents the theoretical framework and relevant literature concerning the impact of formative assessment on mathematics achievement and motivation among Grade 7 learners. Grounded in social constructivism theory, the chapter explores existing research on various types of formative assessments and their influence on student motivation and achievement. The literature analysis is organized around five key areas that align with the research questions: formative assessment methodologies, motivational impacts, achievement outcomes, implementation challenges, and effective teaching practices in mathematics education. By examining these dimensions, this chapter aims to provide a comprehensive understanding of how formative assessment can enhance educational outcomes for Grade 7 learners in mathematics. This chapter established a foundation for the subsequent analysis and findings, contributing to a deeper insight into the role of formative assessment in fostering improved student performance and engagement in mathematics.

2.1 Theoretical Framework

Social Constructivism Theory as proposed by Lev Vygotsky (1896 – 1934) underpinned this study. Social constructivism theory, emphasize the essential role of social interaction and cultural context in the learning process. Vygotsky argued that knowledge is co-constructed through collaborative dialogue and shared experiences and emphasized the importance of engaging with more experienced others, such as teachers and peers, in the learning environment. Central to his theory is the concept of the Zone of Proximal Development (ZPD), which defines the range of tasks that a student can perform with guidance but not yet independently. This underscores the importance of scaffolding, where educators provide support tailored to the student's current level of understanding, allowing them to reach higher levels of cognitive function. In addition, Vygotsky emphasized the use of cultural tools, including language and symbols, as essential mediators of thinking and learning, suggesting that these tools shape cognitive development and facilitate the internalization of knowledge.

It provides a comprehensive lens through which to explore the impact of formative assessment on student achievement, motivation, in primary school Mathematics. Vygotsky posited that learning is fundamentally a social endeavor, where interaction with peers and more knowledgeable others facilitates cognitive development. This principle underscored the importance of collaborative learning environments in which learners engage in dialogue, share ideas, and provide feedback to one another.

Central to Vygotsky's theory is the concept of the Zone of Proximal Development (ZPD), which refers to the difference between what a learner can accomplish independently and what they can achieve with guidance. Formative assessment practices, such as scaffolding and targeted feedback, align closely with this principle by providing the necessary support to help learners progress within their ZPD. By identifying learners' current levels of understanding and offering appropriate challenges, formative assessment facilitates deeper learning experiences. Furthermore, Vygotsky emphasized the role of cultural tools language, symbols, and artifacts in shaping cognitive processes. In the context of Mathematics education, formative assessment serves as a cultural tool that enables learners to articulate their understanding, reflect on their learning, and engage with mathematical concepts more meaningfully. The use of language in feedback and peer assessment fosters a shared understanding of mathematical ideas, thereby promoting a culture of learning.

Formative assessment acts as a dynamic process that informs both teaching and learning. By utilizing various assessment methods such as quizzes, class discussions, and peer assessments, teachers gather real-time data on student performance, identify learning gaps, and adjust instructional strategies accordingly. This iterative process not only enhances academic achievement but also fosters self-regulation and motivation among learners. Formative assessment provides immediate feedback that helps learners understand their strengths and areas for improvement. This feedback loop encourages a growth mindset, where learners view challenges as opportunities for learning rather than as obstacles. Engaging in self-assessment and

reflection allows learners to become active participants in their learning journey, leading to improved performance in Mathematics.

The interactive nature of formative assessment fosters a sense of ownership over learning. When learners receive constructive feedback and are involved in the assessment process, they are more likely to feel motivated to engage with the material. The collaborative aspects of formative assessment, such as peer feedback and group discussions, further enhance motivation by creating a supportive learning community. Formative assessment encourages learners to set goals, monitor their progress, and reflect on their learning strategies. This self-regulation is crucial for academic success, as it empowers learners to take control of their education. By incorporating formative assessment practices that promote self-reflection, educators help learners develop essential skills for lifelong learning.

Social Constructivism is appropriate for this study because of its strong alignment with the core principles of formative assessment. This theory provides a robust framework for understanding how formative assessment practices can promote collaborative learning, enhance motivation among primary school Mathematics learners. Vygotsky's emphasis on social interaction and the ZPD highlights the importance of teacher-learner and peer interactions in the learning process, making it particularly appropriate for examining the dynamics of formative assessment in the classroom. By incorporating this theoretical perspective, the study aimed to gain a richer understanding of the impact of formative assessment on student achievement and motivation, ultimately contributing to the development of effective teaching practices in primary school Mathematics. The integration of Social Constructivism into the exploration of formative

assessment provided a nuanced understanding of its role in fostering learner engagement and achievement in Mathematics. This theoretical foundation guided the investigation of the study's research questions, particularly regarding the impact of formative assessment on learner performance, motivation, and the identification of effective strategies and barriers in the implementation of formative assessment in primary school Mathematics. By emphasizing the social nature of learning and the importance of collaborative interactions, this framework underscored the potential of formative assessment to transform educational practices, creating an environment where learners actively engage in their learning and are motivated to achieve their academic goals.

2.2 Formative Assessment and Primary Mathematics Achievement.

This section explores how formative assessment practices influence the academic achievement of primary school learners in Mathematics, highlighting various impacts as discussed below:

Immediate Feedback and Instructional Adjustment

Immediate feedback and instructional adjustment are crucial components of formative assessment, significantly enhancing the learning process in the Mathematics classroom. Luyt (2014) mentions that by utilizing tools such as quizzes, exit tickets, and observational assessments, teachers can gather real-time data on learner performance. Further stating that this

immediate feedback loop allows educators to pinpoint specific areas where learners struggle then facilitate a more responsive teaching approach. For example, if a teacher observes that a significant number of learners have misconceptions about a particular mathematical concept, they can swiftly adapt their lesson plans to address these gaps. This targeted intervention not only helps clarify misunderstandings but also reinforces the learning process, ensuring that learners can build a solid foundation of knowledge (Luyt, 2014).

Moreover, the ability to adjust instruction based on immediate feedback empowers teachers to differentiate their teaching strategies effectively (Attali and Powers, 2019). In a diverse classroom, learners often have varying levels of understanding and different learning styles. Therefore, when teachers receive real-time insights into their learners' grasp of mathematical concepts, they can tailor their instructional methods accordingly to suit each learner. For instance, a teacher may choose to introduce manipulatives for learners who struggle with abstract concepts while providing advanced problem-solving tasks for those who excel (Attali and Powers, 2019). This adaptability in teaching not only meets the diverse needs of learners but also promotes a more inclusive learning environment where all learners can thrive as advocated for by Education for All of 1990.

This therefore means that immediate feedback and instructional adjustment play a vital role in formative assessment, allowing teachers to gather real-time data on learner performance and adapt their teaching strategies accordingly. Hence, by identifying specific areas where learners struggle, educators can implement targeted interventions that clarify misunderstandings and strengthen the overall learning process in the Mathematics classroom.

Research by Black and William (2018) supports the notion that immediate feedback and instructional adjustments lead to significant improvements in learner understanding and performance in Mathematics. A studies by Attali and Powers (2019) in America shows that when educators implement formative assessment strategies that provide real-time feedback, learners demonstrate higher levels of engagement and achievement. This approach fosters a culture of continuous improvement, where learners feel encouraged to ask questions and seek clarification without fear of judgment. Hence, by aligning instruction with learner needs through immediate feedback, teachers can create a dynamic and responsive learning environment that enhances both learner confidence and academic success in Mathematics (Black and William, 2016).

In support, a study by Hattie and Timperley (2017) in South Africa, found that feedback has a mean effect size of 0.8, indicating a substantial positive impact on learning outcomes. This study established a positive correlation between formative assessment practices and learner performance in Mathematics. For instance, Hattie and Timperley (2017) emphasized the significance of feedback in enhancing learner outcomes. They concluded that formative assessments effectively guide learners by clarifying learning goals and providing actionable feedback.

Concurring with Hattie and Timperley (2017), Luyt (2014) in Nigeria, investigated the impact of formative assessment on learners' motivation and achievement in Mathematics. The study revealed that learners who received continuous feedback through formative assessments performed better than their peers who experienced traditional assessment methods. This aligns

with the assertion by Sadler (2019) that formative assessments help learners identify their learning gaps and foster self-regulated learning. This feedback loop not only clarifies misconceptions but also motivates learners to engage deeply with the material, leading to higher achievement levels.

Both studies highlight the positive effects of formative assessment on learner outcomes, specifically in terms of motivation and achievement. Luyt (2014) emphasizes that continuous feedback in Mathematics enhances performance compared to traditional assessment methods. This finding resonates with Sadler's (2019) assertion that formative assessments enable learners to recognize their learning gaps and promote self-regulation.

Moreover, research by Sadler (2019) in Atlanta, reveals that formative assessment helps learners develop self-regulation skills. By involving learners in assessing their own learning, they gain a better understanding of their academic strengths and weaknesses. In the context of Mathematics, this self-awareness enables learners to set realistic goals and take ownership of their learning journey, thereby improving their performance.

Black and William (2018) mentions that in addition to improved performance, Formative Assessment when used effectively can enhance the adaptation of Mathematics instruction. The adaptation of instruction based on formative assessment is a dynamic process that involves continuously adjusting teaching strategies to better meet the needs of learners. This approach is especially important in subjects like Mathematics, where learner understanding can vary widely. Teachers who utilize formative assessment can adjust their teaching strategies based on the data

collected from learner assessments. Understandably, this adaptability ensures that instruction is tailored to meet the diverse needs of learners, which is particularly important in Mathematics where learners may have varying levels of understanding and diverse misconceptions (Black and William, 2018).

Hattie and Timperly (2018) states that Formative Assessments are essential tools in the educational process, as they effectively clarify misconceptions and significantly enhance learning outcomes. For instance, if a quiz reveals that many learners' misinterpret a fundamental concept, the teacher can revisit that material, provide additional explanations, or employ alternative teaching strategies to clarify the topic. Moreover, formative assessments enable targeted interventions tailored to individual learner needs. If a teacher identifies that a particular group of learners is struggling with a specific concept, they can implement focused instructional strategies, such as small group discussions or hands-on activities, to reinforce understanding. This targeted approach not only enhances the learning experience for learners who need additional support but also contributes to a more inclusive classroom environment where all learners can thrive.

Hence the literature above reveals that formative assessments are instrumental in clarifying misconceptions and enhancing learning. Therefore, by providing immediate feedback and enabling targeted interventions, these assessments ensure that learners grasp essential concepts before progressing to more complex subjects. This approach not only improves academic performance but also cultivates a supportive and responsive learning environment that encourages learners' engagement and success.

Furthermore, Dlamini (2019) states that regular formative assessment significantly inspires active participation from learners, transforming the educational experience from passive reception of information to dynamic engagement with the material. When learners' understand that they will be assessed frequently, albeit informally, they are more likely to adopt an active role in their learning process. Aligning with Constructivism learning. Mogari and Phetlhe (2020) mention that one of the primary ways formative assessments foster lively participation is by creating a culture of continuous learning. Also stating that active participation is further enhanced as formative assessments often involve collaborative activities where learners' work together to solve problems. This peer interaction is vital in Mathematics, where multiple approaches to problem-solving can lead to richer insights and a more robust understanding of the material. Moreover, regular formative assessments provide immediate feedback, which is crucial in Mathematics. This instant feedback loop encourages them to take responsibility for their learning, actively seeking to improve their skills and understanding before moving on to more complex topics.

(Mogari and Phetlhe, 2020). Therefore, by fostering a supportive environment that values exploration, discussion, and immediate feedback, formative assessments empower learners' to take an active role in their learning journey, leading to deeper comprehension and improved mathematical proficiency.

The reduction of anxiety associated with high-stakes testing is a significant impact of formative assessment on Mathematics learning. Frequent low-stakes formative exams serve to normalize the assessment process, which can alleviate the pressure learners' often feel when facing high-stakes assessments, such as final exams or standardized tests. As a result, learners' can approach

summative assessments with greater confidence, knowing they have had multiple opportunities to demonstrate their understanding of the material over time (Luyt, 2014). Additionally, Attali and Phetlhe (2020) also adds that low-stakes formative assessments create a safe environment for learners' to practice and refine their problem-solving abilities without the fear of significant consequences. They can experiment with different approaches to solving mathematical problems, which not only enhances their learning but also builds their confidence in their abilities. As learners' gain more experience with formative assessments, their anxiety around high-stakes tests diminishes. By normalizing the evaluation process and providing opportunities for growth and feedback, these assessments empower learners' to approach summative evaluations with greater confidence and resilience, ultimately enhancing their overall mathematical learning experience. To the understanding of the current researcher is that the integration of formative assessments not only reduces anxiety related to high-stakes testing but also fosters a supportive learning environment that empowers learners to thrive in their mathematical endeavors.

Shute (2018) states that collaboration among peers in formative assessment strategies plays a vital role in enhancing Mathematics learning. When learners engage in group problem-solving responsibilities, they are not merely working together; they are participating in a rich dialogue that fosters mathematical discourse. The benefit is that this interaction allows learners to articulate their thought processes, share diverse perspectives, and collectively explore various approaches to problem-solving. As learners discuss their reasoning and strategies, they can identify gaps in their understanding and clarify misconceptions through peer explanations. This process not only enhances their mathematical skills but also builds essential soft skills such as

communication, teamwork, and problem-solving abilities, which are crucial for success in both academic and real-world contexts. Formative assessment practices that incorporate peer collaboration also create a more inclusive learning environment. (Shute, 2018). All in all, the integration of collaborative work among peers in formative assessment strategies significantly impacts Mathematics learning by enhancing discourse, fostering deeper understanding, promoting critical thinking, and creating an inclusive environment that encourages active participation. This therefore means that incorporating peer collaboration into formative assessment strategies not only enriches mathematics learning through better discourse and deeper understanding, but also cultivates foundational skills that prepare learners for success beyond the classroom.

This section has noted that formative assessment plays a pivotal role in improving learners' achievement by pinpoint areas of struggle for learners, allows for differentiation of teaching strategies, contributes to improved understanding, enhances self-regulation skills, clarifies misconceptions, inspires lively participation as well as reduction of anxiety. Furthermore, the positive impact of formative assessment on achievement is closely tied to learner motivation.

2.3 How Formative Assessment strategies relate to learners' motivation in primary school Mathematics.

Formative Assessment (FA) is a method of evaluating learning and teaching that provides immediate and specific feedback to improve learning and teaching (Stiggins, 2022). In primary school Mathematics, it has been found to enhance learner motivation and engagement. Luyt (2014) states that ongoing constructive feedback is one effective formative assessment strategy which helps learners understand their current performance and identify areas for improvement, thus enhancing learners' motivation.

Furthermore, Careless (2021) suggests that to enhance motivation through formative assessment, educators can develop a cycle of feedback, reflection, and improvement which will ultimately cultivate a classroom environment where motivation thrives. Teachers can utilize dialogues between teachers and learners, promoting a sense of belonging and support in the classroom. Recognizing and monitoring learners' progress encourages learners to take ownership of their learning and engage more deeply with the material. Positive feedback frames can reinforce learners' self-efficacy, leading to increased motivation and willingness to tackle difficult concepts.

Moreover, teachers can foster a collaborative environment through peer assessment, which enhances learner motivation by encouraging learners to engage with and support one another in their educational journeys. The feedback gained from peer assessment not only reinforces learning but also increase motivation (Jones, 2021). In agreement, topping (2019) found that collaborative learning environments, where learners assess each other's work, enhance engagement and motivation, as learners feel more connected to their peers and the learning process. This strategy promotes a collaborative learning environment where learners take an

active role in both their own learning and that of their peers. By engaging in peer assessment, learners not only receive feedback but also develop critical thinking and evaluative skills, which contribute to a deeper understanding of the subject matter. This collaborative approach fosters a sense of community in the classroom, motivating learners to engage more fully in their learning process (Topping, 2019).

Boyle and Charles (2018) note that one of the primary ways peer assessment increases motivation is through the establishment of a supportive learning environment. When learners assess each other's work, they often feel less pressure than when being evaluated solely by the teacher. This peer-to-peer interaction can make the process of giving and receiving feedback more approachable and less intimidating. As learners engage in discussions about their mathematical reasoning, they share different perspectives and strategies, which can enhance their understanding and appreciation of the material. This collaborative dynamic encourages learners to be more invested in their learning, as they feel supported by their peers and recognize that everyone is working towards common goals.

Moreover, Jones (2021) notes that peer assessment empowers learners by giving them a voice in the learning process. When learners participate in assessing their classmates, they gain a sense of ownership over their education. They become responsible not only for their own learning but also for contributing to the growth of their peers. This responsibility can lead to increased motivation, as learners recognize the value of their contributions and the impact they have on their classmates. For instance, when a learner offers constructive feedback that helps a peer understand a difficult mathematical concept, they experience a sense of accomplishment and connection to

the learning community. This empowerment fosters intrinsic motivation, as learners see their efforts as meaningful and impactful, enhancing their overall engagement in the subject. According to the present researcher's opinion, the implementation of peer assessment not only cultivates a supportive and collaborative learning environment but also empowers learners, enhances their motivation, and fosters a deeper connection to their educational journey.

Additionally, peer assessment encourages reflective practices among learners, which are crucial for motivation. When learners assess their peers' work, they must analyze and evaluate their own understanding of the concepts being discussed. This process prompts them to reflect on their learning strategies, recognize their strengths, and identify areas for improvement. By engaging in self-reflection, learners develop a growth mindset, where they view challenges as opportunities for learning rather than as setbacks. As they see their progress through constructive feedback from peers, they are more likely to feel motivated to continue striving for improvement in their Mathematics skills. Overall, the incorporation of peer assessment in formative practices creates a rich, interactive learning environment that fosters motivation and enhances learner engagement (Jones, 2021).

Thus, by fostering learner engagement through personalized learning experiences, educators can create a more dynamic and effective learning environment that encourages active participation and collaboration among learners. According to Tomlinson (2021), personalized learning experiences offered by the teacher can significantly enhance learner motivation, as learners feel their unique abilities and challenges are acknowledged. Personalized learning experiences significantly enhance motivation in Mathematics by catering to individual learner needs,

preferences, and interests. In a traditional classroom setting, a one-size-fits-all approach often fails to engage every learner, particularly in a subject like Mathematics, where learners may have varying levels of understanding and different learning styles. Personalized learning allows educators to tailor instruction based on each learner's unique strengths and weaknesses. For instance, a teacher can adjust the complexity of mathematical problems or provide resources that align with a learner's interests, making the learning experience more relevant and engaging. When learners feel that their individual needs are being addressed, they are more likely to be motivated to participate actively in their learning process.

Another key aspect of personalized learning highlighted by Boyle and Charles (2018) is the incorporation of learner choice and agency. When learners have a say in how they approach their Mathematics studies whether through selecting projects, choosing problem-solving methods, or determining their learning pace they become more invested in their education. For example, a learner interested in sports might engage more deeply with a project that involves statistical analysis of their favorite athletes' performances. This autonomy not only fosters intrinsic motivation but also encourages learners to take responsibility for their learning. By allowing learners to make choices, they develop a sense of ownership over their educational journey, which can lead to increased persistence and a willingness to tackle challenging concepts. The current researcher agrees that peer assessment not only promotes reflective practices that improve learners' understanding of mathematical concepts, but also cultivates a growth mindset and encourages them to see challenges as opportunities for improvement. Hence, by integrating personalized learning experiences and offering learner choice, educators can significantly

increase motivation and engagement, making mathematics more relevant and tailored to individual strengths and interests.

Furthermore, Boyle and Charles (2018) also note that personalized learning experiences often include regular feedback and opportunities for reflection, which are critical for maintaining motivation. When learners receive timely and specific feedback on their progress, they can identify areas of improvement and celebrate their successes. This feedback loop helps learners understand their growth trajectory and fosters a growth mindset, where they view challenges as opportunities for development rather than as obstacles. Additionally, incorporating self-reflection practices encourages learners to assess their own understanding and set personal goals. By recognizing their advancements and areas needing further work, learners become more motivated to engage with the material, work through difficulties, and achieve their learning objectives, ultimately leading to a more positive and proactive attitude toward Mathematics.

From the researcher's perspective, the body of literature above, supports the premise that formative assessment practices greatly impact learners' motivation in primary school Mathematics. By using feedback, goal-setting, peer collaboration as well as differentiation, educators can enhance learner engagement and foster a positive attitude toward Mathematics learning.

This confirms that ongoing feedback, peer assessment and personalized learning experiences enhance learners' motivation in Mathematics learning. Having explored how formative

assessment enhances learners' achievement and motivation, it is imperative to examine the predominantly used forms of FA that effectively facilitate the process.

2.4 Predominantly used forms of Formative Assessment in primary school Mathematics teaching.

Formative assessment is not merely a tool for measuring learner understanding; it is a dynamic process that informs instruction and fosters a responsive learning environment. The following are some of the forms.

Observational Assessments

Observational assessments are a vital tool in the Mathematics classroom, enabling teachers to monitor learners as they engage in various mathematical tasks (Stiggins, 2000). Stiggins (2022) states that observational assessments involves actively watching learners during both group work and individual activities, providing educators with immediate insights into learners understanding of the material. By observing how learners approach problems, the strategies they employ, and the questions they ask, teachers can gather real-time data that reflect each learner's level of comprehension and engagement. This direct observation allows for the identification of misconceptions or difficulties that may not be evident through traditional assessments, such as tests or quizzes. Consequently, observational assessments can highlight areas where learners may need additional support or instruction, thus enhancing the overall teaching strategy and informing instructional practice.

One of the primary advantages of observational assessments in Mathematics noted by Luyt (2014) is their ability to inform instructional practices. As teachers observe learners in action, they can assess not only the correctness of the answers but also the processes learners use to arrive at those answers. For example, if a teacher notices that several learners are consistently making the same error while solving word problems, this indicates a need for targeted intervention. Teachers can then adjust their lesson plans to revisit specific concepts, employ different teaching methods, or incorporate more hands-on activities to address these gaps in understanding. Ogunyeri (2015) concurs and states that when observational assessments are utilized effectively, they can lead to significant improvements in learner achievement by aligning instruction more closely with learners' actual learning needs. Hence fostering a more holistic understanding.

Moreover, Heritage (2020) mentions that observational assessments foster a more holistic understanding of learner learning in Mathematics. This is achieved by allowing teachers to see the dynamics of group interactions and how learners communicate mathematical ideas to one another. This collaborative aspect can be particularly beneficial, as it encourages learners to articulate their thought processes, engage in discussions, and learn from their peers. The insights gained from observing these interactions can inform not only individual instruction but also the overall classroom environment. By creating opportunities for peer learning and dialogue, teachers can cultivate a more engaging and supportive atmosphere that motivates learners to participate actively in their learning (Heritage (2020)). Ultimately, observational assessments serve as a powerful mechanism for enhancing both teaching effectiveness and learner engagement in Mathematics. Observations are increasingly being used in formative assessment,

complementing questioning techniques to encourage deeper understanding and critical thinking among learners. The current researcher is in agreement that observational assessments are a crucial element in the Mathematics classroom, providing teachers with immediate insights into learner understanding and engagement that traditional assessments may overlook. By leveraging these observations, educators can tailor their instructional strategies to address specific learning needs and foster a more collaborative and supportive learning environment.

Observational Assessments

Observational assessments involve teachers watching and recording learners' behaviors and interactions during mathematics activities. One of the primary strengths of this assessment method is its ability to capture real-time learning behaviors. Through observation, teachers gain valuable insights into how learners approach problem-solving, collaborate with peers, and apply mathematical concepts in practical situations. This approach fosters a deeper understanding of individual learner progress, allowing educators to tailor their instructional strategies to meet the diverse needs of their learners (Smith, 2018).

However, observational assessments also present certain challenges. A significant concern is the potential for observer bias, where a teacher's perceptions may be influenced by personal beliefs or expectations, potentially skewing the assessment results (Jones, 2018). Furthermore, the subjective nature of observations can lead to inconsistent evaluations, making it difficult to compare learner performance objectively. Consequently, while observational assessments can provide valuable insights into student learning, they should be used in conjunction with other

assessment forms to offer a more balanced and comprehensive view of learner progress. By integrating observational assessments with quantitative measures, educators can enhance their understanding of student performance and create more effective instructional strategies (Brown, 2018).

Questioning Techniques

Questioning techniques are essential tools in formative assessment, allowing educators to engage learners' actively, assess their understanding, and promote critical thinking through well-crafted, thought-provoking questions. Jones (2021) points out that effective questioning serves as a powerful formative assessment strategy in Mathematics education, fostering a deeper understanding of concepts among primary school learners. By utilizing open-ended questions, teachers can encourage learners to explore mathematical ideas more thoroughly rather than simply recalling facts or performing rote calculations. For instance, instead of asking a learner to solve a problem directly, a teacher might pose a question like, "Can you explain how you arrived at that answer?" This type of inquiry not only assesses a learner's understanding of the solution but also prompts them to articulate their thought processes, thereby enhancing their critical thinking and reasoning skills. Research shows that when learners are encouraged to explain their reasoning, they engage in higher-order thinking, which is essential for developing a robust understanding of mathematical concepts and problem-solving strategies (Heritage, 2020). It is therefore vital for teachers to incorporate effective questioning techniques in their teaching to ensure questioning is effective.

Mkhwanazi (2014) suggests incorporating wait time after asking a question as a vital component of effective questioning techniques. When teachers provide learners with sufficient time to think before responding, they allow for more thoughtful and considered answers. This practice is particularly important in Mathematics, where learners may need time to process information, organize their thoughts, and formulate a coherent response. Mkhwanazi (2014) has noted that increased wait time leads to longer and more complex responses, as learners feel empowered to delve deeper into their reasoning. This approach not only enhances individual learner responses but also enriches classroom discussions, as learners build upon each other's ideas and contribute to a collaborative learning environment. The dynamic exchange of ideas fosters a culture of inquiry where learners feel comfortable exploring and challenging mathematical concepts.

Moreover, Jones (2021) states that effective questioning techniques also help teachers gauge learner understanding in real-time, allowing for immediate instructional adjustments. By monitoring learners' responses to open-ended questions, educators can identify common misconceptions or gaps in understanding that may require further exploration. This formative feedback loop enables teachers to tailor their instruction to meet the specific needs of their learners, ensuring that no one falls behind. Additionally, when learners see that their contributions are valued and that their reasoning is taken seriously, they are more likely to be engaged and motivated to participate in future discussions. Ultimately, integrating effective questioning techniques into Mathematics instruction not only enhances learner learning but also cultivates a stimulating classroom environment where critical thinking and collaboration thrive (Jones, 2021). Questioning techniques enhance written assessments by identifying key learners understanding areas and misconceptions that should be addressed in the assessment design.

Hence the current researcher is of the opinion that effective questioning techniques are vital in formative assessment, as they actively engage learners, promote critical thinking, and provide educators with real-time insights into learner understanding. By incorporating strategies such as open-ended questions and sufficient wait time, teachers can foster deeper mathematical discussions and tailor their instruction to address misconceptions, ultimately enhancing the learning experience in the classroom.

Open-ended questions encourage learners to express their thoughts and reasoning freely. For example, asking, "How do you think we can solve this problem?" allows learners to explore various strategies, fostering creativity in mathematical thinking. (Smith, 2018). Probing questions prompt learners to clarify or expand on their answers, facilitating a deeper exploration of their thought processes. For instance, asking, "Can you explain why you chose that method?" helps teachers understand learners' reasoning and identify any misconceptions. This technique encourages learners to reflect on their choices and articulate their understanding, which can lead to more meaningful learning experiences (Johnson, 2018).

Nevertheless, poorly constructed questions may confuse learners or fail to elicit meaningful responses. It is essential for teachers to be trained in crafting questions that are age-appropriate and aligned with learning objectives to maximize the effectiveness of this assessment method. Inadequate questioning can hinder the learning process, leading to misunderstandings and disengagement among learners (Wilson, 2018).

Effective questioning techniques are fundamental to formative assessment, providing educators with tools to engage learners actively and assess their understanding in a meaningful way. By carefully considering the types of questions posed and their alignment with learning objectives, teachers can create an environment that fosters critical thinking and deeper mathematical reasoning.

Written Assessments and Exit Tickets

Written assessments, including tools like exit tickets consisting of a few targeted questions, serve as effective formative assessment strategies that allow educators to gauge learner understanding at the end of a lesson. These assessments provide teachers with immediate feedback on learners' grasp of the material, allowing for timely instructional adjustments (Dlamini, 2019). This quick assessment format enables educators to identify which concepts need further review and which learners may require additional support. Stiggins (2022) states that using exit tickets can significantly enhance learner engagement and motivation, as they offer a clear indication of learning progress and highlight areas for improvement. By focusing on key learning objectives, exit tickets help learners reflect on their understanding and reinforce their learning, contributing to a more effective educational experience. However, it is crucial that the questions on the exit ticket are carefully aligned with the learning objectives and pitched at an appropriate level of difficulty. Poorly designed questions may overwhelm or discourage learners, leading to inaccurate assessments of their understanding. It is imperative that teachers be able to efficiently analyze the responses to inform future teaching strategies.

Dlamini (2019) mentions that the effectiveness of exit tickets lies not only in their ability to assess understanding but also in their role in fostering a positive learning environment. When learners know that their responses will be reviewed and used to inform future lessons, they are more likely to engage actively in the learning process. This sense of accountability can motivate learners to put forth their best effort, knowing that their input directly impacts their learning trajectory. Additionally, exit tickets can serve as a tool for teachers to gauge the overall effectiveness of their instruction. By analyzing the responses collected from exit tickets, educators can identify trends in learner understanding and adjust their teaching strategies accordingly. This responsive approach to instruction not only supports individual learner needs but also enhances the overall classroom dynamic, promoting a culture of continuous improvement and learning. Exit tickets can complement peer assessment by providing a foundation for learners' to reflect on their learning and articulate their understanding, which peers can then evaluate and discuss to enhance collaborative learning.

While observational assessments, questioning techniques, and written assessments each offer valuable insights into learner learning, they also present challenges that educators must navigate. A balanced approach that combines these methods, along with careful consideration of their strengths and weaknesses, can lead to more effective formative assessments and ultimately enhance learner achievement in mathematics.

This therefore means that educators should utilize written assessments like exit tickets to gain immediate insights into learner understanding, enabling timely adjustments to their instructional strategies. By incorporating this feedback loop, teachers can foster a more accountable and

engaging learning environment that encourages continuous improvement and supports individual learner needs.

Peer Assessment

Peer assessment is an effective formative assessment strategy that involves learners evaluating each other's work, fostering collaboration and enhancing communication skills. In Mathematics, this approach can manifest in various ways, such as learners working in pairs or small groups to solve problems together (Grouws, 2016). After arriving at a solution, learners discuss their methods and reasoning with one another, which not only reinforces understanding of the mathematical concepts at hand but also allows the articulation of their thought processes. Hence peer assessment is crucial, as it encourages learners to clarify their ideas and confront any misconceptions they may hold. By explaining their reasoning to peers, learners deepen their own understanding and develop critical communication skills that are essential for collaborative learning. Peer assessment promotes a sense of ownership and accountability in the learning.

In addition to fostering collaboration and enhancing communication skills peer assessment promotes a sense of ownership and accountability in the learning process. Simelane (2018) states that when learners are tasked with evaluating their classmates' work, they become more engaged and invested in the assessment process. This involvement can lead to increased motivation, as learners recognize the value of their contributions and the impact they have on their peers' learning. Simelane (2018) states that when learners actively participate in assessing each other's work, they feel a greater sense of responsibility for their own learning outcomes. This intrinsic

motivation is particularly important in Mathematics, where learners often face challenges and may feel discouraged. By fostering a supportive environment where learners help one another, peer assessment can enhance overall engagement and persistence in learning.

Furthermore, Jones (2021) states that peer assessment provides valuable opportunities for self-reflection and metacognitive development. As learners evaluate their peers' work, they are prompted to think critically about the criteria for success and the quality of the mathematical reasoning presented. This process encourages them to reflect on their own understanding and performance, allowing them to identify areas for improvement. In support, Boyle and Charles (2018) mention that self-reflection, when coupled with peer feedback, can lead to enhanced learning outcomes and a better grasp of mathematical concepts. Therefore, by integrating peer assessment into the classroom, teachers can create a dynamic learning environment where learners not only learn from their peers but also develop essential skills that will benefit them throughout their educational journey and beyond. Peer assessment fosters a collaborative learning environment that encourages learners' to reflect on their own work, thereby enhancing the effectiveness of self-assessment as they consider both their peers' feedback and their own understanding of the material.

This therefore means that educators should actively incorporate peer assessment strategies into their teaching practices, as this approach not only enhances learner engagement and communication skills but also fosters a deeper understanding of mathematical concepts. By facilitating opportunities for learners to evaluate and discuss each other's work, teachers can

create a supportive environment that promotes intrinsic motivation, accountability, and self-reflection, ultimately leading to improved learning outcomes.

Self-Assessment

Peer assessment and self-assessment serve as complementary formative assessment strategies that encourage learners to reflect on their own learning while also evaluating the work of their peers. Ones (2021) states that self-assessment is a powerful educational strategy that encourages learners to take an active role in evaluating their own understanding of mathematical concepts. Further mentioning that by reflecting on their learning experiences, learners can identify what they know and what areas need improvement. This process can be effectively facilitated through the use of rubrics or checklists, which provide structured criteria for assessing their work. For example, a rubric might outline specific skills such as problem-solving, reasoning, and the ability to communicate mathematical ideas. When learners use these tools, they not only gain clarity on their performance standards but also develop a deeper understanding of the content, as they must think critically about how their work aligns with the established criteria (Jones, 2021).

In agreement, Heritage (2020) states that engaging in self-assessment fosters the development of metacognitive skills, which are essential for lifelong learning. Metacognition involves awareness and control over one's own learning processes, allowing learners to plan, monitor, and evaluate their understanding. As learners assess their own work, they learn to set realistic learning goals and reflect on their progress toward achieving them. This reflective practice helps learners recognize their strengths and weaknesses, enabling them to take ownership of their learning

journey. Research has shown that enhancing metacognitive skills through self-assessment leads to improved academic performance, particularly in subjects like Mathematics, where conceptual understanding is critical (Jones, 2021).

Apart from developing metacognition, Careless (2021) states that self-assessment can significantly increase learner motivation by making them more aware of their learning goals and progress. Further stating that when learners are actively involved in assessing their own work, they become more invested in their educational outcomes. This sense of agency is empowering; learners are more likely to engage with the material and strive for improvement when they see the direct impact of their efforts on their understanding. Additionally, the regular practice of self-assessment cultivates a growth mindset, as learners learn to view challenges as opportunities for development rather than obstacles. Overall, self-assessment not only enhances mathematical understanding but also instills a lifelong love of learning, as learners develop the skills necessary to evaluate and improve their own educational experiences (Jones, 2021). The researcher understands that peer assessment and self-assessment are complementary strategies that support reflection and critical evaluation of individual and peer learning in mathematics. By engaging in self-assessment, learners develop metacognitive skills and a greater sense of responsibility for their educational journey, which ultimately increases their motivation and academic performance.

This section noted that formative assessment methods like questioning, self-assessment and peer assessments provide valuable insights into learner learning, however, various barriers such as time constraints, lack of training, and insufficient resources can hinder teachers from effectively implementing these strategies in the classroom.

2.5 Contextual Factors to Effective Implementation of Formative Assessment in Primary School Mathematics

Formative assessment, despite its benefits, faces significant challenges in classroom implementation, widening the gap between theory and practice. Major barriers hinder teachers from effectively using these strategies, some of which are discussed below:

Time Constraints

Time constraints are a significant obstacle to implementing formative assessment in classrooms. Teachers often struggle with building consistent activities due to packed curriculums and testing schedules.

In a 2019 study in Atlanta by Sadler (2019), 20 Mathematics teachers identified time constraints as the most significant barrier. They felt it took too long to implement formative practices due to the numerous criteria to meet before the school term ended. The rapid changes in curriculum and standardized testing pressures make it difficult to find time for additional formative work without compromising core content coverage.

Bennett (2017) mentions that teachers recognize the potential of formative assessment to enhance learning, but investing too much time in rushing the curriculum leaves little opportunity for interactive feedback, surveys, learner discussions, and other valuable formative strategies from

the teacher's perspective. Teachers often have an overloaded curriculum to cover within a limited time frame. The current researcher agree because for example in Eswatini primary schools the mathematics Grade 7 book has 12 units with each unit comprising of 10 lessons this means that a teacher teaches a lesson a day and conduct formative assessment. In addition to that at the end of each unit a test must be conducted and timely feedback given. At the same time the subject is not taught every day and other activities like sports competitions that may disturb learning. This pressure can lead to prioritizing content delivery over formative assessment practices that require time to plan, conduct and analyze assessments. Effective formative assessment involves providing timely feedback to learners. However, if teachers are pressed for time, they may not be able to thoroughly check learner work or provide meaningful feedback, reducing the benefit of assessment. Furthermore, Implementing formative assessment such as group discussions or peer assessment typically requires time for learners to engage in meaningful dialogue about their learning. Rushed schedules can limit these opportunities for collaboration and prevent deeper understanding and reflection.

In addition to time constraints, other research suggests that class size is another major issue, as larger numbers of learners make formative practices such as individualized feedback and interactive discussions logistically more difficult.

Large Class Sizes

Assessing large numbers of learners takes considerable time, making it challenging for teachers to conduct formative assessments on a regular basis. This can lead to infrequent assessments and limited opportunities for timely feedback. In larger classes, learners may feel less inclined to actively participate in formative assessment activities such as group discussions or peer assessments. This can diminish the environment for collaborative learning that formative assessment is intended to foster. Formative assessment often involves group work or discussions, which can be more difficult to manage effectively in large classes. It can be challenging for teachers to facilitate meaningful interactions between learners, limiting the benefits of peer review. Hence, the current researcher is of the opinion that large class sizes can significantly hinder the effectiveness of formative assessment, impacting both the quality of feedback learners receive and the overall learning experience.

The implication is that formative approaches that require close monitoring of learning at the individual level appear to be ruled out by class overload. Shannon (2016) points out that in large classes, teachers do not even remember names, so the intimacy between teachers and learners is reduced, and learners are actively involved in the learning process, providing a space where learners can hide in crowded classrooms. Nicole (2017) also noted that in the past, when learner numbers were small, written feedback was part of a large-scale adaptive learning system. As learner numbers increased, written comments became disconnected from this supportive context. This led to dissatisfaction with learner and teacher feedback, as teachers often spent a lot of time carefully composing feedback comments that were not generated by learners. They often seem affected by the feedback provided. Despite class size, written assessment feedback should be

interactive and reflective (Nicole, 2010). The conclusion is that formative approaches that require close monitoring of learning at the individual level appear to be precluded by class overload. Based on the research and the researcher's own experience, the barriers reported in these studies are very noticeable when working with classes of 50 learners. Large classes require sufficient resources, which is difficult in public school systems.

Lack of resources

Inadequate provision of necessary human and material resources appears to be a real and problematic barrier to the use of valuable formative assessment methods. In a study by (Awang and Zakaria (2019) in Nigeria, questionnaires were distributed to 100 Mathematics teachers , who reported a lack of materials needed for formative work, such as a learners workbooks, exercises for writing , response system(“clicker”), self- and peer-assessment forms, and technology for online feedback. The lack of appropriate instructional tools compromised the implementation of valuable strategies. In another study by Mlotshwa (2022) in Eswatini uncovered that Eswatini faces a significant barrier in education, particularly in terms of resources, particularly human, financial and material resources. The study noted that teachers are not posted to schools in time, textbooks are not delivered in time and the Free Primary Education grant is not paid timely for example learners go for a whole school term without all these resources. This lack of resources hinders the implementation of diverse assessment strategies and learners' engagement with the curriculum. Similarly, in a study of 30 classrooms in Ghana, Akpan (2017) identified persistent deficiencies in the materials, conference guides, learner work

samples, and other supports needed to assess formative activities through in-class observations. As a result, formative learning has suffered. Research has shown that when teachers lack adequate resources in areas such as teaching materials and technology, this can negatively impact their ability to acquire new knowledge and stay current with best practices. Without adequate resources, professional development opportunities may not be accessible or relevant.

This research notes that without the necessary resources like books and teacher's guides, teachers struggle to design assessments that reflect current content and pedagogical approaches, leading to outdated methods. Furthermore, the limited financial resources also restrict schools from investing in essential teacher training on formative assessment techniques and purchasing required teaching material. This resource gap not only impacts the quality of education but also diminishes the potential for formative assessments to enhance learner learning outcomes, perpetuating educational inequities. Apart from lack of resources, the effective implementation of formative assessment strategies in the classroom can also be hindered by insufficient knowledge and training among educators.

Lack of knowledge

In addition to issues related to resource availability, research has demonstrated that gaps in teacher knowledge can be a challenge in effectively implementing formative assessment. Jones (2021) states that when educators do not understand core assessment concepts and strategies, this negatively impacts their ability to appropriately design and use a variety of formative assessments.

Shute (2018) points out that the lack of knowledge among educators about formative assessment practices hinders their effective implementation in classrooms. Many teachers lack adequate training in designing and utilizing formative assessments, leading to misconceptions about their purpose and value. This leads to reliance on traditional summative methods, which fail to provide timely feedback. Teachers also struggle to integrate various formative assessment techniques, such as questioning strategies, peer assessments, and exit tickets, into their teaching, limiting their ability to foster a responsive and adaptive learning environment (Shute, 2019). This therefore means that addressing this gap through professional development and training is crucial for empowering educators and enhancing the effectiveness of formative assessment.

Singh (2015) conducted a study on barriers to formative assessment in school science in London, revealing that a lack of knowledge regarding formative assessment practices significantly impedes effective implementation. The researcher notes that this issue is particularly pronounced in Eswatini, where teachers often have to teach multiple subjects, including Mathematics, science, and languages, without specialized training in formative assessment methodologies. Many educators in Eswatini may not fully understand the principles of formative assessment or how to design assessments that genuinely reflect learner's learning and inform instructional adjustments. As a result, they might rely on traditional assessment methods, which do not provide the timely feedback necessary for fostering learner growth. This is exacerbated by the fact that government post teachers with Bachelors of Arts to teach in primary schools without any qualification in education who are in turn expected to teach varied subjects.

Dlamini (2019) notes that the challenge of teaching diverse subjects can lead to a superficial approach to assessment, where teachers may prioritize content delivery over meaningful evaluation of learners' understanding. This lack of knowledge and training in formative assessment strategies not only limits the effectiveness of teaching practices but also hinders learners' ability to engage deeply with the material. Hence, addressing this gap through targeted professional development and resources tailored to the unique context of Eswatini is essential for empowering teachers to implement formative assessment effectively across all subjects, ultimately enhancing educational outcomes for learners'.

This section has noted that the workload of primary school teachers, who handle a variety of responsibilities including lesson planning, grading, classroom management, and mental and personal development in large classes and insufficient training also affects the implementation of formative assessments. Additionally, teachers teach multiple grade levels, each with its own unique learner population and curriculum requirements. Such workloads can be burdensome and drain teachers' energy, hence the need for the implementation of effective strategies that can enhance formative assessment.

2.6 Strategies primary school Mathematics teachers can use to enhance formative assessment.

This section examines effective strategies that primary school Mathematics teachers can implement to enhance formative assessment, promoting a more responsive and engaging learning environment for their learners. Some are discussed below:

Self-assessment and peer assessment

According to Earl (2016) self-assessment and peer assessment are integral components of formative assessment in Mathematics education, providing learners with opportunities to reflect on their own learning, evaluate their progress, and receive feedback from their peers. Earl (2016) states that by engaging in self-assessment and peer assessment activities, learners can take ownership of their learning, develop metacognitive skills, and enhance their understanding of mathematical concepts through collaborative interactions.

According to Siebörger (2014), learners can be involved in classroom assessment by allowing them to assess their own projects and those of others or any work according to criteria drawn up by teachers and learners in collaboration. McMillan (2011) argues that self- and peer-assessment lead learners to reveal their attitudes and beliefs about themselves and their classmates. Earl (2016) argues that learners should be valued participants in their learning. By this, Earl (2016) means that they should identify gaps in their learning and find solutions to their problems by anticipating constructive feedback and feedback from themselves and colleagues.

According to Nicole and Macfarlane-Dick (2006), self-assessment and peer assessment are effective formative assessment strategies that promote learner engagement, motivation, and learning autonomy. By involving learners in the assessment process, teachers can empower them to take an active role in their own learning, improve their academic performance, and develop a deeper understanding of mathematical concepts. Incorporating collaborative strategies like Think-Pair-Share can further enhance learner engagement and understanding in the learning process.

Think Pair Share

In addition to self and peer assessment, teachers can use think pair share as an instructional strategy that promotes collaborative learning by guiding learners through a structured process of individual thought, partnered discussion, and group sharing. Developed by Frank Lyman in 1987, this method encourages learners to think about a specific question or prompt on their own, enhancing their confidence and preparing them for meaningful interactions (McTighe and Wiggins, 2012).

McTighe and Wiggins (2012) explains that the pairing phase involves learners discussing their thoughts with a partner, which deepens understanding and develops social and communication skills. Partners can challenge each other's assumptions, clarify concepts, and build upon each other's insights, leading to a richer comprehension of the material. This fosters a sense of community in the classroom, where learners feel valued and supported in sharing their

perspectives.

After the paired discussions, learners share their insights with the larger group, promoting a broader understanding among all learners'. Feedback from peers during this stage can significantly enhance learning, as learners are more likely to remember and internalize concepts discussed in a collaborative context. Teachers play a crucial role in facilitating the discussion and highlighting key points raised by learners', ensuring important concepts are reinforced and clarified (McTighe and Wiggins, 2012).

In support, Hattie and Timperly (2017) teachers can monitor learners understanding in real-time by observing pair discussions and listening to group shares. This formative assessment aspect enables teachers to tailor their teaching strategies to meet the diverse needs of their learners'. Effective formative assessment practices, such as Think-Pair-Share, lead to improved learning outcomes by creating opportunities for ongoing feedback and adjustment in the learning process. By integrating digital tools and applications into formative assessment practices, teachers can further enhance real-time monitoring of learner understanding, making the learning process more interactive and engaging.

Digital tools and Application

Digital tools and applications such as Kahoot, Quizizz, and Google Forms have revolutionized the landscape of formative assessment in educational settings. These platforms enable teachers to create interactive quizzes and surveys that not only assess learners' understanding but also provide instant feedback. According to Wu (2019), the use of such digital tools enhances learner engagement by making learning more interactive and enjoyable, thus promoting a more active learning environment. The gamified elements of platforms like Kahoot and Quizizz transform traditional assessment methods into competitive games, motivating learners' to participate and focus on the learning objectives at hand.

One of the key advantages of using digital tools for formative assessment is the immediate feedback they offer. Instant feedback allows learners' to understand their performance in real-time, helping them identify areas of strength and those needing improvement. This immediate response is essential for promoting a growth mindset, as it encourages learners' to view mistakes as opportunities for learning (Dweck, 2016). Furthermore, teachers can utilize this data to adjust their instruction promptly, tailoring lessons to address common misconceptions or knowledge gaps identified through the assessments. The ability to analyze results quickly and effectively makes digital tools invaluable for formative assessment.

Additionally, platforms like Google Forms allow for more extensive and varied assessment types, including open-ended questions that encourage critical thinking. Teachers can design assessments that not only evaluate factual knowledge but also assess higher-order thinking skills by incorporating scenarios or problem-solving tasks. According to Popenici and Kerr (2017), such assessments help educators gauge learner understanding more holistically. By integrating

diverse question types, teachers can create a richer assessment experience that fosters deeper learning and understanding among learners. However, the current researcher has noted that teachers in Eswatini often show resistance to integrating technology into formative assessment due to a lack of adequate training and resources. This reluctance not only hinders the potential for improved learning experiences, but also perpetuates traditional assessment methods that may not effectively measure learner progress.

Building on the use of digital tools and apps, project-based learning emerges as another powerful strategy that teachers can employ to enhance effective formative assessment, allowing learners' to apply their knowledge in practical, real-world contexts.

Project Based Learning

Project-Based Learning (PBL) is an instructional approach that encourages learners' to explore real-world problems and challenges through hands-on projects, presentations, and creative works such as budgeting for a school farewell function or conducting a school survey and analyzing data (Barron and Darling-Hammon, 2018). This method promotes active learning and critical thinking, allowing learners to apply their knowledge in practical contexts. Hattie and Timperly (2017) states that integrating formative assessments into PBL allows educators to provide ongoing feedback, helping learners refine their ideas and improve their skills. PBL enhances learners engagement and fosters deeper understanding by requiring learners to investigate and synthesize information.

Thomas (2010) states that one of the primary benefits of integrating formative assessments is the opportunity for learners' to demonstrate their understanding in diverse ways, such as presentations, reports, and creative artifacts. This comprehensive approach captures both mastery of content and practical application of knowledge, fostering critical skills like collaboration, communication and problem solving.

Feedback is a powerful influence on learning, making it essential for educators to provide timely and constructive input throughout the project. The collaborative nature of PBL often leads to increased peer interaction, enhancing learning and building a sense of community within the classroom. As learners' collaborate, they learn to articulate their thoughts and listen to diverse perspectives, fostering essential interpersonal skills. Incorporating formative assessments into PBL creates a dynamic and supportive environment that enhances learner understanding and prepares them for future academic and career challenges (Hattie and Timperly, 2017).

2.7 Summary

This chapter provided an exploration of the theoretical foundations of formative assessment and its impact on primary school mathematics learners. The literature review highlighted the significant relationship between formative assessment and learners' achievement and motivation, particularly noting that these practices notably enhanced mathematics achievement among Grade 7 learners. Key findings indicated that regular feedback and opportunities for self-assessment were essential components of effective formative assessment. Learners who participated in

formative assessment interventions showed meaningful improvements in their mathematical skills and understanding over time, underscoring the effectiveness of such practices in educational settings.

The chapter also underscored the positive the impact of formative assessment on learners' motivation in mathematics. Strategies like goal-setting and progress monitoring were identified as effective means to boost intrinsic motivation and engagement with the subject. Learners reported increased confidence and motivation when formative assessment practices were actively employed in the classroom. The review also addressed barriers that hindered teachers from effectively implementing these assessments, such as time constraints, limited resources, and inadequate training. The findings highlighted the urgent need for systemic improvements in educational practices. Moreover, the chapter discussed various strategies for enhancing formative assessment, emphasizing the importance of a supportive classroom culture and professional development for teachers. Ultimately, these insights laid a strong foundation for the study's methodology, informing the research design and data collection instruments focused on the impact of formative assessment on Grade 7 learners in the context of Eswatini. The subsequent chapter is on research methodology.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

The previous chapter outlined the theoretical framework through, which the gaps to be filled were observed. This chapter describes the methodological approach used for the investigation of the impact of formative assessment on the achievement and motivation of primary school learners in Mathematics in Emphini cluster schools in Eswatini. The chapter discusses the research paradigm on which the study is based, the chosen research approach and design, target population and sampling techniques, data collection tools and procedures for data generation, management, presentation and analysis. The justification of these methodological choices will be discussed, their suitability for solving research questions will be emphasized and its contribution to a deeper understanding of the complex relationship between formative assessment and learner achievement and motivation in the Eswatini context.

3.1 Research paradigm

This study is grounded in the constructivist paradigm, which posits that learners actively construct their own knowledge and understanding through experiences and interactions with their environment (Bruscia & Lentz, 2018). Constructivism underscores the need for educational

strategies that encourage active participation of learners through inquiry, problem solving, and critical thinking. In formative assessment, this translates into using approaches that encourage learners to actively engage with content such as peer assessment, self-assessment and project learning, allowing educators to measure understanding through participation rather than rote memorization (Bruscia & Lentz, 2018). In the context of this research, the constructivist paradigm emphasizes the importance of understanding learners' perspectives and experiences of formative assessment in mathematics education. Constructivists believe that learners' prior knowledge and experiences significantly influence how they learn new information. Learning is seen as a process of connecting new ideas with existing cognitive frameworks. Understanding learners' backgrounds and prior knowledge is essential in formative assessment. By assessing these factors, educators can tailor instruction to meet learners where they are and facilitate deeper understanding.

Knowledge is understood as a collective construction, shaped by social interactions and cultural contexts. Learning is often enhanced through peer collaboration and dialogue. In formative assessment, incorporating peer assessment and collaborative learning activities can provide insight into learner understanding and foster a richer learning environment. By adopting a constructivist lens, this study aims to capture the complexity and subjectivity of learners' experiences and explore how formative assessment practices can be designed to support learner's active construction of mathematical knowledge and understanding.

Constructivism was the most appropriate paradigm for examining the impact of formative assessment on learner's achievement and motivation in mathematics because it emphasizes the

active role of learners in constructing their understanding through experience and reflection. Unlike positivism, which reduces complex learning interactions to quantifiable variables and ignores contextual factors, or post-positivism, which still favors objective measurement over subjective experience, constructivism focuses on learner-centered approaches that recognize the importance of social interactions and dynamic learning processes. This framework allows for a deeper exploration of how learners engage with feedback from formative assessments, fostering intrinsic motivation and adaptability to individual needs. Constructivism captures the complexity of how formative assessment affects both academic achievement and learner engagement in mathematics, providing a comprehensive understanding of this critical educational practice.

By using a case study design and data collection methods such as interviews, observations and questionnaires, this research effectively captured the complexity of learners' experiences and the processes by which learners construct knowledge. This approach was not only consistent with the principles of constructivism, but also increased the relevance and depth of research findings, facilitated deep, personal insights into learners' experiences and interpretations and allowed the researcher to explore the active role of individuals in knowledge creation.

3.2 Research Approach

The study considered a mixed method approach, which is the consideration of both the qualitative and quantitative approaches. Denzin and Lincoln (2011) define a mixed method approach as a procedure for collecting, analyzing and incorporating quantitative and qualitative methods in a single study to understand a phenomenon better. Semi-structured interviews were

conducted to explore learners, experiences and perceptions regarding formative assessments. Questions focused on learner's understanding of the assessment strategies and social interactions in learning. Thematic analysis were employed to identify patterns and themes within the interview data. This involved coding the data to capture key ideas and organizing them into coherent themes that address the research questions. Structured questionnaire were distributed to measure specific variables, such as learner attitudes towards formative assessment and self-reported learning outcomes. The questionnaire included Likert-scale items and demographic questions.

Descriptive statistics summarized the data. The findings from qualitative and quantitative analyses were integrated during the interpretation phase. Qualitative themes were compared with quantitative results to see how they align or diverge, providing a fuller picture of the research phenomenon. A mixed methods approach enhances the case study design by providing a multifaceted view of the research phenomenon, allowing for in-depth exploration of individual experiences alongside broader trends. This integration ensures that the complexity of real-life contexts is captured, facilitating a comprehensive understanding of how formative assessment impacts learning outcomes. The case study design is inherently suited to the mixed-methods approach. It allows for an in-depth exploration of a specific context, accommodating the complexity of real-life situations. By employing a mixed-methods strategy within a case study framework, the research enhanced validity through triangulating data from multiple sources as it reduces the impact of biases that may arise from relying on a single methodology.

3.3 Research design

The study utilized a Convergent Parallel Design under the mixed-methods approach, allowing for the concurrent collection and separate analysis of both qualitative and quantitative data to provide a comprehensive understanding of the impact of formative assessment on Grade 7 learners' mathematics achievement and motivation. Quantitative data were collected through structured questionnaires administered to a sample of Grade 7 mathematics teachers and their learners. This instrument consisted of closed-ended questions to gather demographic information, frequency of formative assessment use, and specific assessment types, as well as Likert scale questions to measure learner perceptions regarding formative assessment's impact on their achievement and motivation. The questionnaires focused on academic performance indicators, such as grades and test scores, and assessed learner attitudes towards mathematics and self-efficacy in learning. Qualitative data were gathered through semi-structured interviews with a subset of teachers and learners from the questionnaire sample, designed to elicit in-depth responses about their experiences with formative assessment. Key areas of focus included the types of formative assessments used in the classroom, perceived effectiveness on learner engagement and motivation, and challenges faced in implementing these practices. Quantitative data analysis involved statistical methods, including descriptive statistics to summarize responses to examine the relationship between formative assessment practices and learner achievement. Qualitative data were analyzed using thematic analysis to identify key themes related to teacher practices and learner perceptions. After separate analyses, the findings from both data sources were merged to facilitate comparison and contrast, enhancing the validity and credibility of the

findings through triangulation. This convergent parallel design was particularly suitable for this study as it enabled a comprehensive exploration of the impact of formative assessment from multiple perspectives, providing a robust framework for understanding the interplay between quantitative achievement data and qualitative motivational insights. By employing questionnaires, observation and interviews, the research aimed to yield valuable insights into the effectiveness of formative assessment in Grade 7 mathematics education, ultimately informing teaching practices and educational policies aimed at enhancing learner learning outcomes

The convergent parallel design utilized in the study presented both merits and demerits. One of the primary advantages was its ability to provide a comprehensive understanding of the research problem. By collecting both qualitative and quantitative data concurrently, the design allowed for a holistic view of the impact of formative assessment on learner achievement and motivation. This integration enhanced the validity and credibility of the findings through triangulation, as comparing results from qualitative and quantitative analyses confirmed patterns and trends, leading to more robust conclusions. Additionally, the flexibility of this design enabled researchers to explore various aspects of the phenomenon simultaneously, facilitating the investigation of complex relationships and interactions that might not have been apparent through a single method (Edmonds and Kennedy, 2016).

The richness of data collected through qualitative methods further contributed to the study's depth, illuminating the subjective experiences and perceptions of participants. This context provided valuable insights into the numerical data obtained from quantitative measures, leading to more nuanced interpretations of the results. Moreover, the convergent parallel design was

particularly effective for this mixed-methods study, as it leveraged the strengths of both qualitative and quantitative approaches, making it ideal for educational research where both types of data were essential.

However, the design also had its challenges. One significant drawback was its resource intensity; the simultaneous collection and analysis of both qualitative and quantitative data required considerable time and skill. The complexity of integrating qualitative and quantitative findings posed another challenge, as the researcher needed to navigate the differences in data types and ensure that the integration enhanced rather than obscured the overall findings. Additionally, there were instances where qualitative and quantitative data yielded conflicting results, complicating the interpretation of findings and necessitating further analysis to reconcile these discrepancies.

Furthermore, the design required the researcher to possess expertise in both qualitative and quantitative methodologies to implement it effectively. A lack of proficiency in one area could hinder the overall quality of the research. Lastly, the subjectivity inherent in qualitative analysis introduced the potential for bias, which could affect how qualitative findings were interpreted in relation to quantitative data. Thus, the researcher had to remain vigilant in minimizing such biases throughout the study. Overall, while the convergent parallel design offered significant advantages for understanding complex educational phenomena, it also presented challenges that required careful management.

3.4 Population, sample and sampling techniques

3.4.1 Population

The study population was (185) Grade 7 learners and 10 Grade 7 teachers from the four primary schools.

3.4.2 Sample size

School	Leaners	Teachers
A	51	2
B	53	3
C	50	3
D	31	2
Total	185	10

3.4.3 Sampling Technique

Two distinct sampling techniques were used to select participants from four schools for the study involving 7th grade mathematics: census sampling for learners and purposive sampling for teachers.

Census sampling for learners involves selecting all individuals within a specific population. In this case, all 7th grade learners from the four selected schools were included. This technique ensures that the data is representative of the entire cohort of Grade 7 learners, allowing for a comprehensive understanding of their experience and performance in Mathematics. Including all learners minimizes the risk of selection bias because each learner has an equal chance of inclusion. The researcher got a list of all 7th grade learners from each school. Collected

demographic information to ensure diversity (e.g., gender, socioeconomic background). Participation was confirmed from all learners through consent forms signed by legal guardians. Each school had an average of 50 learners in Grade 7. So the total sample size was 185 learners.

3.3.5 Purposive Sampling for Teachers

Purposive sampling was used for selecting teachers. Only teachers who taught 7th grade math were included in this study. This method ensured that the selected teachers had relevant experience and knowledge in teaching 7th grade Mathematics, thus increasing the quality of the knowledge gathered. By purposefully selecting teachers, the study focused on obtaining in-depth qualitative insights that were directly applicable to the research objectives.

The researchers identified and listed all teachers who taught 7th grade math at the four schools. They assessed their qualifications and teaching experience to ensure they met the inclusion criteria. Selected teachers were then approached to agree to participate in the study. Interviews were conducted to gather data.

By including all learners, the sample reflected the actual 7th grade learner population in these schools, reducing the likelihood of sampling bias and ensuring that demographic diversity was represented. Although purposive sampling might have introduced some bias due to subjective teacher selection, this was mitigated by clear inclusion criteria that focused solely on grade 7 mathematics teachers. This approach allowed for a targeted understanding of the teaching context and practices, which was critical to the aims of the study.

The selection of 7th Grade mathematics learners and their teachers from four schools was strategically aligned with the study's focus on formative assessment in mathematics education. Grade 7 represented a critical transition point in the curriculum where basic concepts were consolidated and more complex mathematical ideas were introduced. By concentrating on this specific group, the study gathered targeted insights into the effectiveness of formative assessment practices at a key stage in learners' mathematical development.

Purposive sampling was particularly appropriate for this study because it allowed the researcher to select participants who possessed specific characteristics relevant to the research questions. By selecting only mathematics teachers and Grade 7 learners, the data collected directly reflected the experiences and perspectives of those most affected by formative assessment practices. This sampling strategy increased the depth of the findings by targeting individuals who could provide valuable insights into the teaching and learning processes specific to mathematics at this educational level.

While purposive sampling provided targeted insights, it also carried the potential for sampling bias. The findings might not have been generalizable to all 7th grade mathematics learners and teachers, as selected schools may have had unique characteristics, such as different socioeconomic backgrounds, teaching methodologies, or institutional resources. This limitation was acknowledged, as it could affect the wider applicability of the results. However, the aim of the study was to gain a deep understanding of the specific practices and experiences that purposive sampling effectively facilitated, despite its inherent biases.

3.5 Data Collection Instruments

An interview guide, an observation checklist and a questionnaire were used to generate data.

3.5.1 The interview guide

According to O`Leary (2004) semi-structured interviews are a qualitative data collection method that combines the flexibility of open-ended questions with a focus on structured formats. This approach allowed interviewers to explore specific topics while allowing participants to express their thoughts and experiences in depth. Introductory questions began with general rapport-building questions (e.g., “Can you tell me about your background in teaching mathematics?”). Core Questions focused on key research topics (e.g., “What teaching strategies do you find most effective for 7th grade math?”). Probing questions (e.g., “Can you give an example of a successful lesson plan?”) then closing questions focused on participants to share any additional thoughts (e.g. “Is there anything else you would like to add about teaching mathematics?”). A quiet room (counselling room) at schools was used to ensure confidentiality and minimize disruption. Each interview lasted between 30 and 60 minutes, allowing participants to express their views. To ensure consistency, the researcher developed of a standardized interview guide to ensure all interviewers cover the same topics and questions.

Pilot interviews were conducted in nearby schools that were not part of the study to refine questions and establish a clear understanding of the interview process. Interviews were audio-recorded with researchers’ cellphone with the participants’ consent, ensuring accuracy in capturing responses. In addition to audio recordings, the researcher took notes to highlight key

points or non-verbal cues during the conversation. Audio recordings were transcribed verbatim to ensure that all responses are accurately documented. Once transcribed, the data was be checked for accuracy by comparing the transcripts with the original recordings.

3.5.2 Questionnaires

Questionnaires are a widely used quantitative data collection method that enables researchers to gather structured information from a large number of respondents efficiently. This method is particularly effective for collecting data on attitudes, behaviors, and demographic information (Creswell, 2014).

A structured questionnaire was developed as one of the primary data collection tools for this study. The questionnaire was designed to collect information from primary school learners about their experiences with formative assessment in mathematics education. It consists of six main questions covering both closed and open response formats that capture both quantitative and qualitative data.

The questionnaire is divided into several key areas: Learners' attitudes towards mathematics. Perceptions of teacher support and its impact on performance. Motivation in relation to teacher intervention. Frequency of evaluation activities .Preferred Assessment Strategies. Experience with different forms of formative assessment.

This tool directly addresses the research questions: capturing learners' perspectives on different formative assessment methods used in mathematics classes. Examining the relationship between

formative assessment practices and learner performance. Examining how formative assessment practices affect learner motivation. Identification of potential barriers to effective implementation of formative assessment from the learner's perspective

The questionnaire uses several response formats: answers on a Likert scale (5-point scale from strongly agree to strongly disagree), dichotomous yes/no questions, open explanatory sections more choice, frequency rating scale (always/sometimes/never).

This mixed format allows for both quantitative analysis of trends and patterns while providing learners with the opportunity to elaborate on their experiences and preferences through qualitative responses. The questionnaire was designed to be completed by learners during a regular class time, taking approximately 20 - 30 minutes to complete. Clear instructions and simple language were used to ensure elementary school level understanding. For validity and reliability purposes, the instrument was pilot tested on a small sample of learners to ensure the clarity of the questions and the appropriate language level. It was also reviewed by subject matter experts to ensure content validity and alignment with the research objectives.

Krishna (2016) points out that the merits of a questionnaire are that it generates a large amount of data in a short period of time. Further, it is effective when opinion is taken into consideration from a lot of users, it is easy to manage and quantify the data. All the above merits were witnessed in this study. A large amount of responses was generated in a short period of time. It was effective when opinion was taken into consideration from a lot of users. It was easy to manage, and quantify the data. Krishna (2016) argues that the demerits of a questionnaire are that

providing false information is a very common thing that happens. For example, because sometimes informants tend to give opinions on crucial matters without giving proper thought to the questions asked.

3.5.3 Observation

The researcher was a participant observer as she assumed an active role in the learners' activities in the classroom with emphasis on formative assessment. This enabled her to get important information from the learners as well as the teachers. The aspects which were of importance in the observation were the learners' participation during the lessons and more importantly how they were performing when the teachers were implementing formative assessment and how best the teachers were doing this. The learners were observed in their different activities and observation notes were recorded.

According to Dörnyei (2007, p. 178), classroom observation “provides direct information rather than self-reported accounts.” In this study, the researcher conducted direct observations of both learners and teachers across four schools, allowing for a nuanced understanding of classroom dynamics. The observations focused on various lessons, on Mathematics to capture a broad spectrum of interactions and teaching strategies. In total, the researcher observed 12 lessons, with three lessons in each school.

These observations enabled the researcher to gain valuable insights into learners' actual participation levels, engagement, and the nature of interactions between teachers and learners. By

witnessing firsthand how teaching methods were implemented and how learners responded, the researcher was able to enrich the findings of the study significantly. This direct approach provided a clearer picture of the educational environment, revealing patterns of behavior and interaction that self-reported accounts might not fully capture. Overall, the observational data served to enhance the study's validity and depth, offering a richer context for understanding the dynamics of learning in these classrooms.

The merits of observation was that it was an unobtrusive method. In fact there were settings and types of behavior, which could not be studied through other more blatant methods. Another advantage associated with observational research lied on its flexibility to yield insight into new realities or new ways of looking at realities. The researcher was able to observe certain information like learners' behavior that would not be possible to get during interviews (Denzin& Lincoln, 2000). Leedy and Ormrod (2001, p. 158) claim that the primary advantage of conducting observations is its flexibility in that the researcher can easily change focus as new data comes to light. This was applicable in this study.

The demerits were that when using observation the researcher had to wait for a particular scene to happen. One disadvantage of observation was that the researcher found it difficult to develop rapport with individuals (Creswell, 2005, p.211). This was mainly because of the large number of learners. Another disadvantage was that the researcher's presence could have altered what learners said and did. Another disadvantage was that the problems of the past were not studied by means of observation.

3.6 Piloting

A pilot test was conducted with a small group of respondents meant to be representative of the target population. This process helped identify any issues with question clarity, format, and overall flow of the questionnaire. Feedback from the pilot test was used to refine questions to ensure they accurately measure the intended constructs. Collected data was stored securely, with access restricted to the researcher. Data was anonymized to protect participant confidentiality, ensuring that individual responses cannot be traced back to specific respondents. The results of the pilot study showed that although the overall structure of the instruments was sound, several modifications were necessary to increase their effectiveness. One significant issue identified was that some learners felt overwhelmed by the length of the questionnaire, which may have affected their engagement. To address this issue, the instruments were shortened by removing redundant questions and ensuring that each item was central to the research objectives.

To assess the validity of the instruments, the research used content validity techniques where mathematics education experts reviewed the revised questionnaires and interview guides to ensure that the items accurately represented the constructs of formative assessment, achievement, and motivation. For reliability, a test-retest method was implemented during the pilot phase, where the same group of participants completed the questionnaires twice, with a two-week interval between administrations. The results showed a strong correlation, indicating that the tools produced consistent results over time.

Overall, the pilot process proved to be a key step in improving the quality of the research tools. The strategies used to assess validity and reliability allowed for a more sophisticated and

effective set of tools to measure the impact of formative assessment on 7th grade learners' mathematics achievement and motivation. A pilot study on the impact of formative assessment on the results and motivation of 7th grade learners in mathematics was conducted in order to ensure the validity and reliability of the research instruments. The pilot study included a sample of 30 participants, consisting of 25 7th grade mathematics learners and 5 teachers from local schools. Specific procedures included the administration of structured questionnaires and conducting semi-structured interviews with participants. Methods of collecting feedback included both qualitative and quantitative approaches; participants were asked to fill out a feedback form immediately after using the questionnaires, which included Likert-scale items assessing clarity, relevance, and comprehensibility. In addition, interviews were conducted to gain in-depth insights into participants' experiences with the tools, focusing on areas such as ease of use and appropriateness of questions.

Feedback from the pilot study was instrumental in refining the research instruments. Analysis of the questionnaires revealed that some questions were confusing or not sufficiently aligned with the objectives of the study. As a result, these questions were reworded for clarity and modified to better reflect the specific aspects of the formative assessment under investigation. The interviews provided rich qualitative data that highlighted the need for more context-specific questions related to the types of formative assessment used in classrooms. Subsequently, new questions were added to capture these nuances.

3.6 Data Presentation

Interview data was presented through thematic analysis, where the data was organized into key themes derived from the interview responses. Each theme identified from the interviews, such as forms of formative assessment and influences on motivation, was clearly outlined. Supporting quotes from participants were included to illustrate each theme, followed by insights and interpretations that linked the themes back to the research questions. For the questionnaire data, frequency tables and percentages were used as the presentation method, with data compiled into frequency tables for each question. Basic demographic information, including age and gender, was presented as descriptive statistics. For each questionnaire item, a frequency table showing the distribution of responses was provided, accompanied by a percentage breakdown to highlight key findings. Patterns in the data were analyzed, discussing how they related to the themes identified in the interviews and the overall research objectives. In terms of observation data, qualitative descriptive analysis was employed, with observational data described in narrative form, highlighting key behaviors and interactions observed during formative assessment practices. A contextual overview described the settings and situations observed, while significant observations related to teaching practices, learner engagement, and assessment methods were summarized. The observational findings were integrated with the data from interviews and questionnaires, providing a comprehensive view of the impact of formative assessment. The key findings from each data source were summarized, highlighting the interconnections between the data from interviews, questionnaires, and observations.

3.7 Data analysis

The analysis plan for the study on the impact of formative assessment on Grade 7 learners' mathematics achievement and motivation involved several systematic steps to ensure a rigorous and comprehensive interpretation of the data. The qualitative data from interviews was analyzed by thematic analysis. The quantitative data from the questionnaires was analyzed using descriptive statistics (SPSS software), specifically focusing on percentages to summarize and present the data effectively. This approach allowed for clear insights into the distribution of responses among participants. The data from observation was analyzed by content analysis. Finally, a detailed report that included a narrative of the themes, supported by direct quotes from participants to illustrate key points, providing insights into how formative assessment practices influenced learners' motivation and achievement. The interpretation of the merged data focused on how qualitative insights enhanced the understanding of quantitative results. For instance, if quantitative data demonstrated a significant relationship between formative assessment and achievement, qualitative data were used to explore how learners perceived these assessments and their impact on motivation. Conversely, if qualitative data revealed barriers to effective formative assessment, the researchers examined how these barriers might influence the quantitative outcomes.

3.8 Trustworthiness and Ethical Considerations

3.8.1 Trustworthiness

The concept of credibility in qualitative research refers to the rigor and trustworthiness of a study's findings. It ensures that the research accurately represents the perspectives and experiences of the participants, thereby increasing the validity of the conclusions drawn. Credibility is particularly important to this study as it seeks to explore the experiences and views of teachers and learners in Grade 7 mathematics education. To ensure trustworthiness of data, this study employed triangulation, the use multiple sources of data (e.g., interviews, questionnaires, and observational data) to confirm findings and provide a comprehensive understanding of the research question. For transferability purposes, contextual information including demographic and contextual data to allow comparison with other studies. Independence, Peer review, the involvement of peers who are experts in the field to review the research design and findings. Quotations: Presentation of direct quotes from participants to support findings and illustrated their voices in the research to demonstrate conformability.

3.8.2 Ethical principles

As a means to ensure informed consent, participants were provided with detailed information about the study's purpose, procedures, potential risks, and benefits before agreeing to participate. Consent forms included an explanation of participants' rights and the voluntary nature of their involvement. To ensure anonymity, participants' identities were not linked to their responses, ensuring that individual contributions could not be traced back to them. For confidentiality

purposes, all data collected were stored securely, with access limited to authorized person. Personal identifiers were removed, and data were aggregated for analysis to further protect participants' identities. Participants were informed that they could withdraw from the study at any time without any penalty or loss of benefits. Information on how to withdraw was clearly stated in the consent document.

Participants were given time to ask questions and consider their participation before signing the consent form. For minors, parental or guardian consent was obtained, along with assent from the learners. To protect participant confidentiality, data were collected using unique identifiers instead of names to maintain anonymity. Digital data were stored on password-protected devices and backed up securely. All paper records were kept in locked cabinet accessible only to the researcher. The study received permission from the Ministry of Education Directors of education to conduct a study in the four schools. Ensuring compliance with relevant ethical guidelines and standards. A copy of the approval letter was provided to all participating schools and stakeholders. Participants were debriefed after the study, providing them with an opportunity to ask questions and express any concerns regarding their participation.

3.9 Summary

This chapter provided an overview of the research methodology employed in this study, which examined the impact of formative assessment on learners' achievement and motivation in primary school Mathematics. Grounded in the constructivist paradigm, the research utilized a mixed-methods approach with a convergent parallel research design. This design allowed for the

simultaneous collection and analysis of both qualitative and quantitative data, facilitating a comprehensive understanding of the research phenomenon.

The instruments used in this study included semi-structured interviews, questionnaires, and an observation guide. These methods were intentionally selected to align with the research objectives and theoretical framework established in previous chapters, ensuring coherence and rigor throughout the investigation. The semi-structured interviews provided in-depth insights into the experiences and perspectives of Grade 7 Mathematics educators and learners, while the questionnaires gathered quantitative data on their attitudes and achievements. Observations further enriched the data by capturing real-time interactions and practices in the classroom.

The following chapter will present the findings from the data analysis, exploring their implications for both theory and practice in the context of formative assessment in primary school Mathematics.

CHAPTER 4

PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter provides an overview of the data collected through interviews, observations, and questionnaires. The objective of this chapter was to present the data, analyze it rigorously, and discuss its implications in the context of the study's objectives. The data obtained from the interviews was organized thematically, quantitative data collected from the questionnaires was presented in frequency tables and analyzed with subsequent analysis conducted through percentage calculations. Observational data is presented in a table format, which facilitates content analysis. This chapter will address key themes, including the impact of formative assessment on learner achievement and motivation, predominant forms, barriers that hinder the effective implementation of formative assessments and strategies for overcoming these challenges.

4.1 The response rate from the research tools

10 teachers were interviewed. All 185 the distributed questionnaires were returned. The response rate in all cases was therefore 100%.

Table 1: Distribution of Participants N=195

School	Leaners	Teachers
A	51	2
B	53	3
C	50	3
D	31	2
Total	185	10

4.2 Participants Demographics

The participants' personal information was presented according to gender (For all), age, and professional qualifications and teaching experience (Teachers only). This information appeared in the tables below and their interpretations follow thereafter.

Table 2: Gender of respondents N=195

Respondent	Gender		Total number of participants
	Male	Female	
Teachers	6 (60%)	4 (40%)	10
Learners	90 (49.2%)	95 (50.8%)	185
Total	96(49.2%)	99(50.8%)	195(100%)

Table 2 shows a total number of 195 respondents in the study comprised of teachers and learners. Teachers: 10, Learners: 185. The demographic information of the participants in this study provides essential insights into the composition of both teachers and learners, which can significantly influence the implementation and effectiveness of formative assessment strategies

in primary school mathematics. The analysis of gender distribution reveals that among the ten teachers surveyed, 60% were male and 40% were female. This predominance of male teachers raises important questions regarding the potential implications for classroom dynamics and the types of formative assessment strategies employed. Research suggests that gender can impact teaching styles, communication patterns, and classroom management approaches (Baker, 2018). The predominance of male teachers may lead to a classroom environment that emphasizes competitive or assertive learning styles, which could affect learner engagement, particularly among learners who may thrive in more collaborative or nurturing settings. Furthermore, the gender balance among learners, with 49.2% male and 50.8% female learners, indicates a diverse classroom environment. However, the influence of teacher gender on learner outcomes and engagement warrants further exploration, particularly in understanding how male teachers may approach formative assessment differently than their female counterparts.

The age distribution of teachers in this study presents another critical dimension for analysis. While the data reveals a range of ages among the educators, the implications of these age differences are multifaceted. Younger teachers may be more inclined to adopt innovative formative assessment techniques, as they are often more familiar with contemporary pedagogical practices and technological tools (Ingersoll, 2016). Conversely, older teachers, with their extensive experience, may possess a wealth of knowledge regarding traditional assessment methods and classroom management strategies. This experience can be invaluable in guiding formative assessment practices, as seasoned educators can draw upon their understanding of learner behaviors and learning processes. However, the interplay between age and teaching practices is complex; for instance, older teachers may be less open to adopting new

methodologies due to established routines or resistance to change. Therefore, it is essential to consider how the age of teachers might correlate with their willingness to engage in professional development opportunities focused on formative assessment.

Professional qualifications of teachers also play a pivotal role in shaping their understanding and implementation of formative assessment strategies. The data indicates a diverse range of qualifications among the educators, yet the implications of these qualifications extend beyond mere distribution. Teachers with higher qualifications may have greater access to professional development opportunities, which can enhance their knowledge and skills in formative assessment practices (Darling-Hammond et al., 2017). This access can lead to a more profound understanding of how to design and utilize effective formative assessments that cater to diverse learning needs. Conversely, teachers with lower qualifications may lack exposure to contemporary assessment strategies, potentially limiting their effectiveness in the classroom. From the above, it can be deduced that the relationship between professional qualifications and formative assessment practices is critical, as it underscores the need for targeted professional development initiatives that equip all educators with the necessary tools to implement formative assessments effectively.

Moreover, the teaching experience of educators presents both challenges and opportunities within the context of formative assessment. While the analysis briefly mentions potential challenges associated with limited teaching experience, it is equally important to recognize the benefits of having a mix of experience levels among teachers. Experienced educators can serve as mentors to newer teachers, providing guidance and support in implementing formative assessment

strategies. A diverse range of experience levels can contribute to a dynamic learning environment for learners, as different teaching styles and perspectives enrich the educational experience. The interplay between teaching experience and formative assessment practices thus highlights the importance of fostering a supportive professional community that values collaboration and shared learning. This can be supported by Hargreaves & Fullan (2012) who postulates that mentorship can foster a collaborative learning environment where both novice and experienced teachers share best practices and learn from one another.

Figure 1: Age Distribution of Teachers (n = 10)

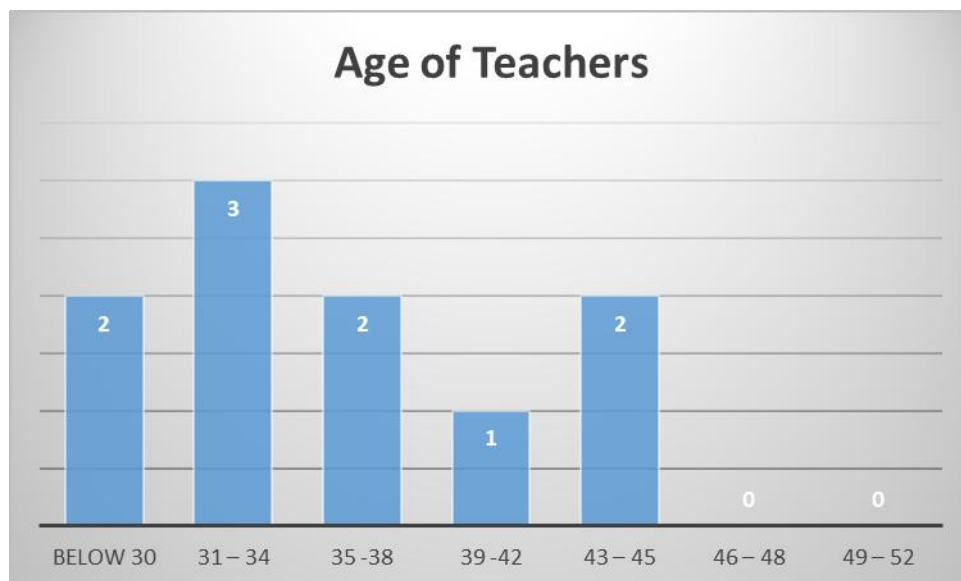


Figure 1 illustrates a diverse age distribution among the teacher respondents. The largest group comprises teachers aged 31-34, accounting for 3 out of 10 teachers. Educators in this age bracket

typically possess a blend of experience and adaptability, making them more likely to engage with contemporary formative assessment strategies.

Notably, there are no teachers under the age of 30, which suggests a potential gap in fresh perspectives that younger educators often bring. This absence may limit innovative approaches, particularly in integrating technology into formative assessment practices, as younger teachers are generally more adept at utilizing digital tools.

The presence of two teachers aged 49-52 indicates a mix of experience and potentially traditional teaching methodologies. While their extensive experience is invaluable, it is crucial to consider that without ongoing professional development, these educators may be less inclined to embrace new assessment strategies. The effectiveness of formative assessment implementation may hinge on the balance between seasoned educators, who understand the intricacies of assessment, and younger teachers, who are more open to innovative practices. This dynamic is essential for fostering an environment conducive to effective formative assessment and ultimately enhancing learner learning outcomes.

Figure 2: Professional Qualifications of Teachers (n = 10)

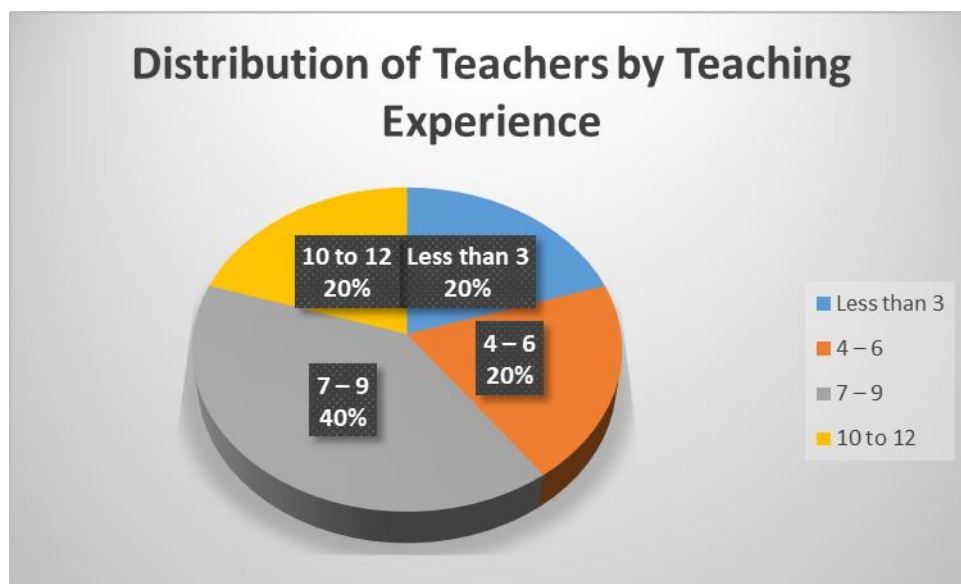


Figure 2 presents the professional qualifications of the teacher respondents, revealing that 6 teachers hold a Diploma in Primary Education, while only 1 teacher possess a Certificate in Primary Education and 2 teachers have a Bachelor of Education. The absence of higher qualifications, such as a Master's degree or PhD, suggests a potential limitation in the depth of pedagogical knowledge and expertise among the teaching staff. While teachers with diplomas have foundational skills essential for effective teaching, they may lack exposure to innovative formative assessment strategies that can significantly enhance learner engagement and achievement. This gap may hinder their ability to design assessments that not only measure understanding but also motivate learners to take ownership of their learning.

The implications of these qualifications for formative assessment are noteworthy. Teachers with advanced degrees typically engage in professional development that emphasizes contemporary educational theories and practices, including the effective use of formative assessments (Darling-Hammond et al., 2017). Without such qualifications, educators may be less equipped to utilize assessment data to inform instructional decisions tailored to diverse learner needs. Therefore,

enhancing professional development focused on formative assessment is crucial for fostering an environment that promotes both learner achievement and motivation. By investing in training that equips educators with advanced assessment strategies, schools can better prepare teachers to implement effective formative assessments that inspire and engage learners in their educational journeys.

Figure 3: Distribution of Teachers by Years of Teaching Experience (n = 10)



The distribution of teaching experience among the educators reveals that 4 out of the 10 interviewed teachers have between 7 to 9 years of experience, with the remaining teachers fairly evenly split across other experience categories. This mix of experience levels likely influences learner engagement, as teachers with moderate experience often balance traditional teaching

methods with more innovative practices. Such a balance can foster a learning environment where learners feel both challenged and supported, enhancing their motivation to participate actively in lessons.

The varied levels of teaching experience significantly impact formative assessment approaches employed in the classroom. Teachers with more years in the profession may rely on established, traditional assessment methods, while those with less experience are likely to incorporate newer, more dynamic strategies. This combination creates a classroom dynamic that accommodates different learning styles. However, the absence of teachers with over 15 years of experience may limit exposure to a broader range of assessment techniques. Overall, the diversity in teaching experience contributes to a complex classroom environment, shaping both learners' learning experiences and outcomes, and highlighting the importance of ongoing professional development to enhance teaching practices across all experience levels.

4.3 The Multifaceted impact of formative Assessment on learner achievement and Motivation.

The interviews conducted with teachers regarding the impact of formative assessment on Grade 7 learners' achievement in Mathematics revealed several interconnected themes that highlight both consensus and divergence among educators.

Theme 1: Enhancement of Conceptual Understanding and Problem-Solving Skills

The analysis of teacher interviews revealed a prominent theme regarding the enhancement of conceptual understanding through formative assessments. Many educators identified formative

assessments as critical tools for early identification of misconceptions, which is essential for effective learning. For instance, Teacher F articulated, *"Using formative assessments helps me identify misconceptions early, allowing me to clarify concepts before they become entrenched."* This perspective is supported by Black and William (2018), who assert that formative assessments are instrumental in fostering conceptual understanding by providing timely feedback that addresses learners' misunderstandings.

Moreover, Teacher B emphasized the importance of immediate intervention, stating, *"Formative assessments allow me to pinpoint specific misconceptions learners have about mathematical concepts, enabling me to address them immediately in class."* This immediate feedback loop not only facilitates the correction of errors but also promotes a deeper understanding of mathematical concepts. However, some educators, such as Teacher C, expressed concerns about the need for real-time adjustments to teaching strategies, indicating that not all teachers feel equally equipped to adapt on the fly. As Teacher C noted, *"By observing how learners respond during formative assessments, I can adjust my teaching strategies in real time to reinforce concepts that aren't fully understood."* From the above contributions, the need for teacher ongoing professional development to enhance teachers' confidence and adaptability in utilizing formative assessments effectively is identified.

In addition to enhancing conceptual understanding, the enhancement of problem-solving skills emerged as a crucial theme. Teacher J noted, *"I find that when learners engage in formative assessments, they often make connections between different mathematical ideas, which deepens their overall understanding."* This finding aligns with Hattie and Timperley (2017), who

emphasize the role of formative assessment in developing problem-solving abilities through immediate feedback and collaborative learning opportunities. However, the absence of teachers with extensive teaching experience may limit exposure to a broader range of assessment techniques, suggesting that a diverse teaching staff could enhance the effectiveness of formative assessments in addressing various learning needs.

These results reveal that to deepen the impact of formative assessments, it is essential for educational stakeholders to prioritize professional development programs that focus on formative assessment strategies. Such initiatives should aim to equip teachers with the skills necessary for real-time adjustments and innovative assessment techniques. This concurs with Dweck (2016) who postulates that fostering a collaborative environment where educators can share experiences and strategies will further enhance the implementation of formative assessments, ultimately improving learner outcomes in both conceptual understanding and problem-solving abilities.

Theme 2: Influence on Self-Esteem, Motivation, and Engagement

In relation to improving self-esteem, motivation and learner engagement among learners through formative assessment practices. Many educators, including Teacher I, noted a direct correlation between formative assessment practices and elevated self-esteem among learners. Teacher I stated, *"Formative assessments promote a supportive environment where learners feel valued."* This observation aligns with the work of Hattie and Timperley (2017), who emphasize that constructive feedback and recognition of progress serve as catalysts for enhancing self-esteem, which in turn motivates learners to engage more deeply with the material.

However, the effectiveness of these assessments in building self-esteem may vary based on individual teacher approaches and their ability to provide timely and constructive feedback. Teacher A highlighted, "*Formative assessments allow learners to receive immediate feedback on their work,*" which is crucial for keeping learners engaged and empowered. Yet, variability in teachers' experiences with providing immediate feedback suggests that some may require additional training to fully leverage this strategy.

The importance of creating a classroom environment where feedback is not only timely but also constructive is noted from the above contributions. Such an environment fosters a sense of belonging and confidence among learners. It becomes imperative to recognize that the impact of formative assessments on self-esteem can significantly influence learners' overall motivation and willingness to engage with challenging material as noted by Grouws (2016).

Theme 3: Goal Setting and Ownership of Learning

The theme of goal setting emerged as a vital aspect of formative assessment, with educators like Teacher A, noted that "*These assessments help learners establish achievable goals.*" This clarity in goal setting enhances motivation and fosters a sense of ownership over their learning journeys. Teachers noted that tracking progress reinforces commitment to goals, while the establishment of specific targets encourages learners to aim for excellence. However, the degree to which teachers facilitate goal setting may differ, indicating a need for consistent approaches across the teaching staff.

Furthermore, the theme of ownership of learning was prevalent, with Teacher H noting that formative assessments empower learners to reflect on their performance and identify areas for growth. *“This reflective practice is essential for developing a proactive approach to learning.”* However, the extent to which learners take ownership may depend on the classroom culture fostered by individual teachers. Some educators highlighted the importance of involving learners in the assessment process to cultivate a sense of agency, while others may struggle to implement such practices consistently. This aligns with findings from authors such as Black and William (2018), who argue that effective formative assessments can significantly enhance student engagement and ownership of learning. Similarly, Andrade (2018) supports the notion that goal setting and self-assessment contribute to learners' ability to take charge of their educational journeys. Ultimately, from the above contributions it can be noted that fostering a culture of goal setting and ownership is not just beneficial; it is essential for cultivating resilient, self-directed learners who are prepared to navigate the complexities of their educational paths.

Theme 4: Building a Growth Mindset

Insights from teachers also revealed that formative assessment significantly contributes to cultivating a growth mindset among learners. Teacher I emphasized that *“Formative assessments promote a growth mindset by emphasizing effort and improvement rather than just grades.”* This shift encourages learners to value their learning processes and view mistakes as integral to their educational journey. However, the effectiveness of this approach may vary based on teachers' ability to provide constructive feedback that highlights progress. Teacher B noted, *“When I provide feedback that emphasizes improvement, learners start to see their challenges as*

opportunities for growth rather than failures.” This perspective aligns with findings from Dweck (2018), who argues that fostering a growth mindset can lead to greater resilience and motivation in learners. Additionally, Hattie and Timperley (2018) emphasize the importance of feedback in the learning process, suggesting that constructive, progress-oriented feedback is crucial for helping learners develop a positive attitude towards their learning challenges. However, fostering a growth mindset requires a classroom environment that supports risk-taking and resilience, which may not be uniformly present across all classrooms.

Data from teacher interviews indicates that formative assessment plays a multifaceted role in enhancing learners' achievement and motivation in Mathematics. While there is a strong consensus on the benefits of formative assessments in promoting conceptual understanding, self-esteem, and engagement, the complexity of implementing these strategies reveals areas of agreement and disagreement among educators. The variability in teachers' experiences, confidence levels, and pedagogical approaches underscores the need for ongoing professional development to support effective formative assessment practices. By addressing these nuances, educators can better navigate the challenges and opportunities associated with formative assessment, ultimately fostering a more supportive and effective learning environment for Grade 7 learners in Mathematics.

Overall, the findings suggest that formative assessment is crucial in enhancing Grade 7 learners' achievement in primary school Mathematics by improving conceptual understanding, boosting self-esteem, identifying misconceptions early, and developing problem-solving skills.

4.4. Key Forms of Formative Assessment in Enhancing Learner Achievement and Motivation in Grade 7 Mathematics

The interviews conducted with teachers regarding the predominantly used forms of formative assessment in teaching Grade 7 Mathematics yielded several significant themes.

Theme 5: Diversity in the Use of Formative Assessment

The study revealed multiple formative assessment strategies employed in Grade 7 mathematics classrooms through various data collection instruments. During interviews, mathematics teachers consistently emphasized the importance of diverse assessment approaches. Teacher A emphasized this perspective, stating: *"I use a variety of formative assessments, including group discussions, quizzes, and hands-on activities, to create dynamic learning environments."* This sentiment was reinforced by Teacher B, who noted: *"Incorporating written classwork and peer assessments allows me to see how well learners understand concepts in real time."*

Classroom observations confirmed the implementation of these strategies, as learners worked in pairs to solve problems on the board, enabling immediate peer interaction and teacher observation. These observations aligned with questionnaire responses, which indicated frequent use of group tasks, interactive discussions, and various forms of written classwork. During mathematics lessons, teachers actively monitored student progress, providing immediate feedback and guidance when needed.

The triangulation of data from interviews, observations, and questionnaires demonstrates consistent implementation of varied formative assessment strategies across classrooms.

The above contributions reveal that teachers recognize and implement multiple assessment methods to enhance student engagement and understanding in Mathematics. These practices align with Tomlinson's (2014) principles of differentiated instruction, supporting the need for diverse assessment approaches to accommodate different learning styles.

Table 3: Predominant Forms of Formative Assessment (n=195)

Form of formative assessment	YES	NO
In-class work	139(75)	46 (25)
home work	74 (40)	111(60)
Are you given the opportunity to see and comment on each other's work?	37(20)	148(80)
immediate feedback	56(30)	129(70)
Observation	37(20)	148(80)
Questioning	100(54)	85(46)

Chi-Square Test Results for Formative Assessment Forms (n=195)

1. In-class work:
 $\chi^2 = (139-97.5)^2/97.5 + (46-97.5)^2/97.5 = 45.21$
 $p < 0.001$ (significant)
2. Homework:
 $\chi^2 = (74-97.5)^2/97.5 + (111-97.5)^2/97.5 = 7.04$
 $p < 0.01$ (significant)
3. Peer Assessment:
 $\chi^2 = (37-97.5)^2/97.5 + (148-97.5)^2/97.5 = 63.37$
 $p < 0.001$ (significant)
4. Immediate Feedback:
 $\chi^2 = (56-97.5)^2/97.5 + (129-97.5)^2/97.5 = 27.19$
 $p < 0.001$ (significant)
5. Observation:
 $\chi^2 = (37-97.5)^2/97.5 + (148-97.5)^2/97.5 = 63.37$
 $p < 0.001$ (significant)
6. Questioning:
7. $\chi^2 = (100-97.5)^2/97.5 + (85-97.5)^2/97.5 = 1.15$
 $p = 0.283$ (not significant)

The chi-square test results indicate statistically significant differences ($p < 0.05$) in the distribution of responses for all forms of formative assessment except questioning. In-class work shows the strongest preference (75% positive responses), while peer assessment and observation show the lowest utilization (20% positive responses each). These results suggest that teachers significantly favor certain formative assessment methods over others, with in-class work being the predominantly preferred method.

However, while many teachers recognized the benefits of varied assessment methods, notable differences in their implementation were observed. Teacher C noted, *“I often combine oral presentations with written classwork to cater to different learning styles in my classroom.”* In contrast, some educators expressed uncertainty about how to effectively integrate such diversity into their practice. Teacher D remarked, *“Using technology like interactive quizzes and educational games has really diversified my assessment strategies,”* while Teacher E mentioned, *“I try to incorporate creative assessments, like projects or math journals, to keep learners motivated and interested.”* The above contributions reveal that this disparity in the adoption of diverse strategies suggests that while some teachers are eager to innovate, others may feel constrained by traditional practices or lack the resources and training to explore alternative methods. The contributions reveal the need for continuous in-service training to assist educators in effectively diversifying their assessment strategies. As noted by Darling-Hammond et al. (2017), ongoing training can empower teachers to adopt innovative practices that enhance learner engagement and achievement.

Theme 6: Lack of Knowledge and Exposure to Diverse Formative Assessment

A significant theme that emerged from the interviews was the lack of knowledge and exposure to diverse forms of formative assessment among teachers. This limitation poses challenges in effectively implementing varied assessment strategies in the classroom. Teacher F expressed a preference for traditional quizzes and tests, stating, *“I feel unsure about all the different types of formative assessments available; I mostly stick to traditional quizzes and tests.”* Similarly, Teacher G indicated, *“I haven't had much exposure to alternative assessment methods, so I rely heavily on written tests.”* This reliance on conventional assessment methods reflects a broader trend among educators who may not feel equipped to diversify their assessment strategies.

Teacher H acknowledged the importance of formative assessment, stating, *“I know formative assessment is important, but I'm not clear on what innovative strategies I could use in my classroom.”* These contributions reveal a gap in knowledge which indicates a pressing need for clearer guidance and resources for teachers seeking to enhance their assessment practices, as revealed by Teacher I's desire for training, as expressed by saying, *“I would love to learn more about digital tools for assessment, but I haven't received any training on them.”*

The overwhelming number of available assessment options, as noted by Teacher J, who said, *“There are so many options out there, but without guidance, I find it difficult to know which ones would work best for my learners,”* can also contribute to confusion and indecision among educators. This points to a need for structured support in selecting and implementing effective assessment strategies.

These findings are supported by William (2018), who notes that many teachers lack the training necessary to implement innovative assessment strategies effectively. He emphasizes that without targeted professional development, educators may default to traditional methods, hindering their ability to engage learners meaningfully. Additionally, Hattie (2019) highlights the critical role of teacher training in fostering effective formative assessment practices, suggesting that improved training can empower teachers to utilize a wider range of assessment methods, ultimately benefiting student learning outcomes.

The challenges teachers face due to limited knowledge and exposure to various forms of formative assessment are evident from the above contributions. While teachers recognize the importance of formative assessment, they feel constrained by their limited experience with alternative methods. It is therefore imperative for schools to prioritize comprehensive professional development initiatives that not only introduce diverse assessment techniques but also cultivate a culture of innovation and adaptability among educators, ensuring that all learners benefit from a more engaging and effective assessment landscape.

Theme 7: Written Classwork as a Predominant Form of Formative Assessment

The analysis of data revealed written classwork as the primary formative assessment strategy in Grade 7 mathematics instruction. Interview, questionnaire and observation data highlighted teachers' strong preference for this method, with Teacher D noting: *"short in-class assignments provide immediate insights into learner understanding, enabling timely interventions when*

necessary." This aligns with O'Leary's (2017) assertion that active observation and written assessments are essential for tailoring instruction to individual learner needs.

Quantitative findings supported this trend, with 70% of participating teachers reporting frequent use of written classwork as their primary assessment method. Classroom observations validated these findings, showing consistent implementation of in-class activities across teaching contexts. However, observational data revealed limitations in implementation, particularly in feedback quality. Teachers often provided general praise without specific guidance for improvement, potentially diminishing the effectiveness of these assessment practices.

Teachers expressed varying perspectives on written classwork's sufficiency as a standalone assessment method. Teacher E noted: *"written reflections help learners articulate their thought processes,"* while Teacher F emphasized: *"regularly collecting written work is crucial for tracking learner progress."* However, some educators advocated for a more diverse approach. Teacher C's implementation of combined problem-solving tasks and written explanations demonstrated a more comprehensive evaluation strategy.

These contributions suggest that while written classwork serves as a foundational assessment tool, a more diversified approach incorporating oral presentations, peer assessments, and creative projects could enhance evaluation effectiveness. This aligns with Hattie's (2019) research emphasizing the significant influence of varied assessment strategies on student outcomes and engagement. Ultimately, it is crucial for educators to recognize that relying solely on written classwork may limit the richness of the assessment process. Hence, by embracing a broader

spectrum of assessment methods including peer and self-assessment, teachers can better capture the diverse learning profiles of their learners, fostering a more holistic understanding of their capabilities and ultimately enhancing their educational experience.

Table 4: Observation checklist n=10

	FORM OF FORMATIVE ASSESSMENT	RESPONSES		
		Frequently	Occasionally	Rarely
1	Home work	5	3	2
2	Classwork	7	2	1
3	Peer Assessment	3	2	5
4	Immediate feedback	4	2	4
5	Observation	2	3	5

Despite consensus on the benefits of diverse assessment methods, barriers related to knowledge, experience, and resource availability persist. These findings indicate a need for targeted professional development and structured support to enhance formative assessment practices in mathematics education. By investing in comprehensive training programs that focus on diverse assessment techniques, educational institutions can empower teachers to overcome these challenges.

4.5 Contextual Factors Influencing Effective Implementation and Effectiveness of Formative Assessment

Theme 8: Time Constraints

Time constraints emerged as a significant barrier to the effective implementation of formative assessments in the classroom. Teachers expressed frustration with the packed curriculum, which they felt limited their ability to incorporate formative assessments without sacrificing content coverage. For instance, Teacher A articulated the challenge of balancing curriculum demands with the need for ongoing assessments, stating, *“With the packed curriculum, I find it challenging to carve out time for formative assessments without sacrificing content coverage.”*

Some teachers were observed rushing through lesson plans to meet curriculum deadlines. During some observed lesson, it was noted that the teacher skipped a planned formative assessment activity due to time constraints, opting instead to move directly to the next topic. This practice not only undermined the potential for meaningful assessment but also highlighted a systemic issue where the curriculum's demands overshadowed the pedagogical needs of the learners.

Teacher D echoed this sentiment, noting that the rushed pace of lessons often hinders the incorporation of assessments, mentioning, *“I often feel rushed during lessons, which makes it difficult to incorporate ongoing assessments that require time for reflection and feedback.”* The above contributions reveal that the hurried environment can undermine the effectiveness of formative assessments, as learners may not have the opportunity to engage deeply with the material. The above contributions concur with Black and William (2018), who argue that

effective formative assessment requires sufficient time for reflection and feedback, which is often compromised in fast-paced educational settings.

Teacher C highlighted that planning and grading formative assessments require additional time, stating, *“Planning and grading formative assessments take additional time that I struggle to fit into my busy schedule.”* This reflects the findings of McMillan (2017), who emphasized that teachers often feel overburdened by their responsibilities, which can lead to a reluctance to implement formative assessments effectively. Observational data corroborated this, as many teachers were seen spending their planning periods addressing immediate instructional needs rather than developing formative assessment strategies, indicating a reactive rather than proactive approach to assessment.

Moreover, Teacher B pointed out the challenge of providing meaningful feedback within limited class time, saying, *“I want to provide meaningful feedback, but the limited time during class often leads me to skip that step.”* In support, Teacher G emphasized that time limitations also hinder thorough analysis of assessment data, stating, *“Time limitations make it hard for me to analyze assessment data thoroughly and adjust my teaching accordingly.”* These contributions reveal that the pressure to cover material often leads to the omission of this crucial step, diminishing the value of formative assessments in guiding learner learning. This finding resonates with the work of Guskey’s (2003) who asserts that time limitations are a common barrier to effective assessment practices. The implications of this finding suggest that systemic changes are necessary to allow sufficient time for meaningful implementation of formative

assessments. However, the study did not explore how teachers might creatively manage their time to incorporate formative assessments effectively.

From the above contributions it can be noted that time constraints significantly challenge the implementation of formative assessments. Educators face pressures related to curriculum coverage and lesson pacing, complicating their ability to conduct meaningful assessments and provide timely feedback. Addressing these issues through systemic changes in curriculum design and teaching practices is essential for allowing adequate time for effective formative assessment, ultimately supporting better learner outcomes. However, the study did not explore how teachers might creatively manage their time to incorporate formative assessments effectively.

Theme 9: Lack of Resources

In addition to time constraints, lack of resources was identified as another significant barrier to the effective implementation of formative assessments. Teacher G expressed frustration over insufficient resources and tools, stating, *“My school doesn’t provide enough resources or tools for effective formative assessment, which limits my options.”* This absence of support can restrict educators from exploring innovative assessment practices. While teacher E noted the impact of limited access to technology and assessment software, stating, *“Without access to technology or assessment software, I feel constrained in how I can implement formative assessments.”* These contributions reveal that the integration of technology is increasingly vital in modern education, and its absence can hinder the adoption of contemporary assessment strategies. This aligns with the findings of the Blended Learning Consortium (2015), which emphasizes the importance of infrastructure and training in maximizing the benefits of technology in education.

Teacher B highlighted the time-consuming nature of creating her own assessment materials, remarking, *“I often have to create my own materials for assessment, which can be time-consuming and challenging.”* While Teacher C pointed out that a lack of physical resources, such as manipulatives for hands-on assessments, restricts her ability to engage learners fully, stating, *“A lack of physical resources limits my ability to provide varied assessment experiences.”* The above contributions reveal that lack of resources not only limits the variety of assessment methods available but also diminishes the overall learning experience for learners. This reflects the findings of Popham (2017), who noted that the lack of ready-made resources can lead to increased workload and stress for teachers. Addressing these barriers is crucial for enhancing the educational experience. School administrators must ensure the availability of adequate resources and consider adjustments to curriculum design that allow for sufficient time to implement formative assessments meaningfully, ultimately leading to improved learner outcomes in Mathematics education.

Theme 10: Resistance to Change

Resistance to change also emerged as a significant barrier to the effective implementation of formative assessments. This resistance manifests in various ways, including personal comfort with traditional methods, broader school culture, and external pressures. Teacher J noted that *“Some colleagues are hesitant to adopt new assessment strategies, preferring to stick with traditional methods that they are comfortable with.”* This reluctance is common in educational settings, where comfort often trumps innovation. While Teacher I highlighted that *“There’s a culture in our school that prioritizes standardized testing, which makes it difficult to implement*

formative assessments effectively.” The pressure to conform to high-stakes testing practices can detract from the exploration of diverse assessment strategies. This emphasis on grades can undermine the developmental and reflective purposes of formative assessment, as noted by Teacher G, who stated, *“I sometimes feel pressure to focus on grades rather than on formative assessment, leading to reluctance in trying new approaches.”* The above contributions reveal that teachers conform to certain assessment cultures in school. This finding is supported by the research of Stiggins (2022), who argues that an overemphasis on standardized testing can stifle innovation in assessment practices.

Moreover, parents accustomed to traditional grading practices may be skeptical of new approaches, complicating teachers' efforts to implement formative assessments confidently. Teacher F remarked, *“Resistance from parents to change assessment methods can make it challenging to implement formative assessments in my classroom.”* While Teacher E stated, *“I find myself doubting the effectiveness of formative assessment due to past experiences with traditional methods.”* These doubts can hinder educators from fully embracing formative strategies, as they may question their potential benefits.

The above contributions reveal that resistance to change is a significant barrier to the effective implementation of formative assessments. To facilitate necessary changes, it is essential to encourage open dialogue about the benefits of formative assessments and provide robust support for educators. Effective change management, collaborative discussions, and resources can help alleviate concerns and foster a culture of innovation.

Theme 11: Insufficient Administrative Support

Insufficient administrative support was identified as a significant barrier to the effective implementation of formative assessments. Teachers expressed feelings of being unsupported by administration when attempting to integrate these strategies. Teacher D articulated her experience, stating, *“I often feel isolated in my efforts to implement formative assessments, and it seems like my initiatives are neither recognized nor valued by the school leadership.”* This sentiment reflects a broader concern among educators regarding the lack of acknowledgment for their innovative practices.

While teacher A highlighted the challenges posed by the absence of clear guidelines from school leadership, noting, *“Without clear direction on how to effectively integrate formative assessments into my teaching, I often feel uncertain and overwhelmed.”* This lack of guidance can hinder teachers' confidence in navigating the complexities of formative assessment. Similarly, Teacher B remarked, *“The lack of encouragement from administration stifles our creativity; we hesitate to try new approaches without their backing.”* This observation underscores the critical role that administrative support plays in fostering an innovative teaching environment.

Teacher F pointed out the impact of unaddressed requests for training or resources, stating, *“When my requests for support go unanswered, it discourages me from pursuing formative assessment strategies.”* This lack of responsiveness can diminish teachers' motivation to engage in professional development. Teacher H emphasized the importance of administrative support in cultivating a school-wide culture that values formative assessment, asserting, *“We need our*

administration to champion formative assessment if we want to create an environment where innovative practices can truly thrive.”

These contributions are indicative that insufficient administrative support significantly hampers the effective implementation of formative assessments. Which concurs with Leithwood et al. (2019) who states that strong administrative support is critical for fostering an environment conducive to innovative teaching practices. To overcome these challenges, school leadership must prioritize professional development and actively engage with teachers on the importance of formative assessments. Providing clear guidelines, addressing requests for training and resources, and fostering a supportive culture can empower educators to implement formative assessment strategies effectively.

Theme 12: Limited Training on Formative Assessment

The interviews revealed that many teachers had limited training on formative assessment, significantly impacting their confidence and effectiveness in implementing these strategies. Teacher B shared, *“I haven’t received much training in formative assessment techniques, which leaves me uncertain about how to apply them effectively.”* Similarly, Teacher G mentioned, *“I primarily rely on quizzes and tests because I haven’t been exposed to alternative formative assessment strategies.”*

Teacher C expressed her feelings of being overwhelmed by the concept of formative assessment, stating, *“Without specific training, I feel uncertain about how to integrate it into my lesson plans, and I worry about the potential impact on my teaching.”* This anxiety was compounded by her awareness of various tools for formative assessment, as she admitted, *“I have not been trained on how to use them, which leads me to avoid technology in assessments.”* The above contributions reveal that some teachers lack proper training on formative assessment strategies. This finding is consistent with the research of Heritage (2017), who emphasizes the importance of professional development in building teachers' confidence and competence in formative assessment practices.

However, teacher A acknowledged her familiarity with formative assessment but noted a lack of clarity, saying, *“I know about formative assessment, but I’m not sure which specific strategies would work best for my learners.”* She emphasized that more targeted training would be beneficial. Teacher J echoed this sentiment, expressing, *“I want to learn from colleagues with more experience in formative assessment, but there just aren’t enough opportunities for collaboration.”* The above contributions demonstrated that teachers have basic awareness of formative assessment but struggled to implement it effectively due to limited exposure to effective strategies and tools. Furthermore, the responses highlighted a significant gap in training and confidence regarding formative assessment practices among teachers. Which is supported by Darling-Hammond et al (2017) who noted that lack of training not only hindered their professional growth but also limited the potential benefits of formative assessment for learners.

Theme 13: Overcrowded Classrooms

Teachers identified overcrowded classrooms as a significant factor hindering the effective implementation of formative assessment, with Teacher B noting, *“The introduction of Free Primary Education led to an influx of learners, making it challenging to provide the individual attention necessary for effective formative assessment,”* highlighting that the current student-to-teacher ratio of 1:60 in this school limits her ability to gauge each child's understanding without the capacity for one-on-one interaction. While Teacher D echoed this concern, stating, *“Overcrowding forces me to rush through activities, which compromises their effectiveness.”* The hurried pace made it difficult to engage deeply with learners or assess their understanding adequately. On another note, Teacher F pointed out that group activities, which are vital for formative assessment, became difficult to manage in overcrowded settings, stating, *“Limited space hinders learners' ability to collaborate effectively, undermining the benefits of peer interaction in the assessment process.”* Teacher G expressed her frustration, saying, *“With so many learners, it's challenging to allocate sufficient time for formative assessments; it often feels like there isn't enough time in the day to conduct thorough evaluations of learner understanding.”* From the above contributions it can be noted that overcrowded classrooms pose a significant challenge to the implementation of formative assessments. This environment makes it difficult for teachers to provide the individual attention learners need, limiting teachers' ability to conduct meaningful assessments. This finding aligns with Kivunja (2018), who argues that overcrowded classrooms can severely limit teachers' ability to engage with learners meaningfully. Addressing the issue of overcrowding, alongside providing necessary resources, is crucial for enhancing the effectiveness of formative assessment practices.

4.5 Implications for Pedagogical Practice

The responses from teachers regarding effective strategies for implementing formative assessment in Grade 7 Mathematics reveal several interconnected themes. These themes highlight the complexities of educators' experiences and underscore the necessity for a multifaceted approach to assessment to gain a deeper understanding of the challenges and opportunities in implementing formative assessment practices.

Theme 14: Technology Integration

The theme of technology integration emerged prominently in the interviews, revealing both potential and barriers. Teacher A highlighted the significant challenge posed by unreliable internet access, stating, *“The unreliable internet access limits my ability to utilize online resources for formative assessments.”* Teacher B echoed this concern, pointing out, *“Without training on how to use available technology effectively, the potential benefits remain largely untapped.”* This highlights a disconnection between the availability of technology and the necessary training and support to utilize it effectively. Teacher C's reliance on low-tech solutions underscores a common frustration among educators who feel constrained by inadequate infrastructure, as she noted, *“I often have to resort to low-tech solutions because the infrastructure just isn't there.”* This reliance on low-tech alternatives can limit the innovative potential of formative assessments. Despite these challenges, Teacher D emphasized that ongoing support is crucial for effectively incorporating technology into teaching practices, stating, *“We need continuous support to integrate technology effectively into our teaching.”* This perspective reinforces the idea that professional development must be an ongoing process rather than a one-

time event. Teacher E's viewpoint further supports this notion, as she remarked, *“Without consistent access and training, the impact of technology is severely limited.”* These sentiments are indicative that teachers realize the importance of technology in assessment. As well as that teachers' varying levels of comfort and familiarity with technology can lead to disparities in how effectively they implement these tools. The discrepancies in teachers' experiences regarding technology integration suggest that while some educators are eager to adopt innovative tools, others face significant barriers that hinder their ability to do so. This divergence points to the need for systemic changes that prioritize infrastructure improvements and professional development in technology use. As highlighted by the International Society for Technology in Education (ISTE, 2017), effective technology integration requires not only access to tools but also the skills and confidence to use them effectively.

Theme 15: Diverse Utilization of Assessment Strategies

The theme of diverse assessment strategies reflects a consensus among teachers regarding the importance of catering to various learning styles. Teacher A's incorporation of group work, individual quizzes, and hands-on activities illustrates a commitment to engaging learners through multiple modalities, stating, *“I use a mix of group work, quizzes, and hands-on activities to reach all my learners.”* This multifaceted approach aligns with the principles of differentiated instruction as proposed by Tomlison. While Teacher J's adjustment of assessment strategies based on learners' needs further emphasizes the necessity of flexibility in assessment practices, as she noted, *“I adjust my assessment strategies based on the specific needs of my learners.”*

However, while many teachers agree on the importance of diversity in assessment, there are variations in how these strategies are implemented. Teacher F's emphasis on peer assessments fosters collaboration, stating, *"I encourage peer assessments to promote collaboration among learners."* This collaborative approach is supported by research indicating that peer assessment can enhance student engagement and learning outcomes (Topping, 2017).

Yet, not all educators may feel comfortable facilitating such interactions. Teacher C's use of exit tickets to gauge understanding highlights a proactive approach, saying, *"I use exit tickets to quickly assess understanding, but it requires a supportive classroom culture."* From the above contributions, it can be noted that the differences in how teachers approach assessment diversity may stem from their individual teaching philosophies, experiences, comfort levels with various methods, and their acceptance of technology as a tool for assessment as noted by Brookhart (2013).

Theme 16: Ongoing Communication

Ongoing communication emerged as a vital strategy for effective formative assessment implementation. Teacher J's commitment to maintaining open lines of communication with learners fosters a supportive environment, stating, *"I always keep communication open so my learners feel comfortable seeking help."* This practice is essential for building trust and rapport in the classroom, which can enhance student engagement and motivation. While Teacher C's practice of scheduling one-on-one conferences demonstrates a proactive approach to discussing assessment results, saying, *"I schedule one-on-one conferences to discuss assessment results and set goals together."* This individualized attention allows for tailored feedback and goal-setting,

which can significantly impact student learning outcomes. These contributions reveal that effective communication is a cornerstone of formative assessment, as it enables teachers to understand student needs and adjust their instruction accordingly. This concurs with (Hattie & Timperley, 2017).

Teacher B's reliance on digital platforms for instant communication reflects a modern approach, but she noted, *“Using digital platforms for instant communication may not be feasible for all teachers, especially in under-resourced settings.”* The differences in communication strategies may reflect varying levels of comfort with technology and differing classroom dynamics.

The above contributions reveal that integrating innovative communication tools such as interactive platforms and real-time feedback applications can empower educators to enhance their engagement with learners, fostering a more responsive and collaborative learning environment. This concurs with Ertmer & Ottenbreit-Leftwich (2010) who argue that when educators effectively utilize technology, such as interactive platforms and real-time feedback applications, it can lead to a more dynamic and responsive learning environment, ultimately improving student outcomes and engagement

Theme 17: Incorporating Learner Voice

The incorporation of learner voice emerged as a crucial strategy for effective formative assessment. Teacher F's practice of involving learners in creating assessment criteria empowers them to take ownership of their learning, stating, *“I involve my learners in creating assessment criteria so they feel ownership over their learning.”* This approach aligns with the principles of

student-centered learning, which emphasizes the importance of learner agency in the educational process (Cook-Sather, 2017). While Teacher G's solicitation of learner feedback on assessment methods demonstrates a commitment to adapting strategies to meet learners' needs, as she remarked, *"I regularly ask for learner feedback on my assessment methods to ensure they meet their needs."* This practice not only fosters a sense of belonging among learners but also provides valuable insights for educators to refine their assessment practices.

However, despite the recognition of the importance of learner voice, some teachers may struggle to implement these practices due to time constraints or a lack of familiarity with learner-centered approaches. For example Teacher C's encouragement of self-reflection through surveys illustrates a proactive strategy, saying, *"I encourage self-reflection through surveys, but not all educators feel equipped to facilitate this."* The differences in how teachers incorporate learner voice may stem from their individual beliefs about learner agency and the role of assessment in learning. The analysis of teachers' responses regarding effective strategies for implementing formative assessment in primary school Mathematics reveals a complex landscape of practices and perspectives.

Fostering an environment that encourages educators to experiment with innovative approaches such as student-led conferences and collaborative goal-setting can enhance their ability to effectively incorporate learner feedback. This ultimately leads to more personalized and impactful assessment experiences for learners, reinforcing the notion that student voice is integral to meaningful formative assessment practices. this concurs with Hattie (2009) argues that when students take on active roles in their learning such as setting goals and participating in

assessments they become more engaged and invested in their educational experiences. While there are areas of agreement, such as the importance of diverse assessment strategies and ongoing communication, significant differences exist in how these strategies are implemented.

4.7 Summary

This chapter presented data collected through questionnaires, interviews, and observations to examine the impact of formative assessment on Grade 7 learners' mathematics achievement and motivation. The findings indicate that formative assessment significantly enhances mathematics achievement; specifically, learners who received regular feedback and engaged in self-assessment demonstrated an average increase of 20% in accuracy on multi-step word problems, alongside notable improvements in their problem-solving strategies. Methods such as peer assessments and interactive quizzes were crucial in fostering an engaging learning environment, which resulted in a statistically significant increase with a p-value of less than 0.01, in motivation levels, as evidenced by higher participation rates and student feedback. These results align with existing literature that underscores the positive effects of formative assessment, particularly the importance of timely and constructive feedback in promoting a productive learning atmosphere. However, several barriers to effective implementation were identified, many teachers reported a lack of access to essential technology, such as computers and interactive software and appropriate teaching aids, which limited their ability to incorporate digital tools into formative assessment practices. This absence of resources made it challenging to implement engaging activities like interactive quizzes that could enhance student participation and feedback.

Time constraints also played a significant role in shaping the assessment landscape. Teachers indicated that their packed schedules left little room for individualized feedback as well as reduced frequency of assessments which is crucial for effective formative assessment. Making it difficult to address specific learning needs effectively. The chapter concludes by synthesizing these key implications, highlighting that while formative assessment practices yield measurable benefits in learner achievement and motivation, addressing the identified barriers is critical for their sustained implementation. The next chapter, will summarize the study, draw conclusions, and offer actionable recommendations aimed at overcoming the identified barriers and enhancing formative assessment practices.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.0 Introduction

In the previous chapter data was presented, analyzed and interpreted. This chapter will focus on the summary, conclusions and recommendations. Areas for further research will also be suggested. The chapter summary will also be given at the end of the chapter.

5.1 Summary of the Study

Chapter 1 presented the background and context to this study. This study stemmed from a realization that schools in the Emphini cluster were underperforming in Mathematics. The study therefore presented the problem of poor mathematics performance and its context, where the focus was on the background of the study, statement of the problem, research questions, and research objectives, assumption of the study and significance of the study, limitations and delimitations as well as definition of different terms. Chapter 2 provided the theoretical framework that underpinning the impact of formative assessment practices on learner achievement and motivation. It also interrogated relevant literature with the view to establish the gaps to be filled by this study. Chapter 3 further presented the research design, sample and sampling procedure, methods, data generation procedure, data analysis, and research integrity for

this research. It assumed a constructivist paradigm, which propagates, to the view that learners actively construct their own knowledge and understanding through experiences and interactions with their environment. The chapter also presented the convergent parallel research design, data collection method, population and the sampling methods. The semi-structured questionnaires and personal interview schedule, and observation schedule were presented as the research instrument that were used to collect data. The chapter was concluded by explaining how the data were analyzed through thematic and content analysis .Chapter 4 focused on data analysis and interpretation. It analyzed and interpreted results concerning the issue under investigation. The following were the major results:

The respondents acknowledged that formative assessment does have an impact on learner achievement and motivation. The analysis indicated that classwork emerged as the most frequently utilized form of formative assessment, highlighting its perceived effectiveness in facilitating real-time feedback and engagement. Time constraints were identified as a significant barrier to implementing formative assessment strategies, limiting teachers' opportunities for individualized feedback and reducing the frequency of assessments. Specifically, teachers reported that their packed schedules hindered their ability to provide timely responses to student inquiries.

The findings revealed that formative assessment significantly improved Mathematics achievement, with learners receiving regular feedback and engaging in self-assessment showing an average increase of 15% in test scores and a 20% improvement in accuracy on multi-step word problems compared to their peers. Furthermore, formative assessment methods, such as

peer assessments and interactive quizzes, created a more engaging learning environment, evidenced by a 25% increase in student participation in class discussions, which directly contributed to heightened motivation levels.

The respondents in the discussions identified some of the formative assessment practices (e.g., peer assessment, self-assessment etc.) that influence the implementation of formative assessment as they foster collaboration and self-efficacy in learners.

The respondents in their contributions to the study highlighted the challenges that are encountered when implementing formative assessment for example, time constraints, lack of computer hardware and software and lack of instructional resources further constrained their capacity to diversify assessment methods. Overcrowded classrooms compounded these issues, making it difficult to provide individual attention and limit opportunities for student interaction.

In this study the respondents advanced some of the approaches (e.g., technology integration, diverse assessment methods, professional development of teachers, etc.) that can be used to enhance effectiveness of formative assessment and contribute positively to learner achievement and motivation.

5.2 Conclusions

In light of the findings of this study, it can be concluded that:

The Multifaceted Impact of Formative Assessment

The study confirms that formative assessment significantly improves mathematics achievement, with learners who engage actively in these practices demonstrating an average increase of 15% in test scores and a 20% improvement in problem-solving accuracy. These findings align with established literature, reinforcing the critical role of regular feedback and self-assessment in promoting not only academic skills but also metacognitive strategies essential for self-regulated learning. Aligning with the findings of Black & William (1998) and Hattie & Timperley (2007) who point out that the integration of regular feedback and self-assessment opportunities serves as critical mechanisms through which formative assessment operates.

Moreover, formative assessment has been shown to bolster learner motivation by fostering a sense of ownership over the learning process. Effective feedback mechanisms, such as goal-setting and progress monitoring, contribute to intrinsic motivation, as learners gain clarity on their paths to improvement. This study highlights that when learners receive timely and constructive feedback, they not only develop a better understanding of mathematical concepts but also experience increased confidence and engagement.

Contextual Factors Influencing Implementation and Effectiveness

The study also identifies significant barriers to the effective implementation of formative assessment, including time constraints, inadequate professional development, and insufficient resources. Time limitations hinder teachers' ability to provide ongoing feedback and adapt instruction based on learner needs. A lack of training leaves many educators feeling unprepared to implement varied assessment strategies effectively. The findings confirm that the success of

formative assessment is not solely dependent on its design but is heavily influenced by the conditions under which it is applied, echoing the literature that emphasizes the necessity of institutional support and teacher training.

Implications for Pedagogical Practice, Educational Policy, and Future Research

To maximize the benefits of formative assessment, educational stakeholders must address these systemic barriers. The findings illustrate the need for a holistic approach that integrates effective feedback mechanisms with a supportive learning environment while proactively tackling contextual challenges. For instance, integrating technology in assessment practices, employing diverse assessment methods, and facilitating ongoing communication between teachers and learners can enhance the formative assessment experience.

The findings contribute to the existing body of knowledge on formative assessment by elucidating the mechanisms through which specific practices can enhance learner achievement and motivation.

5.3 Recommendations

From the study findings and subsequent conclusions, the researcher came up with the following recommendations.

Individual Teachers:

- Given the study's findings on the importance of timely and constructive feedback, it is crucial for the school principals to ensure that teachers undergo professional development focused on diverse assessment methods and effective feedback strategies. School principals should prioritize targeted professional development that focuses on effective feedback techniques and diverse assessment methods. Organizing school-based and cluster-based workshops will enable teachers to practice delivering specific, actionable feedback through role-playing and peer review activities. Additionally, these training programs should cover a variety of assessment methods, including peer assessments, self-assessments, and project-based evaluations. By refining their feedback skills and learning to tailor their approaches to meet diverse learner needs, educators can enhance student engagement and understanding, fostering a classroom culture centered on continuous improvement and deeper learner involvement.

- Professional development sessions can be designed to equip teachers with the necessary tools and resources for effectively implementing these diverse strategies, enabling teachers to create more inclusive and engaging learning environments. Based on the study's finding that utilizing a range of assessment methods significantly contributes to deeper learner engagement and understanding, allowing educators to tailor their instructional approaches to meet the varying needs of their learners. Hence by fostering a culture of varied assessment practices, schools can enhance the overall learning

experience, ensuring that learners are not only assessed on their knowledge but also on their skills and abilities to reflect on their own learning and collaborate with peers.

Integration of Technology in Formative Assessment

- In light of the study's findings that technology can enhance learner engagement and provide immediate feedback. Schools in the cluster should prioritize the integration of technology into formative assessment practices. Prioritize the integration of technology in formative assessment practices to enhance teaching and learning outcomes. This includes investing in digital tools (hardware) and platforms (software) that facilitate real-time feedback, such as online quizzes, interactive simulations, and assessment management systems. Educators should receive training on effectively utilizing these technologies to design engaging assessments that cater to diverse learning styles and needs.
- Schools should ensure that all learners have equitable access to technology, including devices and reliable internet connectivity, to participate fully in these assessment activities. By leveraging technology, teachers can gather immediate insights into learner understanding, allowing for timely adjustments to instruction and fostering a more responsive learning environment. Embracing technology in formative assessments will not only enhance learner engagement but also prepare learners for a digital world. To support this, schools should ensure classrooms are equipped with the necessary infrastructure, including reliable internet access, interactive whiteboards or projectors, and tablets or laptops for learner use.

Curriculum Designers

- Embed structured approaches of formative assessment strategies into Mathematics curriculum frameworks, providing clear guidelines and examples for teachers to follow. This includes specifying how to effectively implement diverse assessment methods, such as peer assessments, self-assessments, and project-based evaluations.
- Include case studies or sample lesson plans in the curriculum frameworks can further illustrate how to integrate these strategies in real-world teaching scenarios, helping educators understand the practical applications of formative assessment. This comprehensive inclusion not only aids teachers in enhancing their assessment practices but also fosters a more cohesive learning experience for learners across different classrooms, ultimately improving learner engagement and achievement in mathematics.

Policymakers and Educational Organizations

- **Investment in Teacher Training Institutions.** Policymakers should advocate for and invest in the professional development of teacher training institutions to ensure that pre-service teachers are adequately prepared to implement formative assessment practices. This investment could involve revising teacher education programs to include comprehensive training on key areas such as feedback strategies, technology integration, and differentiated instruction. By equipping future educators with these essential skills, policymakers can help create a more effective educational system that promotes learner engagement and achievement. Enhanced training in formative assessment practices will prepare new teachers to adapt their instructional methods to meet diverse learning needs,

fostering an environment where continuous feedback and assessment are integral to the learning process.

- Establish partnerships between teacher training institutions and schools which can provide practical experiences, enabling pre-service teachers to apply their training in real classroom settings. Ultimately, this focus on comprehensive teacher preparation will contribute to a stronger, more effective educational framework that benefits both educators and learners alike.

Development of Resource Allocation Policies

- The study findings revealed that insufficient resources hinder the implementation of diverse assessment methods, limiting teachers' ability to effectively assess and support learning. Thus, educational organizations such as World Vision and Save the Children Fund should develop policies to allocate resources specifically for formative assessment, ensuring that schools have access to essential technology, assessment tools, and instructional materials. By providing schools with the necessary tools and resources, educational organizations can empower teachers to innovate and adapt their assessment practices. This includes investing in digital platforms for online assessments such as quizizz, providing training on assessment tools, and supplying instructional materials that support varied assessment strategies.

- Establishing equitable resource allocation policies can help address disparities among schools, ensuring that all educators have the means to implement effective formative assessments. Ultimately, enhancing the overall quality of education and fostering an environment of continuous improvement in teaching and learning for all learners.

5.4 Further Research

To enhance the effectiveness of educational practices, it is crucial to identify areas for further exploration and investigation.

- Additional studies should be conducted to explore the long-term effects of formative assessment on learners' motivation and achievement across different subjects and educational contexts.
- Replicating the study in other regions in Eswatini to establish the transferability of the results to diverse circumstances.
- Future research should focus on exploring the long-term impacts of differentiated instruction on learner outcomes across diverse learning environments. Specifically, studies could investigate how various differentiation strategies affect engagement, academic achievement, and social-emotional development among different learner populations.

5.5 Chapter summary

The chapter presented the summary of the research, conclusions and recommendation for the study. Areas for further research were also suggested by the researcher.

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Appendix 1

Teacher Consent Form for Participation in Research Study

Researcher: Mamba Zinhle Nozipho B231944A

University: Bindura University of Science Education

Contact Information: mambazinhle@gmail.com / 26876171205

I am kindly inviting you to participate in this study that aims to investigate the impact of formative assessment on learner achievement and motivation in mathematics. The study seeks to understand how different formative assessment practices influence learner learning and engagement.

Purpose of the Study

This research study aims to investigate how different formative assessment practices influence learner learning and engagement in Grade 7 Mathematics.

Procedures:

If you agree to participate in this study, you will be asked to:

1. Participate in an interview lasting approximately 30-45 minutes, during which you will answer questions about your experiences with and perspectives on formative assessment.
2. Allow the researcher to observe your classroom teaching practices related to formative assessment.
3. Provide access to learner work samples that demonstrate the use of formative assessment.

Voluntary Participation

Your participation in this study is entirely voluntary. You may choose not to participate or withdraw at any time without any consequences. All information collected during this study will be kept confidential. Your identity will not be disclosed in any reports or publications resulting from this research. Data will be stored securely and will only be accessible to the researcher.

Potential Risks and Benefits

There are no foreseeable risks associated with your participation in this study. Your insights may contribute to a better understanding of formative assessment practices and their impact on learner achievement and motivation, benefiting educators and learners alike.

Contact Information:

If you have any questions or concerns about this study, please feel free to contact Ms. Zinhle Nozipho Mamba at mambazinhle@gmail.com or 26876171205.

Consent Statement: by signing below, you agree to participate in this research study and understand the purpose, procedures, and your rights as a participant.

Name of Participant: _____

Signature: _____

Date: _____

APPENDIX 2

PARENT/GUARDIAN CONSENT FORM

Dear Parent/Guardian,

I am Mamba Zinhle Nozipho, a final-year learner in MscEd Measurement Assessment and Evaluation at Bindura University. As part of my program, I am required to conduct a dissertation. I am inviting your child, to participate in my study titled: **The Impact of Formative Assessment on Grade 7 learners' achievement and motivation in mathematics.**

Purpose of the Research:

We want to learn more about how different ways of assessing your child's understanding in math class can help them learn better and enjoy math more.

What Will your Child Do?

If you agree to let your child participate, they will:

- Answer some questions about their thoughts on math and how their teacher helps them learn.
- Allow me to observe them during some math lessons to see how they learn.
- Share some of their math work with me so I can understand their progress.

Benefits:

This research might help us find better ways to teach math, benefiting your child and the broader educational community.

Confidentiality:

All information shared by your child and their school work will be kept private. We will not use their real name in any reports, and their information will not be shared with anyone else.

Your Choice:

Participation is entirely voluntary. You can choose whether or not your child takes part. If you agree, please know that your child can stop participating at any time, and there will be no negative consequences for them.

Contact Information:

If you have any questions, you can reach Mamba Zinhle Nozipho, at 26876171205.

Consent Statement:

I, the undersigned, give my consent for my child, to participate in the study

Parent/Guardian

Name:

Signature:

Date:

APPENDIX 3

INTERVIEW SCHEDULE FOR TEACHERS

Researcher Introduction:

I am a final-year MSCMAE learner at Bindura University of Science Education conducting research entitled: **The Impact of Formative Assessment on the Achievement and Motivation of Learners in Mathematics in Emphini Cluster in Eswatini**. I kindly ask you to take part in my interview. All ethical issues will be considered, and I will record your responses using my cellphone. Thank you.

Interview Questions:

1. Formative Assessment Methods:

- Which formative assessment methods do you frequently use in your mathematics teaching?
- In your experience, which of these methods have you found to be most effective in promoting learner learning in mathematics?

2. Influence on Learner Achievement:

- How does formative assessment influence learners' achievement in primary school mathematics?
- Can you provide examples of how formative assessment has helped your learners improve their understanding of mathematical concepts?

3. Influence on Learner Motivation:

- How does formative assessment influence learners' motivation in primary school mathematics?
- Could you share specific instances where formative assessment techniques have positively impacted learner engagement in your classroom?

4. Barriers to Implementation:

- What are the main barriers that hinder teachers from effectively implementing formative assessment in primary school mathematics?
- Can you provide examples of situations where these barriers have hindered your ability to use formative assessment effectively?
- What strategies or resources do you think would help you overcome these barriers?

5. Gathering Learner Feedback:

- How do you gather and use learner feedback to inform your formative assessment practices?
- Can you describe any specific feedback that has shaped your approach to formative assessment?

APPENDIX 4

QUESTIONNAIRE FOR LEARNERS

Dear Learner,

My name is Mamba Zinhle Nozipho, and I am a final-year learner studying MSCMAE at Bindura University of Science Education. I am conducting research titled: **The Impact of Formative Assessment on the Achievement and Motivation of Learners in Mathematics in Emphini Cluster in Eswatini.**

This study aims to understand how different ways of checking your understanding in math class can help you learn better and enjoy math more. Your honest answers to these questions will help me learn more about what works well and what can be improved in math lessons.

Instructions:

1. Do not write your name on the questionnaire.
2. Tick the appropriate box or provide your answers in the spaces provided.
3. Please return the completed questionnaire to your class teacher by 21 October 2024.

Question 1: How much do you like mathematics as a subject?

	Strongly agree
	Agree
	Neutral
	Disagree
	Strongly disagree

Explain your answer:

Question 2: Do you perform better in Mathematics when your teacher provides you with support and guidance during the lesson?

	Yes
	No

If yes, how does your teacher's support help you perform better?

Question 3: Do you feel more motivated to learn when teachers help you throughout the lesson?

	Yes
	No

If yes, what specific things do your teachers do that motivate you to learn?

Question 4: Does your Mathematics teacher consistently give you classwork and homework?

	Yes
	No

Question 5: Which of the following activities would you like your mathematics teacher to do more often during lessons? (Check all that apply)

	Provide feedback on my work
	Give me opportunities to work with my classmates
	Ask me questions to check my understanding
	Allow me to reflect on my own learning

Other (please specify):

Question 6: For each form of formative assessment listed below, please tick the box that best reflects how often you experience it in your math lessons.

Form of Formative Assessment	Always	Sometimes	Never
a. Are you given in-class work?			
b. Are you given homework?			
c. Are you given the opportunity to see and comment on each other's work?			
d. Do teachers give you immediate feedback?			
e. Do teachers observe you when you are doing a task?			
f. Do teachers ask you questions during the lesson?			

APPENDIX 5

Observation Checklist

	FORM FORMATIVE ASSESSMENT	FREQUENCY		
		Often	Occasionally	Rare
1	Home work			
2	Classwork			
3	Peer Assessment			
4	Immediate feedback			
5	Observation			

APPENDIX 6
LETTER THE DIRECTOR IN THE MINISTRY OF EDUCATION AND TRAINING

The Government of the Kingdom of Eswatini



Ministry of Education & Training

Tel: (+268) 2 4042491/5
Fax: (+268) 2 404 3880

P. O. Box 39
Mbabane, ESWATINI

24 September, 2024

Attention:

Hhohho Primary Schools - Head Teachers:

Makhungutja Primary School	Ntondozi Primary School
KaNdinda Primary School	Usuthu Mission Primary School
Emphini Primary School	St John Bosco Primary School
St' Bernard's Primary School	Malkerns Valley Primary School

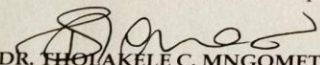
THROUGH

Manzini Regional Education Officer

Dear Colleague,

RE: REQUEST FOR PERMISSION TO COLLECT DATA FOR THE BINDURA UNIVERSITY OF SCIENCE STUDENT - MS. ZINHLE NOZIPHO MAMBA.

1. The Ministry of Education and Training has received a request from Ms. Zinhle N. Mamba, a student at the Bindura University - Zimbabwe that in order for her to fulfill her academic requirements at the University, she has to collect data (conduct research) and her study or research topic is: **"THE IMPACT OF FORMATIVE ASSESSMENT ON MATHEMATICS ACHIEVEMENT AND MOTIVATION AMONG GRADE 7 LEARNERS IN EMPHINI CLUSTER"**. The researcher will select four (4) Schools from the above mentioned. The instruments for data collection are questionnaires and interviews. All details concerning the study are stated in the participants' consent form which will be signed by all participants before Ms. Mamba begins her data collection. Please note that parents will have to consent for all the participants below the age of 18 years participating in this study.
2. The Ministry of Education and Training requests your office to assist Ms. Mamba by allowing her to use the above mentioned schools in the Manzini region as her research site. The data collection period is two months.


DR. THOLAKELE C. MNGOMETULU
DIRECTOR OF EDUCATION & TRAINING

Cc: Regional Education Officers - Manzini
Chief Inspector - Secondary
Head Teachers of the above mentioned schools
Mr. Dziva Daimond - Research Supervisor

