



Examining the effects of code switching in teaching mathematics at form 2 at rural secondary school in Goromonzi District.

By

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ABBREVIATIONS/ ACRONYMS

HBSCED- Honours Bachelor of Science Education Degree

UNESCO- United Nations Educational, Scientific and Cultural Organisation

1.1 Abstract:

This study examined the effects of code switching in teaching mathematics at form 2 at a rural secondary school in Goromonzi District. Previously done research has indicated that most teachers use code switching for various reasons which include, promoting better understanding and avoiding rote learning.

The study employed a mixed-methods approach, incorporating both quantitative and qualitative research techniques to gain a more comprehensive understanding. Research tools used were interviews, questionnaires and classroom observations.

Based on the findings, the research also identified both positive and negative effects of using code switching when teaching mathematics. One of the positive effect being the fact that it enhances understanding while on the negative side it can be time consuming. The use of visual aids was also identified as a way to address challenges that may arise with the use of code switching. The results of this study were expected to provide a better understanding on the impact of code switching in the teaching of mathematics. The findings can be used by policy makers as they make policies concerning the language of instruction to be used in teaching mathematics especially in rural areas where most of the learners have a very low English proficiency.

DEDICATION

This study is dedicated to my husband Luke Piwa who has been a pillar of strength throughout the course of the study. Also to my sons Austin Piwa and Anenyasha Piwa for giving me strength to carry on. Not forgetting my parents for their support. To my dear friends and colleagues I am thankful for all the encouragement you have given me.

APPROVAL FORM

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Dissertation Title: Examining the effects of code-switching in teaching mathematics at form 2 at a rural secondary school in Goromonzi District.

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RELEASE FORM

Title of the dissertation: Examining the effects of code-switching in teaching mathematics at form 2 at a rural secondary school in Goromonzi District.

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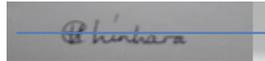
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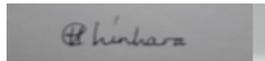
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CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This chapter introduces the research topic ‘examining the effects of code switching in teaching mathematics at form 2 at a rural secondary school in Goromonzi district’. This chapter addresses the introduction of the research, background to the study, statement of the problem, research objectives and questions then limitations and delimitations of the research. The chapter also defines key terms which shall be frequently used in the research.

1.2 Background to the study

1.2.1 Language of instruction

Language plays a pivotal role in the teaching and learning of Mathematics. Language usage is important in the way it is used in exploring mathematical concepts, formulae and procedures. Language is used to define mathematical terms, processes, read and interpret mathematical concepts. Each country lays out its language policy which is adhered to in the education system. Zimbabwe uses English Language as the medium of instruction and this has been argued by many to be one of the major reasons learners underperform as majority of them are not eloquent in English and find it difficult to understand and participate during Mathematics lessons. Ruebstein and Thompson (2002) emphasize that it is imperative for teachers to be more aware of and sensitive to issues of mathematical language acquisition and to be more creative in finding ways to support learners through understanding learners’ difficulties in understanding Mathematics language hence the need to examine if code-switching would bring about the much needed change in teaching mathematics at form 2 level.

1.2.2 Learner performance in mathematics at a national level

In Zimbabwe, Mathematics is considered one of the core subjects which everyone is expected to master for their daily lives, academic and professional circles. There is need for classroom practitioners to equip learners with the requisite skills for them to excel in Mathematics. The national pass rate for Mathematics is too low which has sparked the researcher to have a closer look at the cause of this low pass rate in secondary school. It emerged other factors have been

tackled by other researchers but a gap seems to exist as far as code switching is concerned in the teaching of mathematics.

The trend of pass rate of Mathematics in Zimbabwe has been decreasing for the past years. For the past years the pass rate for Ordinary level Mathematics has been going down usually slightly below 20%. The ZIMSEC spokesperson Dhlamini was quoted commenting after the release of 2022 November results. (Chronicle , 3 February 2023). This pass rate has affected progression to tertiary institution as Mathematics is one of the core subjects for one to be enrolled to tertiary institution. This prompted this researcher to want to examine if code switching would help alleviate this problem when introduced at form 2 level.

1.2.3 Definition of code switching

Code-switching is defined as the act of exchanging between a first language and an optional language, in the case of my study it is the exchange between first language and the official language of instruction which is English language. It is perceived as the quickest, least demanding, and the best method for saying something. Celario (2023) clarifies the meaning of Code-switching, by saying that it is from the term itself code which means language, and switching which means changing from one thing to another, which in general, is moving from one language to another in a conversation. It has been stated that it is a process of communication where the speaker alternates between two languages in one sentence or conversation without changing the content of the discussion. It commonly happens in bilingual and multilingual countries where people can use more than one language to communicate. From this, it is clear that code switching is undertaken in speaking and explaining not during the writing process.

1.2.4 The need to code switch in teaching mathematics

According to Celario (2023), the mere thought of the subject of Mathematics causes students to have anxiety and phobias thus affecting students' achievement and mastering mathematics formulae. Therefore, a positive learning climate should be manifested in the classroom to enable learners to perform at their best. Celario (2013) says that code-switching is utilized in Mathematics to bridge the gap between mathematical registers to informal terminology that students are accustomed to and would make it easier for them to understand. This also makes them more comfortable in dealing with the subject. The aim of this study is to determine the effect of code-switching in teaching mathematics at form at a rural Secondary School in Goromonzi district of

Mashonaland East which is composed of learners with low English proficiency and are of low elaborate code.

Celario (2023), highlights that many research studies have been done to test the validity of using code switching in teaching and the research which he undertook in Filipino of using code-switching in Filipino classes revealed that, if properly used in Mathematics where learners are struggling to master the concepts and formulae code switching is of utmost importance as an instruction tool as it may facilitate numerical comprehension. The results indicated that code-switching is a way to understand a concept better through the use of language. The findings revealed that the use of code-switching in a multilingual Mathematics classroom does not bring about inadequacy in learning; but a useful strategy in classroom interaction and an efficient way of transferring knowledge to students.

In Saudi Arabia, code-switching between English and Arabic occurs when teachers want to assess students' understanding. The students favored teachers' practice of code-switching Al-Adnani&Elyas, (2016). In Spain, most teachers have a positive attitude to code-switching as a pedagogical tool in their classrooms Balam& Perez, (2017). In the Philippines, code-switching positively boosts students' confidence, motivation, and engagement in English classes Olivera, (2021). This process is observable in many countries where most learners speak English as their second language.

The vitality of code switching in teaching Mathematics cannot be under rated. Diaz (1983) claims that bilingual learners easily switch to their mother tongue while doing complex tasks in a second language as a means to clarify doubts and misunderstandings encountered in the second language. They also switch to their mother tongue when trying to prove to the teachers that they do understand the content presented, although they can hardly explain it in English. This view is premised on Scotton's (1993) which specifically focuses on code-switching in an African context with Zimbabwe not an exception, which requires more investigation because African languages do not have the same structure as European languages. In some cases the meaning of the sentence is slightly distorted or the flow of information is disturbed because the two languages have different structures. Muysken (1995) avers that code-switching is a quite normal and widespread form of bilingual interaction, which can take place in any situation, irrespective of whether the alternated languages developed from the same root or not. It is important to note that in classrooms

where two languages are in contact, teachers end up being multilingual in order to help learners improve their performance (Krause & Prinsloo, 2016).

The Education policy of Zimbabwe detects that all instruction in the education system from the third grade upwards should be in English whilst the infants are to be taught in their mother language L1 (Education Act 1987) (25,4) as amended (2005). This is rooted from the idea that Zimbabwean education system is a product of the colonial master of the British/ English master. The current competence based curriculum still adopted this idea of having English as the medium of instruction except in local languages. This educational policy implemented English as the sole medium of instruction inside an English language and other English language-based subjects such as Science and Mathematics. This has had a negative impact on learner performance in Mathematics.

1.2.5 Effects of code switching on learner understanding

Code-switching has brought about some controversies in the teaching of learners. Diaz (1983) argues that code-switching in Zimbabwe is mammoth task as Zimbabwe is a multilingual country where u may have learners with different ethnic languages in the inclusive class. Mathematics teachers struggle to make their learners grasp concepts because of mismatch between teachers teaching styles and English language acquisition by learners. They say that the medium of instruction of teaching Mathematics is English. Ball (2014) indicates that Piaget and Vygotsky view language as atool of cognition, thus it is a vehicle of understanding since students make or create meaning through language. Abad (2010) concurs with this view of having challenges of using English alone in the teaching of Mathematics and say that there is a lack of ability and lack of understanding because student's languages are different in rural schools and their home context. Teachers become translation machines to let learners understand English texts in Mathematics lessons but the dilemma is aggravated once the teacher does not know all the languages spoken by the learners making code-switching a dream which never materializes.

The thrust of this research, is to present underlying reasons teachers and learners use code-switching in learning of mathematics. The approach is deemed beneficial in understanding the teachers' and learners' attitudes, needs, and preferences in learning. Supporting and opposing studies on the use of code-switching inside the Mathematics class where English is a secondary and foreign language classroom will be presented to identify code-switching implications on the

learning and teaching process of equations. Moreover, both the positive and negative effects of code-switching on teaching and learning will be provided.

1.3 Statement of the problem

Zimbabwe adopted English as the medium of instruction in the education sector from the third grade to tertiary level. Mathematics is one core subject which is required when one is progressing to tertiary level which calls for all learners to have the required expertise to progress. Teachers have indicated that one major cause for the high failure rate is that learners fail to understand the instructions given in the second language L2 which sparked this researcher to want to examine if code-switching can be the gateway to high achievement and performance when used in the teaching of mathematics.

1.4 Purpose of the Study

The study aims to examine the effects of code switching in teaching mathematics at a rural secondary school in Goromonzi District Mashonaland East. The aim of the study is to examine how the use of language varieties during math instruction can impact students' understanding, engagement, and academic achievement. The study aims to investigate the potential benefits and drawbacks of code-switching in mathematics education, and to provide educators with insights to make informed decisions about its integration into their teaching practices. By understanding the effects of code-switching, researchers hope to enhance mathematics learning experiences for students, particularly those from diverse linguistic backgrounds, and promote inclusivity and cultural relevance in the mathematics classroom.

1.5 Aim of the study

- To investigate the effects of code switching in teaching mathematics at form 2 at a rural secondary school in Goromonzi District.

1.6 Objectives of the study

- To identify how code switching in mathematics instruction impact students comprehension of mathematical concepts.
- To assess the benefits and challenges of incorporating code switching in teaching mathematics.

- To identify the effects of code-switching on student engagement and motivation in learning mathematics at form two.

1.7 Research questions

This study aims to answer the following questions:

1.7.1 Main research question

What are the effects of code switching in teaching mathematics at form 2 at a rural secondary school in Goromonzi District Mashonaland East?

1.7.2 Research sub-questions

- How does code switching in mathematics instruction impact students comprehension of mathematical concepts?
- What are the benefits and challenges of incorporating code switching in teaching mathematics?
- What are the effects of code-switching on student engagement and motivation in learning mathematics?

1.8 Assumptions of the study

The research is based on the assumption that teaching mathematics in English language (L2) comes along with challenges and one of the reasons for poor performance in mathematics and that code switching enhances teaching and learning of mathematics.

1.9 Significance of the study

The study will be significant in many ways:

1.9.1. Inclusivity and Cultural Relevance:

Mathematics education should be inclusive and culturally relevant to meet the needs of diverse student populations. By exploring the effects of code-switching, the study can contribute to creating a more inclusive and culturally responsive learning environment in mathematics classrooms. It can help educators better understand how to integrate students' linguistic and cultural backgrounds into instruction, promoting a sense of belonging and enhancing student engagement.

1.9.2. Language Development:

Code-switching can have a positive impact on students' language development, particularly for bilingual and multilingual students. Understanding the effects of code-switching in teaching mathematics can provide valuable insights into how language skills can be enhanced through the integration of multiple languages or language varieties. This knowledge can inform language acquisition strategies not only in mathematics but also in other academic areas.

1.9.3. Academic Achievement:

The study can shed light on the potential impact of code-switching on students' academic achievement in mathematics. By investigating the effects of code-switching on comprehension, engagement, and performance, educators can gain insights into how to optimize instructional strategies to improve students' mathematical understanding and achievement. This knowledge can inform instructional practices and contribute to better student outcomes.

1.9.4 Teacher Professional Development:

The findings of the study can inform teacher professional development programs. Educators can gain a deeper understanding of the benefits and challenges associated with code-switching in mathematics instruction. This understanding can help teachers develop strategies for effectively integrating code-switching into their teaching practices, enhancing their instructional repertoire and pedagogical approaches.

1.9.5 Policy and Curriculum Development:

The study's findings can inform policy and curriculum development in mathematics education. Policymakers and curriculum developers can consider the potential benefits of code-switching in mathematics instruction when designing educational policies and curricula. This can promote the incorporation of diverse linguistic and cultural perspectives in mathematics education, fostering a more inclusive and equitable learning environment.

1.10.0 Limitation of the study

1.10.1 Generalizability: The study's findings may be limited in their generalizability due to factors such as sample size, demographics, and geographical location. It is important to consider that the effects of code-switching in teaching mathematics may vary across different educational contexts and student populations.

1.10.2 Researcher Bias: Researchers' own beliefs, perspectives, and teaching styles may influence the implementation and interpretation of code-switching in the study. It is crucial to acknowledge and address potential researcher bias to ensure the validity and reliability of the study's findings.

1.10.3. Language Proficiency: The language proficiency of both students and teachers involved in the study can influence the effects of code-switching. Varying levels of proficiency may impact students' comprehension, engagement, and academic achievement, which could confound the results.

1.10.4 Time Constraints: Conducting a comprehensive study that examines the long-term effects of code-switching in teaching mathematics may be challenging due to time constraints. Longitudinal studies that track students' progress over an extended period are resource-intensive and may face logistical limitations.

1.10.5. Confounding Variables: There may be other factors, such as instructional methods, teacher-student relationships, or classroom environment that could influence students' understanding, engagement, and academic achievement in mathematics. Controlling for these potential confounding variables can be challenging, and their effects should be carefully considered and addressed in the study design.

1.10.6 Student Perception and Attitudes: Students' attitudes and perceptions towards code-switching may impact their engagement and learning outcomes. It is important to consider students' perspectives, gather qualitative data, and explore potential variations in attitudes towards code-switching among different student groups.

1.11 Delimitation

The research will be carried out at one secondary school in Goromonzi district Mashonaland East province. Goromonzi district is a peri-urban setting about 65 kilometers from Harare. It is composed of rural communities and horticultural farms. Most learners at the Secondary School are farm workers children who live in farm compounds where the life styles is below poverty datum and they speak mainly Shona and other ethnic languages. This study involved 53 learners, 2 teachers and one school head. The researcher opted for one class of form 2 as the class is of mixed ability so it will be uniformity on the subject as the researcher would be examining the effects of code switching.

1.12 Definition of terms.

For the purpose of this study the following definitions shall be used:

Code –switching- Celario (2023) clarifies the meaning of Code-switching, by saying that it is from the term itself code which means language, and switching which means changing from one thing to another, which in general, is moving from one language to another in a conversation. Hughes, Shaunessy, Brice, Ratliff and McHatton (2006) broaden the scope by indicating that “code-switching is a linguistic feature of stable bilingual communities” as code-switchers should have a better understanding of the two languages and culture.

Performance- according to Venkatraman and Ramanujum (1986) performance is the time test of any strategy. In Mathematics performance refers to the level achievement or proficiency in the subject of mathematics.

1.13 Organization of the study

Chapter One: This chapter addresses the introduction to the research, the background of the study, research objectives, research objectives and the statement of the problem. The chapter also provides information concerning the guiding principles from the objectives and research questions as well as the definition of key terms and delimitations of the study to show or outline clearly the geographical areas covered in the research.

Chapter Two: This chapter presents the literature review. This is the stage where the researcher gives a brief summary of some academic literature that has influenced this study. Its purpose is to create familiarity with current thinking and research about code- switching in teaching and justifies

my current topic by revealing previously overlooked gaps. The chapter also outlines the theoretical framework to be followed or adopted by the researcher to come up with meaningful findings.

Chapter three: This chapter is also termed the "methodology" chapter; this is so because that is where the researcher identifies the correct methodical considerations as it is directly linked to the research objectives, hence, to fully answer research questions and fulfill objectives. The methodology chapter outlines the procedure in which the research is followed from the method, research design, sampling strategy, sampling technique as well and sample size derivation.

Chapter Four: The chapter covers the findings presentation and analysis. This is the main chapter of the research study as it paves the way for the successful adoption of recommendations in chapter five. Therefore, the chapter must be free from generalizations and data manipulation.

Chapter Five: The chapter serves to provide conclusions and recommendations for further studies as well as recommendations for possible solutions to the problem under study.

1.14 Chapter summary

This chapter introduced the readers to the study by providing statistics and the basis for carrying out research. The chapter comprises of the statement of the problem, research objectives, and research assumptions as well as limitations and delimitations as to how, what, when, where, and by whom the study will be conducted. The chapter addressed the definition of terms that are used throughout the entire study. The following chapter looks at the review of literature in as far as the research/study area is concerned.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews previous researches done on the effects of code switching in the teaching of mathematics at secondary school. The literature was reviewed under the following headings: definition of code switching, language of instruction used by teachers in teaching mathematics, learners responds and mastery of concepts when taught in English language, reasons why teachers use code switching when teaching mathematics, effects of code switching in teaching mathematics.

2.1 Definition of code switching

Code-switching is the communicative practice where the speaker skillfully switches from one language to another without disturbing the flow of ideas. Poplack (1980) states that “code-switching is the alternation of two languages within a single discourse or sentence’ It mainly occurs in bilingual or multilingual communities where the interlocutors switch from one language to another for a specific purpose. Myers-Scotton (1993) defines code-switching as “the use of two or more languages in the same conversation” because each language has a social role to play in bilingual or multilingual contexts. Hughes, Shaunessy, Brice, Ratliff and McHatton (2006) broaden the scope by indicating that “code-switching is a linguistic feature of stable bilingual communities” as code-switchers should have a better understanding of the two languages and culture.

Code-switching is a change by a speaker of a language or language assortment to another. It can happen in many situations, for example, when a speaker poses their inquiry in one language while the other individual answers in another. In the educational context, code-switching is defined as the act of exchanging between a first language and an optional language. It is perceived as the quickest, least demanding, and the best method for saying something. Over the previous years, numerous researchers looked into code-switching. Fundamentally, code-switching is defined as the use of more than one language in the same speech. Gumperz (1982) referred the term as using languages with different grammatical systems in the same speech.

Adler (1998) defined code-switching as a speech which uses more than one language as alternation. Hoffman (1991) noted that code-switching happens when two languages are used in the same utterance. The term was also further explained by Myers-Scotton (1993) as a situation in which switching of linguistic varieties occurs within a single speech act.) Hafeezah & Masitah,(

2014) also suggested code-switching as “the alternative used by bilinguals of two or more languages in the same conversation.” In discussing the occurrence of code-switching, Jingxia (2010) found that it takes place unconsciously. In his study, Jingxia found students to be more conscious of code-switching that occurred in the classroom than teachers. In the same view, Sert (2005) believed code-switching mostly happens automatically and serves a purpose in the classroom setting even though it may sometimes not be beneficial.

In spite of the wide discussion of code-switching in classrooms, its use in content subject classrooms, especially mathematics has gained attention among researchers. Many studies which have taken place in non-English speaking countries claimed that mathematics teachers practice code-switching in delivering their lessons Lim & Presmeg, (2011). The main reason for this is because code-switching is considered beneficial by teachers and students. Niesche (2009) argued that code-switching is important in delivering lessons since it enhances students’ understanding, especially those who come from rural areas. Ball (2014), noted that instructions in mathematics classrooms can be easily absorbed by students if the instructors code-switch.

Like in other subjects, code-switching is utilized in the discussion of Mathematics, in which the more significant part of the learners is honestly confronting a few troubles in word-problem issues. Code-switching was noted as a vital instructive asset and intended to encourage the numerical comprehension of the students. There are likewise a few investigations that analyzed the viability of code-switching in mathematics .An analytical study explored the functions of code-switching in multilingual public elementary schools in Ile-Ife, Nigeria. It decided the impacts of the dialects utilized on educating and learning arithmetic with the end goal of exhibiting code-switching as a suitable mechanism of guidance to encourage the advancement of proficiency in children. The outcome demonstrates that code-switching is a way to understand a concept better through the use of language. The investigation reasoned that the utilization of code-switching in a multilingual Mathematics classroom does not bring about inadequacy in learning; however, it is a useful strategy in classroom interaction and an efficient way of transferring knowledge to students.

2.2 Language of instruction used by teachers in teaching mathematics

The question of language of instruction is at the top of the educational agenda in many countries and around the world. Decisions about language of instruction and efforts to develop materials and instructional strategies to support the selected language(s) are well underway. The language

of instruction may be the mother tongue of students, that is, a language they speak at home as well as in their community and the official or national language of the country, an international language such as English, or a combination of all of these. Students may begin learning in one language and transition to one or more languages during a lesson. Educating students' in their mother tongue is often described as a language right Skutnabb-Kangas & Phillipson, (1994).

A number of publications focused on education in developing countries argue strongly for use of the mother tongue or home language in teaching, at least in the early years of education. For example, Ball (2014), after an overview of interest in and approaches to mother tongue education in the past several decades in many countries around the world, concludes that, "Children whose primary language is not the language of instruction in school are more likely to drop out of school or fail in early grades. The UNESCO publication cited by Ball gives case studies of the strengths and challenges of mother tongue education in Mali, Papua New Guinea, and Peru. English language is chief in its significance concerning education not merely because this is a universal language but because this is utilized in practically all types of instruction and national and global assessments.

Technical subjects such as Science and Mathematics are instructed through the use of the English language. In spite of this, teachers often see the need to opt to switch from English to mother language to make the learners understand the concepts of the lesson. The switching from second language to first language is called code-switching. The utilization of code-switching in the classroom by the learners and teachers during discussion shows that it is either utilized deliberately or unconsciously.

In Zimbabwe the Education policy detects that all instruction in the education system from the third grade upwards should be in English whilst the infants are to be taught in their mother language L1 (Education Act 1987) (25,4) as amended (2005). The current competence based curriculum still adopted this idea of having English as the medium of instruction except in local languages. This educational policy implemented English as the sole medium of instruction inside an English language and other English language-based subjects such as Science and Mathematics. This means according to the Education policy of Zimbabwe, teachers are expected to teach mathematics at form two using English as the language of instruction. This has had a negative impact on learner performance in Mathematics.

2.3 Learner response and mastery of concepts when taught in English.

Previous studies have shed more lights on students' positive attitudes on code-switching. In a study by Abad (2010), states that even though code-switching had a low occurrence, it was appreciated by the students. Students believed that code-switching managed to build their rapport with their teachers and helped to boost their confidence to participate in classroom activities. In a study conducted by Chitera (2009) code-switching allowed students to be active participants, bridged the gap between teachers and students as well as built students' confidence. This also helped them to enjoy the lessons without having to think much about the language use.

Students supported the use of code-switching because they became more focused in the lesson, and it created a positive learning environment in the classroom. However, the fact that lack of fluency in English was the primary reason that evoked students to depend on exchanging and blending codes. Indeed, proficiency in the English language is essential for academic success because assessments written in the English language can be confusing for students with low levels of English proficiency. Proportionally, English language competency is directly proportional to cognitive skills, which are rudiments in understanding Mathematics.

Students also regard the English language as essential to their education even though they still prefer code-switching to further understand concepts and maintain their attention. Teachers frequently change their code to explain or expand the significant information as a way towards clarifying new jargon, or on the other hand, guide-lines as opposed to proceeding in the foreign language. Teachers can also make use of code-switching for interpretation, explanation, appreciation check, technique. Code-switching helps the triumphant arrangement of the significance of confused writings coded in English and makes input understood to the students, produces a low-uneasiness classroom that is positive for learning; and, keeps the students focused in a class where exercises are profoundly specialized in nature

.The mere thought of the subject of Mathematics causes students to have anxiety. Students' achievement in the subject varies according to their anxieties. Therefore a positive learning climate should be manifested in the classroom to enable students to perform at their best. Code-switching is utilized in Mathematics to bridge the gap between mathematical registers to informal terminology that learners are accustomed to. This will also makes them more comfortable in dealing with the subject.

2.4 Reasons why teachers use code switching when teaching mathematics

- To avoid rote learning

Squazzin & Van Graan, (1998) is of the view that if learners are forced to use a language in which they lack competency, they tend to be silent. Venzke (2002) states that in a classroom where the second language is the only language used, learners tend to fall back on rote learning or being silent, thus defeating meaningful learning. He argues that learners who do not understand what the teacher is saying cannot internalize new knowledge and fall back on memorization in their content subjects. Venzke supports Biggs (1991) who refers to such type of learning as the surface approach to learning which is basically instrumental or extrinsic. With this approach, learners' main aim is to meet the requirements with the least effort and reproduce facts accurately whether or not they understand them.

When learners are pressured by both teachers and the school to learn in a language which is foreign to them, the only way out is to develop learning patterns to please the two institutions. These patterns are either rote learning or being silent. This pattern does not yield good examination results. Dumatog and Dekker (2003) maintain that comprehensible input is mandatory in order for learners to learn in the classroom. Therefore if the learner does not understand the language the teacher uses, he or she cannot learn the subject matter. It is for these reasons that some teachers try to overcome the language problems of their learners by code switching during the lesson and allowing their learners to code switch as well.

Most teachers in secondary schools apply code switching when teaching equations involving word problems in order to avoid rote learning in students with low proficiency in English language.

- To promote better understanding of the subject matter

Dumatog and Dekker (2003) state that if learners do not understand the medium of instruction, a language they understand must be used transitionally until a new medium of instruction can be used with comprehension in the classroom. Previous studies have found that code-switching served different functions in a classroom situation. Yletyinen (2004) found out that code-switching is practiced by teachers and students in giving an explanation, requesting help, helping peers, making self-corrections, moving from one activity to another, and clearing misunderstandings. It also occurred as unofficial interactions and teacher's gentle reproofs. Uys (2010) found similar functions of code-switching in a classroom setting. In the study, Uys noted that code-switching

happened mostly when teachers were explaining the subject matter, building students' understanding, confirming students' understanding, using humor, and disciplining students. The findings showed that code-switching does help to ease the teaching and learning process in the classroom. It also leads us to reflect upon our perception on code-switching; whether it hinders students' language development or helps in delivering lessons well. Students have been the main reasons for code-switching occurrences since their understanding of the lessons is the main priority.

- To serve as a mediation tool

Code-switching serves as a mediation tool that promotes participation in class. Code-switching is a useful tool which bolsters communication in class. When the teacher attempts to use English only, this communication is lacking and learners become passive, as very few learners have the courage to contribute in class. However, teachers must encourage them to use English when communicating in class. Circumstances beyond teachers control force them to breach the departmental policy of using English only as medium of instruction and switch to the first language of learners.

- It helps teacher to evaluate learners understanding

Code-switching helps teachers evaluate whether the students understand the content being taught. It also helps them to emphasize important ideas that require critical understanding in the language that the learners fully understand, after which the switch back to English is made to maintain the flow of information. Learners also make use of code-switching to demonstrate to the teachers that they fully understand the subject matter taught and they can easily explain to the teacher using code-switching when they get stuck. Code-switching helps learners to fill the vocabulary gap to understand the content taught, which ultimately helps teachers gauge the manner in which they teach mathematics. It also affords teachers the opportunity to review their lesson plans and presentation as a means to help learners improve their performance.

- To help teachers to bond with learners

Code-switching helps teachers to bond with learners and inspire them to love mathematics. Code-switching is an empowerment strategy that helps teachers to develop a strong bond with learners. It affords teachers with an opportunity to interact more with learners, thus inspiring their interest in mathematics, which most regard as a challenging subject. Also inserting words or

phrases from learners' native language help them to concentrate more as well as to respond to questions without fear of making grammatical errors. This strengthens the bond between the teacher and learners as they communicate easily without struggling to construct sentences in English only. In addition, allowing learners to code-switch helps them to realize that mathematical concepts can be easily understood in their mother tongue. Thus, code-switching promotes active engagement between the teacher and learners who regard their teacher as a mentor and facilitator rather than a custodian who wants to fill the empty vessels with knowledge.

Code-switching also gives learners an opportunity to create a sound relationship with their teacher, while at the same time empowering themselves to understand mathematics. Code-switching is an unavoidable practice in bilingual or multilingual classes. This is mainly due to the fact that the majority of learners have low levels of proficiency in English. The findings are also consistent with what Chikiwa and Schäfer (2016) conclude in their report on consistency and precision in teachers' code-switching practices. Chikiwa and Schäfer (2016) is of the opinion that mathematics texts are written in highly formal language, which is challenging for learners to comprehend. Therefore, teachers switch codes as scaffolding to help learners conceptualize what the lesson is all about, and help them to acquire basic mathematics knowledge through the use of the learners' first language. The findings of the study are in line with a study conducted by Jegede (2011) in Nigeria. Jegede (2011) is of the opinion that code-switching serves as a communication strategy that bridges "the gap of linguistic competence between the two languages."

Chitera (2009) observes that code-switching in mathematics classrooms in Malawi cannot be avoided as it promotes communication between teachers and learners. However, mathematics teacher educators in Chitera's (2009) study were only allowed to code-switch as a means to verbalize their thinking as the majority of participants were not fluent in English. Kim (2015) found that in one Korean university code-switching "have motivational underpinnings," which enhance communication between teachers and learners. Butzkamm (1998) refers to the insertion of the first language during a lesson as a conversational lubricant which anchors communication between the teacher and learners. In addition, Sampson (2012) provides other functions of code-switching which include strategies for dealing with communication breakdown, the importance of exposure to and practice of the target language, as well as the need to prepare learners to use English in class. Sampson (2012) compares instances where code-switching is used to instances where English only is used in class. Inserting first language while teaching through second language

promotes language diversity, which is one of the pillars of the South African education system. However,.....) propose that in order to produce learners who are capable in mathematics and reading, serious changes should be made in teacher education. Teacher education lays the foundation and helps prospective teachers evaluate how code-switching can promote academic achievement when teaching challenging mathematics content that requires critical thinking and analysis.

2.5 Effects of code switching in teaching mathematics

Comprehension of Mathematical Concepts:

Research has shown that code-switching can enhance students' comprehension of mathematical concepts. According to Celerio (2023) using familiar language and translation in code-switching can improve understanding and clarify complex mathematical terms. Additionally, Wei (2011) found that code-switching bridges the gap between abstract mathematical ideas and concrete examples, leading to a deeper conceptual understanding.

Engagement and Motivation:

Code-switching has been found to positively influence students' engagement and motivation in learning mathematics. Moll et al. (1992) emphasized that incorporating students' cultural and linguistic backgrounds through code-switching fosters a sense of belonging and identity in the mathematics classroom. Furthermore, Garcia and Wei (2014) highlighted that interactive learning facilitated by code-switching promotes active participation, collaboration, and a supportive learning environment.

Academic Achievement:

The relationship between code-switching and academic achievement in mathematics has been explored in various studies. Chitera (2009) found that code-switching can have positive effects on test performance, particularly for students who are English language learners. However, it is important to consider the potential disadvantages of code-switching during assessments, as excessive reliance on code-switching may hinder students' ability to express mathematical ideas independently.

Language Development:

Code-switching in mathematics instruction has been found to contribute to students' language development. Kuhl (2010) highlighted the cognitive benefits of bilingualism and multilingualism, indicating that code-switching promotes language processing and comprehension skills. Additionally Ball (2014) suggested that code-switching supports vocabulary acquisition and transferable language skills in other academic areas.

Sociocultural Factors:

The effectiveness of code-switching in mathematics instruction is influenced by various sociocultural factors. Wei (2011) emphasized the importance of considering students' backgrounds and the sociocultural context in which code-switching is used. Factors such as classroom dynamics, language policies, and cultural diversity play a significant role in interpreting the effects of code-switching on students' learning experiences.

2.6 Chapter summary

The chapter focused on reasons why teachers use code switching when teaching mathematics as well as the effects of code switching in teaching mathematics. Researches done by others were reviewed to explore how the use of code switching has affected the performance of learners. The next chapter will cover methodology of the study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This research focuses on unraveling the effects of code-switching in teaching mathematics, an area ripe for scholarly exploration given the increasing linguistic diversity in classrooms worldwide. The methodology adopted for this investigation synthesizes a post-positivism paradigm with a mixed methods approach, aiming to capture the impact of code-switching through both quantitative and qualitative lenses. In this chapter the following topics will be discussed, research paradigm, research design, research approach, targeted population, sample and sampling procedures, research tools, data analysis and ethical considerations.

3.2 Research paradigm

Post-positivism is a philosophical approach that acknowledges the complexity of the real world, suggesting that while absolute truth might be elusive, we can still make informed and rational guesses about how the world works Eagleton (2006). In the context of code-switching in teaching mathematics, this philosophy could offer a better understanding. It suggests that while code-switching might not universally benefit or hinder the learning process, it can provide valuable insights into how different students learn mathematics in multilingual settings. This perspective encourages educators to consider multiple viewpoints and adapt their teaching methods to better suit the diverse linguistic needs of their students.

By adopting a post-positivist lens, researchers and educators can explore how code-switching affects mathematical comprehension and engagement among students from various linguistic backgrounds. This approach acknowledges the limitations of traditional teaching methods and opens up a space for innovative practices that could enhance learning outcomes.

3.3 Research approach:

A Mixed Methods Approach is suitable for this research topic. Mixed methods approach is an approach that combines both qualitative and quantitative research techniques, theories, and concepts to gain a more comprehensive understanding of a research problem Creswell et al (2017). It's particularly useful when one type of research is not sufficient to address the research questions. The researcher will start with a qualitative approach to gather in-depth insights on how teachers and students perceive and experience code-switching during teaching and learning sessions. Following this, a quantitative phase will be used to gather data on how teachers and students view code switching, this design enables a comprehensive understanding of both the personal experiences and the measurable impacts of code-switching in teaching and learning mathematics.

3.4 Research design

According to Patton (2002) a case study as a research design is particularly effective for in-depth exploration of complex phenomena within real-life contexts, making it a valuable approach in post-positivism philosophy. This methodology allows researchers to gather comprehensive insights into the effects of code-switching in teaching mathematics by focusing on specific instances, classrooms, or learning environments. Through detailed observation and interviews case studies can uncover how code-switching influences mathematical understanding, engagement, and communication among students and teachers.

The strength of case studies lies in their ability to provide a rich, detailed picture of the process and outcome of code-switching in educational settings, highlighting the ways it can affect learning. This method is particularly beneficial for exploring the perspectives of teachers and students, the dynamics of classroom interactions, and the specific contexts in which code-switching occurs. For example, a case study could examine a bilingual classroom to understand how the teacher's use of code-switching supports or hinders students' grasp of complex mathematical concepts.

3.5.Target population

According to Kvale (1996) a population is a set of people with a specialized set of characteristics. In other words population is the group of interest in which the researcher would like the results to be generalized to. The research will be carried out at one secondary school in Goromonzi district of Mashonaland East, since resources are not allowing for the researcher to access all schools. Resources such as finance and time were limited and this is the main reason why the researcher opted to carry the research at one school.

The population of the school is 300 in total with 190 being girls and 110 being boys the teachers are 12 in total. The researcher chose to focus on form 2 learners since she taught them. In total the form 2 learners are 53, with 30 girls and 23 boys.

3.6 Sample

A sample is a subset of a population that is chosen for a study or analysis. The purpose of selecting a sample is to obtain information about the larger population through statistical inference. The researcher is going to use a sample of form two students who are 53 in total out of a population of 300 students.

3.7 Sampling procedures

The researcher will use purposive sampling method as well as random sampling method. Purposive sampling is a non-probability sampling method widely used in qualitative research where the researcher selects participants based on specific characteristics or qualities, ensuring that the sample is relevant to the research questions Patton (2002). This method is particularly effective for in-depth studies focusing on particular phenomena or when targeting a specific subset of people. Purposive sampling will be used to select teachers who will be interviewed as well as answer questionnaires.

Purposive sampling technique will be used to choose teachers and learners to participate in the study. The defining characteristics that made the researcher to choose the participants is that the researcher teach the form 2 learners as well as the fact that the teachers at the school had at least five years of teaching experience. Therefore purposive sampling is ideal mainly to obtain the richest possible source of information to answer the research questions.

Random Sampling: Random sampling is a technique where individuals from a larger population are selected in a manner that gives each member an equal chance of being included in the study. Random sampling can be used in the quantitative phase to ensure that the sample is representative of the target population, making it more likely that the findings can be generalized. For example, random sampling can be employed to select a group of students from different grade levels or educational settings. In this study, the researcher will use random sampling in choosing learners she will be interviewing.

3.8 Research instruments

According to Mertens (2005), research instruments are tools used by researcher for the purpose of data collection. In other words research tools are instruments used as observation parameters when one is carrying out a research. In this study, questionnaires, interviews and observations will be used to gather data from the participants

Questionnaires

A questionnaire is a tool used to collect information from people through a series of questions. It can be used for a variety of purposes such as research. Questionnaires are designed to be self-administered and are usually presented to respondents in a written or online format. They can include questions in various formats, such as multiple choice, open ended, and rating scale.

Quantitative data can be gathered using questionnaires distributed to teachers. Questionnaires can measure perceptions of code-switching, its frequency, and its perceived impact on learning and teaching effectiveness. Questions can be designed to assess the correlation between code-switching and student performance. According to Dillman, (2000), questionnaires are a popular research tool due to their versatility and efficiency in collecting data from large groups of people. According to Dillman (2000) questionnaires offer several advantages, including cost-effectiveness, the ability to reach a wide and geographically dispersed audience quickly, and the standardization of questions which facilitates easier analysis. However, they also have disadvantages, such as the potential for low response rates, the risk of respondents misunderstanding or misinterpreting questions and the lack of depth in responses compared to qualitative methods like interviews.

In this research, the researcher will use close ended questions on the questionnaire and the questionnaires will be distributed to the teachers participating in the research study.

Interviews

An interview is a conversation between two or more people where one person, the interviewer, asks questions and the other person, the interviewee provides answers. Interviews are commonly used for a variety of purposes. They can be conducted in person over the phone or online. Interviews can be structured or unstructured, with structured interviews using a set of predetermined questions and unstructured interviews being more conversational and open ended. In this study the researcher will use structured interviews.

Interviews with learners can provide in-depth qualitative insights into the experiences and attitudes towards code-switching in the classroom. Interviews can explore how code-switching influences engagement, comprehension, and performance in teaching and learning of mathematics. Interviews offer a rich, qualitative method for exploring the effects of code-switching on performance in teaching equations, allowing for deep insights into individual experiences, perspectives, and better understandings that surveys and questionnaires might not fully capture.

Kvale (1996) is of the view that interviews as a research tool offer a unique depth of insight into individuals' perspectives, experiences, and motivations, making them invaluable for qualitative research. One of the primary advantages of interviews is their flexibility; they can be structured, semi-structured, or unstructured, allowing for a tailored approach that can elicit rich, detailed

responses. This method facilitates the exploration of complex topics and the uncovering of insights that might not emerge through other data collection methods.

However, interviews also present challenges. They can be time-consuming and costly, requiring significant resources for conducting and analyzing. Moreover, according to Burgess (1984), interviews rely heavily on the respondents' willingness and ability to articulate their thoughts and feelings, which can introduce biases or inaccuracies in the data collected. The interviewer's presence and questioning style can also influence responses, potentially leading to bias.

The researcher is going to interview teachers and students separately so as to gather unbiased data from both the teachers and students on the effects of code switching in teaching and learning of mathematics.

Interviews with Students

The researcher will also do interviews with students which will provide personal accounts of how code-switching affects their engagement, comprehension, and performance in learning mathematics. Questions will focus on students' preferences for code-switching in instructional contexts, any challenges they face when code-switching is or isn't used, and their overall experiences with learning mathematics through code-switched instruction.

Classroom Observations

In research observation is a technique used to collect data by watching or listening to behaviors, actions and interactions of individuals or groups in their natural environment. This can be done either directly by being present in the environment and taking note or recording, or indirectly by using tools such as camera or microphones. The purpose of observation is to gain a deeper understanding of behaviors, attitudes and experiences of individuals or groups being observed. Observation is often used in qualitative research.

Direct observations in classroom sessions where mathematics is taught can serve as a powerful tool to understand the context and dynamics of code-switching. The researcher will develop observational checklists to note when and how code-switching occurs and its immediate impact on student engagement and understanding. Malinowski (1922) is of the view that observations as a research tool allow for the collection of data in natural settings, providing insights into behaviors, interactions, and phenomena as they occur in real-time. This method offers the advantage of context and depth, allowing researchers to gather information that might not be accessible through

other methods. Observations can lead to unexpected discoveries and provide a rich data source for qualitative analysis.

However, observations also have limitations. They can be time-consuming and resource-intensive. Additionally, Gold, (1958) is of the view that, the presence of an observer might influence the behavior of those being observed, a phenomenon known as the Hawthorne effect. There's also the challenge of subjectivity, as the observer's biases and interpretations can influence the data collected.

Key Areas to Focus on During Observations

- Teacher's Use of Code-Switching

The researcher will note the situations in which teachers switch languages. Is it to explain complex mathematical terms, to clarify instructions, or to engage students? Observing the reasons behind code-switching will help understand its pedagogical value.

- Student Reaction

The researcher will observe how students respond to code-switching. Does it seem to facilitate better understanding and participation, or does it cause confusion? Student reactions will be a strong indicator of the effectiveness of code-switching in teaching equations.

- Classroom Interaction

The researcher will pay attention to the interaction patterns between students and between students and the teacher. Does code-switching encourage more questions, discussions, or collaborative problem-solving among students?

- Teaching Strategies

The researcher will also document the variety of teaching strategies employed in conjunction with code-switching. This includes how mathematical problems are presented, explained, and practiced in class, and whether code-switching plays a role in these strategies.

- Learning Environment

The researcher will observe the overall learning environment. A supportive atmosphere that encourages linguistic flexibility might enhance the positive effects of code-switching.

3.9 Validity and reliability

Validity and reliability are crucial considerations in any research method, but they hold particular significance in mixed methods research due to the combination of qualitative and quantitative approaches. Creswell et al (2000) is of the view that validity in mixed methods research refers to the accuracy and truthfulness of the findings, ensuring that the results genuinely reflect the phenomena being studied. Reliability, on the other hand, pertains to the consistency of the measurement process and the instruments used, indicating that the findings would be replicated if the study were conducted again under similar conditions.

Thorndike, (2005) alludes that for the quantitative aspect, reliability and validity are often ensured through pilot testing, and validation studies. In this research the researcher will do pilot testing first. The credibility and trustworthiness of the mixed methods approach are critical for ensuring that research findings are both reliable and valid, reflecting a true and comprehensive understanding of the research question Tashakkori & Teddlie (1998). According to Greene et al (1989), one way to enhance the credibility and trustworthiness of mixed methods research is through the integration and corroboration of findings from both qualitative and quantitative strands, a process known as triangulation. The researcher will use triangulation through the integration of both qualitative and quantitative methods of collecting data.

3.10 Data presentation and analysis procedures

The researcher examined the quantitative and qualitative data. The data will then be categorized and presented in tables to address the purpose of the study

Analysis and data presentation will be done as per the research questions and supported with relevant data.

3.11 Ethical considerations

Ethical considerations in research are paramount to ensure that the dignity, rights, and welfare of participants are protected. These considerations span a broad range, including obtaining informed consent, ensuring confidentiality and privacy, minimizing harm, and avoiding deception unless justified for the research's integrity Belmont Report (1979).

Taking into account of these ethical considerations, the researcher will introduce herself with the aid of the student identity card, introductory letter from the faculty and permission letter from the Registrar. The researcher will explain the purpose, condition of the research and request their consent. The researcher will also promise respondents that their responses are not going to be used against them nor will they be used to discredit them.

3.12 Conclusion

The exploration of code-switching's effects on teaching equations has unveiled the intricate layers of language's role in educational settings. Through a mixed-methods approach grounded in post positivism philosophy, this research will illuminate the ways in which code-switching can act as both a bridge and a barrier in the mathematics classroom. Questionnaires will reveal broad patterns in perceptions and outcomes, while interviews will offer deeper insights into the personal experiences of teachers and students. The data obtained from the use of these instruments will be presented in graphs and pie charts and tables. The next chapter focuses on data analysis, presentation and interpretation

CHAPTER 4

DATA PRESENTATION, INTERPRATATION, ANALYSIS AND DISCUSSION

4.0 INTRODUCTION

This chapter presents, interprets, analyses and discuss data gathered from the study on the effects of code switching in teaching mathematics at form 2 at a rural school in Goromonzi district. Data

was collected through questionnaires given to teachers as well as interviews done to students and classroom observations. Data collected from the study was presented in tables. The data was analyzed and discussed with reference to the literature reviewed in chapter 2. A summary of the findings was made on the closing chapter.

4.1 BIOGRAPHICAL DATA

The next section presents biographical data of teachers and learners that took part in the study.

4.1.1 Biographical data for teachers

Table 4.1 biographical data for teachers

NUMBER	SEX	LOCATION	TEACHING EXPERIENCE	QUALIFICATION	AGE	TEACHER PUPIL RATIO
1	F	Rural	10years	Diploma in Education(maths)	41	1: 40
2	F	Rural	10 years	Diploma in Education (maths)	32	1:40

The table shows biographical data of teachers involved in the study. Both the teachers involved in the study were female teachers teaching at a rural secondary school. The teachers teaching experience is 10 years and both of them have their highest qualifications as the diploma in education with the area of specialization being mathematics. One of the teachers is aged 41 years and the other one is 32 years. The teacher pupil ratio is 1 teacher as to 40 learners.

4.1.2 Biographical data for students

Table 4.2 Biographical data for students

NUMBER	SEX	AGE	CLASS
1	Male	14yrs	Form 2
2	Male	15yrs	Form 2
3	Male	15yrs	Form 2
4	Male	14yrs	Form 2
5	Female	14yrs	Form 2
6	Female	14yrs	Form 2

7	Female	15yrs	Form 2
8	Female	15yrs	Form 2
9	Female	14yrs	Form 2
10	Female	15yrs	Form 2

The table shows biographical data of learners involved in the study. 10 learners were interviewed. Of the ten learners interviewed 4 were male learners and 6 were female learners. The age of the learners ranged between 14 to 15 years with 5 learners aged 14years and 5 learners aged 15 years. All of the learners interviewed were form 2 learners.

Form 2 learners were interviewed since the researcher wanted to find out the effects of code switching in teaching mathematics at form 2. Both boys and girls were involved in the study for better representation of both male and female in the study.

4.2 IMPACT OF CODESWITCHING ON LEARNER COMPREHENSION OF MATHEMATICS.

The next section presents data on the impact of code switchimng on lerner comprehension of mathematics.

4.2.1 Responses of learners on interview question 1

Table 4.3 Responses of learners on interview question 1

NUMBER	LANGUAGE PREFERENCE DURING MATHEMATICS LESSONS
1	Shona
2	Shona
3	English
4	English
5	English
6	Shona
7	Shona
8	Shona
9	Shona
10	Shona

The table show the response given by learners when they were asked what language of instruction they prefer to be taught in. from the responses given it shows that 3 learners out of the 10 preferred the use of English language whilst 7 out of the 10 learners preferred the use of Shona which is their native language or their first language.

The learners who preferred to be taught in their first language during mathematics lessons gave various reasons why they preferred the language they mention in question 1. They said the use of Shona make them comprehend and understand mathematics better. Some learners said the use of their native language during mathematics lessons increase their engagement, participation and also motivates them. However the 3 learners who preferred English as a language of instruction said that they preferred English because it is understandable and does not bring about confusion and inconsistency in mathematical terminology and notation.

From the responses given by the learners, to maximize the positive impacts and minimize the negative impacts, according to Lin (2013), teachers should use code switching strategically and consistently to ensure students understand mathematical terminology and notation in both languages.

4.2.2 Responses of teachers on question 10 and 11 of the questionnaire

Table 4.4 Responses of teachers on question 10 and 11 of the questionnaire

NUMBER	DO YOU CODE SWITCH DURING LESSONS?	WHICH LANGUAGE DO YOU SWTITH TO?
1	Yes	Shona
2	Yes	Shona

The table shows the responses of teachers on the questionnaires. Both the teachers showed that they use code switching during their mathematics lessons. The table also shows that they switch to Shona which is the learners’ native language.

From the teachers responses ,one teacher noted that she sometimes use code switching during mathematics lessons to make learners understand more complex terms as well as when emphasizing import points as well as for reinforcement. One of the teachers also included the point that she uses code switching to create an inclusive learning environment to cater for some learners who are not fluent in English language.

Grosjean (2010) supports the responses given by the teachers by citing that code switching promotes inclusivity by valuing and acknowledging students' linguistic and cultural diversity. Lin (2013) also suggests that teachers use code switching to help students understand complex concepts by explaining them in a language that is more familiar with them.

4.2.3 Observations noted from the classroom observation.

Table 4.5 Observations noted from the classroom observation

LEARNER UNDERSTANDING	OBSERVATION
Before code switching	Passive
During code switching	Active participation
After code switching	Showed understanding

The table above shows the observation made during a form 2 classroom observation. The results from the table shows that before the teacher used code switching the learners were passive and during the instances when the teacher used code switching, the learners started to actively participate and after code switching the learners showed.

The above observations can be conclude that, learners were passive before code switching was used because they were not comprehending what the teacher was saying but during instances of code switching learners started to be actively engaged in the learning thus showing understanding of the concepts being taught and after code switching they showed understanding by performing well in the exercise they were given to do by their teacher.

From the findings based on the interviews done to learners and questionnaires responded to by teachers as well as the classroom observations, it is clear that the use of code switching has a positive impact on learner comprehension, which include improved understanding, increased engagement as well as promoting inclusivity.

4.3.0 BENEFITS AND CHALLENGES OF INCORPORATING CODE SWITCHING IN TEACHING MATHEMATICS.

The next section presents data on the benefits and challenges of incorporating code switching in teaching mathematics.

4.3.1 Responses of learners on benefits and challenges of incorporating code switching

Table 4.6 Responses of learners on benefits and challenges of incorporating code switching

NUMBER	DOES CODE SWITCHING HAS BENEFITS?	DOES CODE SWITCHING HAS CHALLENGES?
1	Yes	Yes
2	Yes	Yes
3	Yes	Yes
4	Yes	Yes
5	No	Yes
6	Yes	Yes
7	Yes	Yes
8	Yes	Yes
9	Yes	Yes
10	Yes	No

The table shows the responses of learners on the benefits and challenges faced by incorporating code switching in teaching. 9 out of 10 learners are of the view that code switching has benefits whilst only one learner out of the 10 sees no benefits of incorporating code switching in learning mathematics. Results from the table also suggests that 9 out of 10 learners are of the view that code switching has its challenges also with only one learner suggesting that there are no challenges of incorporating code switching.

Based on the learner responses, most learners said the benefits of code switching include improved understanding, that is, code switching facilitates understanding. This is in support of what Lin (2013) that code switching can facilitate comprehension by allowing students to access familiar language and cultural references. One learner said since the use of code switching allows learners to feel free to express themselves in their native language, this can also pose challenges such as noise making, as learners are allowed to communicate in their mother language they tend to express themselves more freely which may lead to noise making and wasting of time. Other learners also suggested that frequent code switching can lead to confusion and inconsistency in mathematics terminology as alluded by Khirsty (1995).

Therefore from the above findings it can be seen that as much as there are benefits to the use of code switching there are also challenges that comes with it. So to minimize the challenges the use of code switching should be balanced as cited by Grosjean (2010) who is of the view that teachers must balance code switching with the need to develop students proficiency in the language of instruction (English language).

4.3.2 Responses of teachers on the benefits and challenges of incorporating code switching

Table 4.7 Responses of teachers on the benefits and challenges of incorporating code switching

RESPONDENT	DO YOU THINK CODE SWITCHING HAS BENEFITED YOUR LEARNERS?	HAVE YOU FACED CHALLENGES IN INCOPERATING CODE SWITCHING?
1	Yes	Yes
2	Yes	Yes

The table above shows the responses given by teachers on the benefits and challenges faced when incorporating code switching during teaching. Both the respondents were of the view that the incorporation of code switching in teaching has got its benefits as well as its challenges.

One teacher suggested that code switching enhances social relations between the teacher and learners and this boots confidence in learners to tackle the subject. Another teacher also suggested that code switching enhances cognitive abilities in learners. On the challenges one teacher said the uses of code switching can be time consuming as the teacher tries to explain the concepts in both English language and the learners' native language so as to make the learners understand. Also another challenges cited by one teacher is the fact that code switching may not be effective in a multi-cultural class were there are learners from different ethnic groups. The teacher may not be well versed with all the learners different native languages thus code switching may end up being a barrier. This is in support with what Khirsty (1995) suggests that code switching can create language barriers if not implemented carefully.

To address the challenges faced by incorporating codes switching, one teacher was of the view that teachers should use visual aids such as pictures and charts and videos to help convey

mathematics concepts and ideas. The other teacher also suggested the need to encourage learner collaboration as well as address resistance to code switching.

4.4.0 EFFECTS OF CODE SWITCHING ON LEARNER ENGAGEMENT AND MOTIVATION

The next section presents data on the effects of code switching on learner engagement and motivation.

4.4.1 Learner response on effects of code switching on learner engagement and motivation

Table 4.8 Learner response on effects of code switching on learner engagement and motivation

LEARNER	DOES CODE SWITCHING AFFECT LEARNER ENGAGEMENT?	DOES CODE SWITCHING AFFECT LEARNER MOTIATION?
1	Yes	Yes
2	Yes	Yes
3	Yes	Yes
4	Yes	Yes
5	No	Yes
6	Yes	Yes
7	Yes	Yes
8	Yes	Yes
9	Yes	Yes
10	Yes	Yes

The table above shows the responses of learners on the effects of code switching on learner engagement and motivation. 9 out of the 10 learners said code switching affect their engagement during math lessons. All of the 10 learners were of the view that code switching affect their motivation.

Some learners said when code switching is used there is increased engagement and participation in mathematics classes. Another also went on to say that code switching motivates learners to learn mathematics by making it more relevant and meaningful. One learner also aid code switching reduce boredom ad monotony in math classes. Some learners also said that code switching boost

their confidence in math when complex terms are explained in their native language. The other learner also said that code switching reduce anxiety and stress by creating a comfortable learning environment.

From the response given by learners it can be concluded that code switching has positive effects on learner engagement and motivation. As cited in chapter 2 by Venzeke (2002) who state that in a classroom where the second language is the only language used, learners tend to fall back to rote learning or being silent, thus defeating the meaningful learning. So if code switching is used learners rote learning is defeated and learners are motivated to participate.

4.4.2 Teacher response on the effects of code switching on learner engagement and motivation

Table 4.9 Teacher response on the effects of code switching on learner engagement and motivation

RESPONDANT	DO YOU THINK CODE SWITCHING AFFECTS LEARNER ENGAGEMENT	DO YOU THINK CODE SWITCHING AFFECTS LEARNER MOTIVATION
1	Yes	Yes
2	Yes	Yes

The table shows the responses of teachers when they were asked about learner engagement and motivation when they use code switching during their math lessons. Both the teachers suggested that code switching has effects on learners' engagement and learner motivation.

One of the teacher's response on the effects of learner engagement and motivation was that she has discovered that code switching increase learner participation and engagement in her class. She further alluded that code switching spark learners interest in math by connecting it to their everyday experience. The other teacher also said that code switching improve learners attitude towards math making it more interactive and enjoyable. She went on to say she notice code switching boosts her learners' confidence in mathematics when complex concepts are explained in a familiar language.

The teachers responses supports what has been reviewed in chapter 2 that code switching serves as a mediation tool that promotes participation in class and when teachers attempt to use English only learners become passive as very few learners will have the courage to participate in class. Therefore when code switching is used learners become engaged and motivated.

4.4.3 Observations noted on learner engagement and motivation

Table 4.10 Observations noted on learner engagement and motivation

		LEARNER ENGAGEMENT	LEARNER MOTIVATION
BEFORE SWITCHING	CODE	Passive	Not participative
DURING SWITCHING	CODE	Active	Motivated to participate

The table shows observations noted on learner engagement and motivation during a classroom observation. The researcher observed that learner engagement before code switching was passive as well as on learner motivation, learners were not participating. During instances where code switching was used learners started to be active and started to participate during the lesson.

The above observations suggest that code switching increase learner participation and engagement in mathematics classes. It was also clear from the observations that code switching can spark interest in math by connecting it to their everyday experiences.

The observations supports what was reviewed in chapter 2 that Code-switching has been found to positively influence students' engagement and motivation in learning mathematics. Moll et al. (1992) emphasized that incorporating students' cultural and linguistic backgrounds through code-switching fosters a sense of belonging and identity in the mathematics classroom.

4.5 CONCLUSION

This chapter focused on data presentation, interpretation, analysis and discussion. Data was presented in form of tables before interpreting and analyzing it. The researcher categorized the impact of code switching on learner comprehension of mathematics, the benefits and challenges of incorporating code switching in teaching mathematics as well as the effects of code switching on learner engagement and motivation. All data presented in this chapter showed that there are more positive effects than negative effects of code switching in teaching mathematics. The next chapter will look at the research summary, conclusions and related recommendations.

CHAPTER 5

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 INTRODUCTION

This chapter gives a summary, conclusion and recommendations of the study findings. The study sought to find out the effects of code switching in teaching mathematics at form 2 at a rural secondary school. The research looked at the impact of code switching on learner comprehension of mathematics, benefits and challenges of incorporating code switching and the effects of code switching on learner engagement and motivation.

5.1 SUMMARY

Here is the summary of the findings of question 1 which sought to find out the impact of code switching on learners' comprehension of mathematics. From the findings it was noted that code switching can facilitate comprehension by allowing learners to access familiar language. It was also noted that code switching can increase student engagement and motivation. On the other hand it was also noted that if not implemented well code switching can create language barriers if not implemented carefully and also the frequent use of code switching can lead to confusion can lead to confusion and inconsistency in mathematics terminology and notation.

The summary of the findings of question 2 which sought to find out the benefits and challenges of incorporating code switching in teaching mathematics. The study found out the benefits of incorporating code switching which include improved communication, that is, code switching enhances communication between teachers and learners ensuring understanding and clarity. The study also found out that code switching facilitates problem solving by allowing learners to approach math problems from their native language. However the study also found out some challenges of incorporating code switching which include language barriers, that is, if not implemented well code switching can create language barriers. Also the other challenge is the fact that the teacher may not be proficient in learners' native languages making code switching difficult.

The third question sought to find out the effects of code switching on learner engagement and motivation. The study found out that code switching increase learner participation and engagement in math classes. Also it was found that code switching motivates learners to learn math by making it more meaningful and relevant. Code switching also boost learners confidence in mathematics by explain complex concepts in a familiar language. The study also found out that when code switching is used there is increased participation, reduce anxiety in learners and also improves sense of belonging among learners.

5.2 CONCLUSION

The Study has shown that allowing students to code-switch between their native language and the language of instruction (often English) can significantly improve their understanding of mathematical concepts. This is particularly beneficial for students from minority or multilingual backgrounds. Also Code-switching creates a more inclusive and welcoming classroom environment, encouraging students to actively participate and engage with the material. This can lead to better learning outcomes and higher academic achievement.

For students with limited proficiency in the language of instruction, code-switching helps them bridge the language gap and access the mathematical content more effectively. This can reduce frustration and improve overall learning. When students are allowed to use their native language to explain or work through mathematical problems, it can help solidify their conceptual understanding of the underlying principles. Embracing code-switching in the classroom acknowledges and values students' diverse linguistic and cultural backgrounds, which can have a positive impact on their self-esteem and sense of belonging.

While the benefits of code-switching in mathematics instruction are well-documented, there can also be challenges, such as the need for teachers to be proficient in multiple languages, the potential for confusion or misunderstandings, and the need for carefully designed instructional strategies to effectively incorporate code-switching.

5.3 RECOMMENDATIONS

From the study's findings, the following recommendations are made:

1. There is need to provide teachers with comprehensive professional development opportunities to enhance their understanding and skills in effectively incorporating code-switching into their mathematics instruction.
2. There is need to Develop and disseminate high-quality instructional materials, such as textbooks, worksheets, and digital resources, that support code-switching and cater to the linguistic diversity of the students.
- 3 teachers to encourage a learner-centered approach that acknowledges and capitalizes on students' linguistic backgrounds. This may involve allowing students to actively engage in code-switching during classroom discussions, group work, and problem-solving activities, fostering a inclusive learning environment.

4. There is need to implement differentiated instructional strategies that accommodate the varying language proficiency levels of students.

APPENDIX 1

Request to carry out research

SAMED

P Bag 1020
BINDURA
ZIMBABWE

Tel: 0271 7531 ext 1038
Fax: 263 71 7616



BINDURA UNIVERSITY OF SCIENCE EDUCATION

Date: 08/05/2018

TO WHOM IT MAY CONCERN

NAME: STANISLAO BLESSING REGISTRATION NUMBER: B225678B
PROGRAMME: HBSCEd MATHS PART: 2.2

This memo serves to confirm that the above is a bona fide student at Bindura University of Science Education in the Faculty of Science Education.

The student has to undertake research and thereafter present a Research Project in partial fulfillment of the BACHELOR OF SCIENCE EDUCATION programme. The research topic is: PERFORMANCE OF GIRLS IN MATHS

EXAMINING THE EFFECTS OF CODE-SWITCHING IN TEACHING MATHEMATICS AT A RURAL SCHOOL IN GOKOMBEZI DISTRICT
In this regard, the department kindly requests your permission to allow the student to carry out his/her research in your institutions.

Your co-operation and assistance is greatly appreciated.

Thank you

Ndlovu (Dr.)
CHAIRPERSON - SAMED

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF EDUCATIONAL FOUNDATIONS
9 APR 2018
P BAG 1020
BINDURA

APPENDIX 2

Permission to carry out research

All communications should be addressed to the
Secretary for Primary and
Secondary Education
Harare: +263 242 794 809
Toll Free: 317



Ministry of Primary and Secondary Education
68 Kwame Ninsin Avenue
Queen Louise House
P.O. Box 121
Causeway, Harare

Reference : C/426/3

10 May 2024

Bissing M. Sithole
Mapfeni Secondary School
P. Bag 29
Goromonzi

RE: PERMISSION TO CARRY OUT A RESEARCH IN MASHONALAND EAST PROVINCE: GOROMONZI DISTRICT : MAPFENI SCHOOL.

Reference is made to your application to carry a research from the above mentioned district school on the research title:

"EXAMINING THE EFFECTS OF CODE-SWITCHING IN TEACHING MATHEMATICS AT A RURAL SECONDARY SCHOOL IN GOROMONZI."

Permission is hereby granted. However, you must liaise with the Provincial Education Director of Mashonaland East Province, who is responsible for the school which you want to involve in your research. You should ensure that your research work does not disrupt the normal operations of the school. Where students are involved, parental consent is required.

You are also required to provide a copy of your final report to the Secretary for Primary and Secondary Education.

Musingarimi M.

**Acting Deputy Director: Research, Innovation and Development
For: Secretary for Primary and Secondary Education**

MIN. OF PRY. & SEC. EDUCATION
POLICY PLANNING, INNOVATION
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APPENDIX 3

OBSERVATION GUIDE

ITEM	OBSERVATION	COMMENT
<u>1 Student engagement in learning</u>		
Before code switching		
during code switching		

After code switching		
2 student understanding during code switching sessions		
3 students' motivation during code switching sessions		
4 teacher's lesson delivery		
5 students' participation when taught in English		
6 students' participation during instances of code switching		
7 relationship between teacher and students		

APPENDIX 4

QUESTIONNAIRE (Teacher)

My name is Sithole Blessing M, I am currently studying for a Honours Degree in Science Education Mathematics with Bindura University of Science Education, Department of Science Education. As part of my degree program I am currently carrying out a research on the effects of code switching in performance in teaching of equations at form two. This information will only be used for purposes of this study.

Your participation in the study is voluntary and the information you give will be treated as confidential.

A. DEMOGRAPHIC DETAILS

1 Gender: Male Female (Tick where appropriate)

2. Location of the school

Rural	Growth point	Mine	Others (specify)
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3. Age of the teacher years

4. What is the highest educational level the teacher has completed?

Secondary level	Diploma in Education	First Degree	Post Grad.	Others (specify)

5. Please indicate your area of specialization:

Mathematics	Physics	Biology	Chemistry	Other (specify)

6. Please indicate your teaching experience.

0 – 2 years	3 – 5 years	6 – 10 years	11 – 15 years	>15 years

7. Please indicate the average teacher pupil ratio in your school

1:20	1:21 – 30	1:31 – 40	1:41- 50	>1:50

B Impact of code switching on learners comprehension of mathematics

TICK YOUR PREFERRED ANSWER

8 Do you often use code switching in your mathematics instruction? YES
NO

9. How often do you use code switching in your mathematics instruction? -----

20. Have you noticed any changes in students' attitudes towards mathematics since incorporating code switching in your instruction? YES NO

21. How is the students' attitude towards mathematics when incorporating code switching in your instruction?-----

22. Do you think code switching can help to promote students' academic achievement in mathematics? YES NO

23. How do you think code switching can help to promote students' academic achievement in mathematics?-----

24. Have you ever faced challenges when incorporating code switching in your mathematics instruction? YES NO

25. What challenges have you faced when incorporating code switching in your mathematics instruction?-----

26. Do you think the challenges mentioned in part 9 above can be addressed? YES NO

27. How can you address the challenges of code switching mentioned above, in mathematics instruction?-----

D Effects of code switching on learner engagement and motivation.

28. Do you think code-switching has affected your students' engagement and motivation in learning mathematics? YES NO

29. How do you think code-switching has affected your students' engagement and motivation in learning mathematics?-----

30. Have you noticed any changes in students' attitudes towards mathematics since incorporating code-switching in your instruction? YES NO

31. What have you noticed on students' attitudes towards mathematics since incorporating code-switching in your instruction?-----

32. Do you think code-switching can help to promote students' engagement and motivation in mathematics? YES NO

33. How do you think code-switching can help to promote students' engagement and motivation in mathematics? -----

34. Have you encountered any challenges or limitations when using code-switching in mathematics instruction? YES NO

35. What challenges have you encountered when using code switching in mathematics instruction?-----

36. How can you address the challenges of code-switching in mathematics instruction, mentioned above?-----

APPENDIX 5

INTERVIEW GUIDE (student)

My name is Sithole Blessing M, I am currently studying for a Honours Degree in Science Education Mathematics with Bindura University of Science Education, Department of Science Education. As part of my degree program I am currently carrying out a research on the effects of code switching in performance in teaching of equations at form two. This information will only be used for purposes of this study.

Your participation in the study is voluntary and the information you give will be treated as confidential.

DEMOGRAPHIC DETAILS

Sex-----

Class-----

Age-----

1. What language of instruction do you prefer to be taught with? English language or mother language?-----

2. Why do you prefer the language of instruction you mentioned above?-----

3. Would you prefer code switching to be used?-----

4. Do you think code switching has any benefits in learning?-----

5. What benefits do you face when code switching is used during the learning of mathematics?---

5. Do you think code switching has any challenges?-----

6. What challenges do you face when code switching is used?-----

7. Do you think code switching affect your engagement?-----

8. How do you think code switching has affected your engagement?-----

9. Does code switching motivates you?-----

10. How does code switching motivates you?-----

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