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Exploring Teachers' Views on Code-Switching as a Communicative Technique to Enhance the Teaching of Mathematics in Grade 4

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Abstract: The teaching and learning of mathematics in South Africa are conducted through the authorised Language of Learning and Teaching (LoLT). South Africa has eleven official languages, and English is a Language of Learning and Teaching (LoLT) from the Intermediate and Further Education and Training (FET) Phase. This study explores teachers' views on code-switching as a communicative technique to enhance teaching mathematics in Grade 4 in selected primary schools in South Africa. This qualitative single case study employed the interpretivist paradigm and social constructivism theory. A convenient purposive sampling technique was used to sample six grade 4 mathematics teachers from three primary schools in the Alexandra township in South Africa. Researchers collected data through the use of semi-structured interviews, which were later analysed and discussed using themes. Findings indicate that teachers often code-switch from LoLT (English First Additional Language) into Home Language (H.L.) to enhance learners' understanding of the mathematics concepts. Researchers suggested the integration of code-switching into the curriculum policy and followed by in-service training for Grade 4 mathematics teachers in code-switching.

Keywords: *Code-switching, communicative teaching technique, mathematics, primary schools, teaching and learning.*

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Introduction

Teaching and Learning mathematics in South Africa in the Foundation Phase, the Intermediate Phase, Senior Phase, and Further Education and Training (FET) Phase is driven by the Curriculum and Assessment Policy Statement (DBE, 2012). However, Language of Learning and Teaching (LoLT) differs from the Foundation Phase and other phases, as indicated above. In the Foundation Phase, Home Language (H.L.) is used as LoLT, while from the Intermediate Phase to FET, English is used as LoLT. The home language is the learner's mother tongue or the most spoken language that the child is exposed to after birth. Despite the South African Department of Basic Education's policy regulation on the use of English as LoLT in the Intermediate Phase, mathematics teachers often find themselves code-switching between English and H.L. as a communicative teaching technique to enhance teaching and learning of mathematics in Grade 4 classes (Chitera, 2009; Maluleke, 2019; Yusob et al., 2018). This is mainly due to the South African language policy on teaching and learning in the Foundation Phase, requiring learners to be taught subjects in their home language, including mathematics (DBE, 2012).

Shartieli (2016) indicates that code-switching is the use of two languages during a conversation. This implies that when a teacher immediately uses more than one language to explain a single concept during teaching and learning, the teacher applies a code-switching approach. Barker (1993) viewed code-switching as a unique alternative way of sharing knowledge using familiar language to the other, using words, phrases, or sentences. Mabule (2015) stated that it occurs when a speaker alternates between two or more language varieties in a single conversation.

The purpose of this study is to explore teachers' views concerning code-switching as a communicative teaching technique to enhance teaching and learning of Mathematics in selected Grade 4 Alexandra township primary schools in South Africa. For this study, scholarly literature about Code-switching as a communicative teaching technique to enhance teaching and learning of mathematics, the integration of code-switching when designing mathematics lesson plans, the benefits of code-switching in the teaching and learning of mathematics, and the challenges of using code-switching in the teaching and learning of mathematics were explored.

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Literature Review

Code-switching as a communicative teaching technique to enhance teaching and learning of Mathematics

Trisnawati (2017) indicated that individuals of the same ethnic identity often code-switch from English First Additional language to identify with the group members. This view was supported by Mabule (2015), who stated that individuals code-switch from one language to another within a single sentence for easy understanding. Therefore, in the classroom, teachers code-switch to make it easy for learners to understand mathematics concepts. It can also be deduced from the preceding statements that mathematics teachers who speak the same ethnic language with the learners can find it easy to code-switch during teaching and learning to promote learners' understanding of the concepts.

In teaching and learning mathematics, various teaching approaches are used to enhance learners' understanding. The process approach or problem-solving, topics, and conceptual field approaches are fundamental to teaching and learning mathematics (Long & Dunne, 2014). In using any of the above approaches, teaching and learning should be learner-centered. However, the teachers' ability to engage learners in any of the above approaches when teaching mathematics is essential (Benson, 2002).

When teaching mathematics, teachers apply one of the above approaches to assist learners in understanding mathematics concepts (Moschkovich, 2005). The Southern and Eastern African Consortium for Monitoring Education Quality (SACMEQ) test results in South Africa's Mathematics indicates that learners predominately perform poorly in mathematics (Venkat & Spaul, 2015). This implies that there is something beyond applying different teaching approaches teachers use in teaching and learning mathematics contributing to poor performance. Nishanthi (2020) alludes that teachers should focus on language (mother tongue) and subject content when teaching them. This view gives an impression that, despite paying attention to learner-centredness (constructivism) when teaching Mathematics, teachers should also use the language (code-switching between LoLT & mother tongue) to promote learners' understanding of the subject content.

In supporting the preceding statement, Sikhondze and Goosen (2010) highlight that learners often do not comprehend certain mathematical concepts due to the language used in teaching and learning (LoLT). Hence teachers resort to using code-switching to help the learners to understand the subject content. Therefore, code-switching is found by most mathematics teachers as an effective communicative teaching technique that can be used to enhance learners' understanding of mathematics concepts (de Sanchez et al., 2018; Maluleke, 2019).

The integration of code-switching when designing mathematics lesson plans

In South Africa, the policy guideline for teaching and learning promotes integrating other subjects' topics to find coherence of subject contents (DBE, 2012). Mukti and Muljani (2016) indicated that code-switching is considered when an individual intends to make a strong argument or an emphasis on conveying a message. This implies that mathematics teachers code-switch from English First Additional Language (EFAL) to learners' native language when emphasizing certain concepts during teaching and learning. Curriculum and Assessment Policy Statement in the Intermediate Phase outlines appropriate teaching approaches of specific mathematics topics that should be adhered to when designing lesson plans (DBE, 2013). The researchers believe that teachers should integrate code-switching with EFAL to improve communicative teaching when developing lesson plans. This view is supported by Long and Dunne (2014) who indicates that in teaching Mathematics, teachers should adhere to the prescribed teaching approaches such as problem-solving, topics, and conceptual field approach when designing lesson plans. However, code-switching is not integrated when developing lesson plans as a communicative teaching technique in the current South African curricula.

Masna (2020) posits that code-switching is more meaningful and understandable to native speakers. On this note, researchers view integrating code-switching when designing lesson plans as relevant to enhancing teaching and learning problematic mathematics concepts. When integrating code-switching into the lesson plan, teachers would be mindful of how code-switching as a communicative teaching technique to promote learners' understanding. This view is supported by Vergnaud (1988), who alludes to the notion that the organisation of the lesson plan should aim at simplifying mathematics concepts for learners to be able to solve problems.

Long and Dunne (2014) echo that most teachers complain about learners' understanding of Annual National Assessment (ANA) examination questions, resulting in poor performance. Although the DBE (2012) policy insists on using EFAL as LoLT in teaching mathematics, the preceding statement highlights that most learners fail to understand ANA questions. The researchers believe that integrating the learners' native language as a communicative technique to explain certain mathematical concepts in Grade 4 can promote learners' understanding when answering ANA questions. Horasan (2014) indicated that teachers use code-switching to convey their ideas in the classrooms. Teachers' exact use of "code-switching" should be used during learners' assessments to overcome learners' incompetence in understanding EFAL. Code-switching can, therefore, be a proper communicative teaching technique for simple mathematics concepts for learners.

The benefits of code-switching in the teaching and learning of Mathematics

Suganda et al. (2018) indicated that teachers believe that code-switching in the EFAL class contributes to the smooth interaction between the teacher and learners during teaching and learning. The researchers believe that code-switching enabled learners' understanding of concepts during teaching and learning. However, the South African scenario is that foundation phase learners (grade 1-3) are taught using their native languages. According to Pandor (2006), stats indicate that learners who learn using their native languages better understand the subject matter. Therefore, the introduction of Home Language as LoLT in Foundation Phase classes in South Africa mainly promoted learners' mother tongue, believing that a second language (EFAL) is easier to acquire if the learner has already grasped their home language (Pandor, 2006).

According to Department of Basic Education ANA reports (DBE, 2012, 2013, 2104), Foundation Phase mathematics learners' performance is higher than in the Intermediate and Senior Phase. This implies that the teaching and learning of mathematics in the home language might enable learners to understand and answer questions during the assessment. This view is supported by mathematics Foundation Phase ANA results (DBE, 2014), indicating a higher performance than in the Intermediate and Senior Phase. The introduction of English as a First Additional Language (EFAL) as LoLT in the Intermediate Phase poses severe threats to mathematics learners' performance. This view is supported by Cummins (2000), who alludes to the notion that learners struggle most with the tasks relating to mathematics language usage. It can be deduced from the preceding statements that there is a need to code-switch to enhance learners' understanding of mathematics concepts. According to Modupeola (2013), code-switching helps the teacher maximise the learner-centered approach and participation, creating an atmosphere that allows the learners to express their ideas and assist teachers in simplifying challenging subjects matter make it understandable to learners.

Most South African learners come from rural areas where EFAL is rarely spoken as a medium of communication. Hence, they often find it awkward to communicate and understand the subject matter being taught in English. In agreement with the above statement, Simasiku et al., (2015) states that code-switching has demonstrated an effective teaching and learning technique in schools that use a second language as a medium of instruction. Even though code-switching is not a formal means of teaching and learning mathematics in schools, learners seem to recall concepts better after using their native language. Cekiso et al., (2019) indicate that the switch to learners' mother tongue when teaching and explaining the assessment task helps learners understand better and clarify the doubts or misunderstandings created by EFAL.

Foley (2010) alludes to the importance of code-switching practices in many of the South African classrooms. However, he argues that code-switching can never be construed as constituting a target language of acquisition or representing a viable alternative to developing formal academic proficiency in the standard form. The researchers' view is that even though code-switching is not an official Language of Learning and Teaching in South Africa, mathematics teachers can use it to enhance learners' mathematics understanding.

The challenges of using code-switching in the teaching and learning

Mooko (2004) echoes that code-switching poses a challenge, mainly when some of the mathematics terms in (EFAL) are to be explained in learners' mother tongue (Setswana, Tshivenda, or isiZulu). This implies that some terminology in Setswana, Tshivenda, or isiZulu may hold a different meaning or interpretation that might confuse learners. Olmo-castillo (2014) states that code-switching hinders the acquisition of the learners' learning of the second language that may also limit the learners' mathematical vocabulary. When the teacher has learners speaking different mother tongues in the same classroom, code-switching might cause chaos since most learners will not understand the teacher's mathematical concept explanation using a specific mother tongue. This view is supported by Cook (2002), who contends that code-switching in a multilingual classroom may cause problems since students do not necessarily share the same native language. Besides, code-switching can easily mislead learners when writing an assessment, particularly if they fail to recall the appropriate words used during code-switching. Setati (1998) alludes that access to the real meaning of mathematics terminology can easily be misinterpreted when explained in the mother tongue. In certain instances, teachers who do not speak the same mother tongue may feel uncomfortable explaining some mathematical concepts using the learners' mother tongue. This view is supported by Bailey (2011), who indicates that psychologically, the use of code-switching (to a mother tongue) by a teacher who is not the native speaker of the language could result in embarrassment and shyness in using the language. On the other hand, code-switching can also be seen as time-consuming and delay the teacher in completing the syllabus (Modupeola, 2013). This implies that giving explanations of different meanings of mathematics concepts to communicate meaning in the mother tongue can also delay learners in acquiring more knowledge, and result in them forever being dependent on code-switching, and work against the teacher's covering of the syllabus (Jantjies & Joy, 2016).

Problem statement

The learners' rights to receive education in the language they best understand during teaching and learning is enshrined in the Republic of South African's constitution Act No 108 of 1996. However, the Department of Basic Education in South Africa introduced a language policy that all teachers and learners must adhere to (DBE, 2012). The introduction of Home Language as a Language of Learning and Teaching (LoLT) of Mathematics in the Foundation Phase seems to have

favoured most students (DBE, 2012, 2013, 2014). Contrary to that, learners' performance in mathematics from the Intermediate to the Further Education Training Phase has been considered very poor compared to the international community (Taylor et al., 2012). This view is supported by Venkat and Spaul (2015), who flag the concerns regarding the regulation of the curriculum policy changes and the teachers' knowledge gap in Mathematics teaching.

Most South African learners enter the Intermediate Phase where EFAL is used as LoLT with the minimal vocabulary required in learning Mathematics. This poses a serious challenge to most South African mathematics teachers expected to teach Grade 4 learners' mathematics in EFAL. In contrast, they were taught in their mother tongue for three years in the Foundation Phase (DBE, 2012). With the struggle to improve learners' understanding of mathematics concepts and their performance, most Grade 4 mathematics teachers code-switch from EFAL to learners' mother tongue (Gutstein, 2007). Teachers code-switch as a means of communicative teaching to reach out to learners struggling to comprehend mathematics concepts in English, hence using learners' mother tongue. However, code-switching is not provided for by policy or an official communicative teaching approach employed during teaching and learning. Despite that, teachers are not trained to use code-switching, and it can be detrimental and misleading if the teacher misconstrues the words. This study explores teachers' views on code-switching as a communicative technique to enhance mathematics teaching in Grade 4 selected primary schools in South Africa.

Theoretical framework

The theory of social constructivism is used to guide this research. To improve teaching and learning, social constructivism theory can be thought of as a communicative technique, philosophy, and communication theory (Bay et al., 2012). The foundation of social constructivist theory is that code-switching as a communicative tool improves mathematics instruction in Grade 4 primary schools. This theory encourages teachers to design learner-centered lesson plans and promote learners' active participation (Shah, 2019) and engagement in teaching and learning to construct meaning (Gobbo et al., 2018). This view is supported by Ofaletse and Oats (2019), who allude to the notion that code-switching promotes effective teaching and learning in schools that use a second language as a medium of instruction. This implies that if learners can understand mathematics concepts explained in their mother tongue, they find the confidence to participate in mathematics teaching and learning.

It is the researchers' view that learners interact during teaching and learning, they find it easier to understand, recall and construct new knowledge. The problem-based Mathematics teaching approach requires a learner-centered approach to increase learners' active participation in a classroom (Ali, 2019). Superficial learning theory occurs when learners passively take information transmitted from the teacher (Krajcik & Shin, 2014). The researchers' view is that if learners cannot understand the EFAL as a LoLT of Mathematics, they might passively take information from the teacher. This view is supported by Musharrat (2020), who indicates that hands-on activities enhance teachers' application of constructivism and promote learners' critical thinking and learning techniques. This study employed social constructivism theory to explore the teachers' views on code-switching as a communicative technique to enhance mathematics teaching in Grade 4 selected primary schools in South Africa.

Research questions

This single case study employed the following main research question and sub-questions to explore teachers' views on code-switching as a communicative technique to enhance mathematics teaching in Grade 4 selected primary schools in South Africa. The main research question is: How do mathematics teachers in Grade 4 primary schools use code-switching as a communicative technique to enhance mathematics teaching? The following sub-questions supported the main research question:

- *How does code-switching enhance the teaching of mathematics in Grade 4 learners?*
- *How do mathematics teachers in Grade 4 integrate code-switching when designing lesson plans?*
- *What are the benefits of code-switching in the teaching and learning of mathematics in Grade 4?*
- *What are the challenges of using code-switching in the teaching and learning of mathematics in Grade 4?*

Methodology

Research design

This study employed a qualitative approach. Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem (Creswell, 2013). This single case study emanated from a community engagement project wherein the researchers used an interpretivist lens to investigate the teachers' views regarding code-switching as a communicative teaching technique to enhance mathematics teaching and learning in primary schools in South Africa (McMillan & Schumacher, 2010).

Sampling and data collection

Six grade 4 mathematics teachers were purposeful from three primary schools in Johannesburg East District in South Africa (Sharma, 2017). This qualitative study collected data from the sampled participants using face-to-face, semi-structured interview techniques (Creswell, 2013). The semi-structured interviews technique was used to obtain a detailed and thick description of mathematics teachers' understanding of, participation in, and contribution to the use of code-switching to enhance the teaching and learning of mathematics in primary schools in South Africa.

The qualitative data collection using the face-to-face semi-structured interviews was based on the utterances of six (n=6) Grade 4 Mathematics teachers currently teaching Mathematics in the selected three primary schools in the Alexandra township, South Africa. Among the six participants, two have ten years of teaching experience, three have over 15 years of experience, and one has 21 years of teaching experience.

Validity and reliability

The literature review aided in developing questions for face-to-face semi-structured interviews on the integration of code-switching to improve mathematics teaching and learning (Moono & Rankin, 2013). The University ethical clearance committee made suggestions on the interview guide and validated the questions' relevance. Consequently, the interview guide for the semi-structured interviews was a reliable instrument for collecting qualitative data from participants. The researchers ensured that data collected from participants were credible, trustworthy, and transferable. To do this, researchers purposively sampled relevant grade 4 mathematics with sufficient teaching experience and subject knowledge to participate in this study. To validate the captured information during the data collection, researchers repeatedly listen to the recorded data to check the missing data from the respondents. The researchers found all captured data valid, reliable, and coherent to adopt a research design.

Data analysis

The data for this study based on teacher views obtained from semi-structured interviews were analysed using qualitative content analysis (Flick, 2013). The semi-structured interviews were audiotaped in settings that allowed for interaction between the researchers and the teacher. The researchers were able to ask probing questions and capture the teacher's thoughts and feelings as a result of this (McMillan, 2016). The researcher kept the field notes to record interactions with the teachers, primarily those that could not be audiotaped. The data analysis involved: (1) create and organise data, (2) reading and profiling, (3) classifying data, (4) interpreting the data, and (5) representing and visualising data (Creswell, 2013). The analysis procedures involved transcribing and data into sets, using codes to establish themes, and representing them using words (Bature & Atweh, 2019). The collected data was later analysed and discussed through themes (McMillan & Schumacher, 2010).

Ethical issues

The researchers obtained ethical clearance from the University of South Africa under the College of Education (*Ref. 2017/03/15/90158024/1/MC*). All ethical issues such as confidentiality, anonymity, seeking permission before data collection were adhered to. Before the interview sessions, the researchers sought permission from each participant, and the study's intention was made known.

Results

The following themes emerged from the data analysis process: code-switching as a communicative teaching technique to enhance teaching and learning of mathematics in Grade 4 learners; integration of code-switching when designing lesson plans; the benefits of code-switching in the teaching and learning of mathematics in Grade 4; and the challenges of using code-switching in the teaching and learning of Mathematics in Grade 4.

The findings of theme one, "code-switching as a communicative teaching technique to enhance the teaching and learning of mathematics in Grade 4 learners", were outlined below as follows:

In response to whether code-switching improves the teaching and learning of mathematics, teacher#1 stated that while code-switching is used in a mathematics Grade 4 class as a communicative teaching technique to enhance the teaching and learning of mathematics, it does not constantly improve the process. *She said: "No, it won't assist in improving learners' performance. Instead, it makes teaching more complicated in a situation wherein the class has learners speaking more than one mother tongue since it requires teachers to be multilingual."*

Disagreeing with the previous teacher, teacher#3 said: *"Yes, code-switching improves mathematics learner's performance in a great deal, since learners find it easier to understand in their mother tongues." Incongruent with the previous teacher's utterances, teacher#6 indicated that code-switching improves learners' performance in mathematics. She said: "Yes, code-switching improves learners' performance in mathematics because learners easily understand the mathematics concepts."*

However, teacher#4 holds a different opinion from the previous teachers. She indicated that code-switching disadvantaged learners' performance in a heterogeneous H.L(class with varying mother tongues). The use of code-

switching in this instance confuses learners as explanations in different languages may not relate to learners' language. She stated: *"Not really; in my class, I have learners who speak different languages as their mother tongue, explaining certain mathematics concepts using different mother tongues may confuse them. One term may have a different meaning depending on the learner's mother tongue. If the teacher does not clearly understand the learners' mother tongue, it can be a problem to pass the word's real meaning to the learners."*

Interestingly, teacher#5 echoed that code-switching is a bridge that teachers should consistently use to help learners find it easy to participate in teaching and learning. He said: *"Learners find it very easy to participate in problem-solving of mathematics concepts if the explanation is given using their mother tongue."*

His view was seconded by teacher#2, who also stated that *"learners feel more comfortable to express themselves using their mother tongue since some mathematical concepts are difficult for them to understand."*

The findings of theme two, *"integration of code-switching when designing Grade 4 mathematics lesson plans"*, were outlined below as follows:

In answering the question on the integration of code-switching when designing Grade 4 mathematics lesson plans, teacher#4 distance herself from code-switching when designing mathematics lesson plans: *"I do not include code-switching when designing mathematics lesson plans."*

These utterances were similar to teacher#1, who indicated that it would be time-consuming to use different mother tongues to explain different mathematics concepts. She said: *"I use English, the official CAPS LoLT, when designing mathematics lesson plans. It will be time-consuming for me to translate all mathematics concepts into my mother tongue."*

Teacher#6 stated that, although she likes code-switching, she would not want to prepare a lesson that has translated words into different home languages. She would instead use code-switching as it suits her during teaching and learning. *"I am not of the idea of designing a lesson plan with translated English words into different mother tongues, but rather code-switch when I find it necessary during teaching and learning."*

Contrary to previous teachers' utterances, teacher#2 alluded to the notion that *"in our school, we are very fortunate since we receive mathematics lesson plans from our district office, written in English, but I use a pencil to explain some words in H.L."*

Teacher#3 does not favour the idea of integrating code-switching when designing mathematics lesson plans.

He stated that: *"I do not incorporate code-switching because lesson plans must be designed in that language of learning and teaching, in this case, English."*

Teacher#4 alluded to the fact that *"I use English as a language of learning and teaching when designing mathematics lesson plans. My lesson can be shared with other mathematics teachers who do not speak my home language. If I mix with other languages when designing the lesson, it might confuse"*.

The findings of theme three, *"the benefits of code-switching in the teaching and learning of mathematics in Grade 4,"* were outlined below as follows:

Teachers hold a variety of ideas regarding the benefits of code-switching, both in teaching and learning Mathematics. Teacher#4 indicated that learners could understand certain mathematical concepts that are difficult for Grade 4 learners. She noted that: *"learners in Grade 4 still find it difficult to understand most of the English terms used in mathematics since they were taught in a home language in the Foundation Phase. Therefore, I need to explain some of the concepts in their mother tongue for them to understand better."*

In supporting the previous teacher, teacher#6 stated that: *"Learners get the lesson content easily, and I also have the confidence in delivering the subject content to learners. I also interact with learners without forcing them to speak English, but use home language to communicate with them, since most of them have limited vocabulary to express themselves properly."*

Contrary to the above, teacher#1 argues that most learners are not benefiting from code-switching since the home language used during teaching and learning is not used when setting assessments. She said: *"Although teachers use code-switching during teaching and learning to enhance understanding of certain concepts, the home language is not used when setting a test and examination. Therefore, code-switching may disadvantage learners' performance in mathematics."*

Her views were supported by teacher#4, who stated that code-switching should be used: *"only if the teacher is going to explain all mathematics concepts in a lesson plan and during assessment in different home languages to all learners in class since we have a heterogeneous H.L. class. I also find it difficult to explain some mathematics concepts in my mother tongue."*

Teacher#2 support the use of code-switching to enhance learners' understanding. She indicated that: *"learners can recall some of the words used during teaching and learning when writing assessment and assist them in getting answers correctly."*

In agreement with the previous teacher, teacher# 5 indicated that *"learners also relate well to their previous Foundation Phase grades work when code-switching and it works to their advantage."*

The findings of theme four, *"the challenges of using code-switching in the teaching and learning of Mathematics in Grade 4"*, were outlined below as follows:

Teachers hold different ideas concerning the challenges of using code-switching in mathematics teaching and learning in Grade 4. While teachers focused on the benefits in the preceding section, they also had a different view of code-switching in teaching and learning mathematics. Teacher#4 indicated her first challenge as using different home languages to explain one concept, which may confuse learners.

She alluded to the fact that *"not all learners are speaking my language, shortage of vocabulary in different mother tongues is a huge challenge to learners and me as well. I also view code-switching as time-consuming since I should also pay attention to covering the syllabus on time."*

In seconding teacher#4, teacher#1 alluded to the fact that *"as a teacher, you will only use code-switching using the language you understand. It is, therefore, possible that not all learners will understand you correctly, which may disadvantage them when writing an assessment. Besides, not all learners in our classes are South African. Hence they will be disadvantaged if I start using my South African mother tongue to explain some of the mathematics concepts."*

Even though teacher#2 favours code-switching, she alluded to the notion that *"it creates laziness in thinking and discourages learners from engaging in English outside their classroom."*

However, Teacher#3 who holds a different challenge concerning code-switching, stated that *"the subject facilitators from the department of basic education do not allow lesson plans designed with code-switching since they do not necessarily speak the same language and cannot justify if the teacher used the correct language translation."*

Although teacher#6 supports code-switching, she indicated that she finds it challenging when learners turn to answer questions during assessment using the mother tongue. *"It is disturbing when learners code-switch from English to their mother tongue when answering questions during the test and or examination."*

To further elaborate on the above-illustrated findings, the researchers opted to give a brief discussion below.

Discussion

Mahlambi and Mawela (2021) indicated that code switching provides meaning and understanding when conveying the message to learners in class. The study participants' views agree with Hayek, in the sense that they all agree that code-switching does convey the message to learners in a better way than English First Additional language.

According to this study, teachers in grade 4 mathematics who offer English as a First Additional Language (EFAL) frequently code-switch from EFAL to learners' mother tongue as a communicative teaching strategy to improve teaching and learning in the classroom. Gutstein (2007) supports this and states that most Grade 4 mathematics teachers code-switch from EFAL to the mother tongue. Shartiely (2016) indicates that code-switching is the use of two languages during a conversation. In this study, mathematics teachers' central idea behind code-switching (using two languages) is to explain certain mathematics concepts in learners' mother tongues that seem challenging to understand in EFAL to learners.

Social constructivism emphasises learner-centered teaching and learning and can quickly be promoted in mathematics class when learners easily understand what is being taught. In discussing code-switching as a communicative teaching technique to enhance the teaching and learning of mathematics, the literature study reveals that various teaching approaches, such as process-approach or problem-solving, topics, and conceptual field approach, are used teaching and learning of mathematics (Long & Dunne, 2014) These teaching approaches should enhance the teaching and learning of mathematics and yield the expected learner's performance in Grade 4.

However, applying these teaching approaches contradicts the expected results since most learners are still performing poorly. The Southern and Eastern African Consortium for Monitoring Education Quality (SACMEQ) test results in South Africa's mathematics indicates that learners predominately perform poorly in mathematics (Venkat & Spaul, 2015). Most Grade 4 mathematics teachers concur that code-switching as a communicative teaching technique enhances teaching and mathematics learning. Teacher#3 highlighted that code-switching improves mathematics learners' performance in a significant way. *"Learners find it easier to understand in their mother tongues,"* says teacher#6. Besides, code-switching makes it easier for learners to problem-solve mathematics concepts in class and understand mathematics if they explain certain concepts in their mother tongue.

Besides that, *"learners feel more comfortable expressing themselves using their mother tongue since some English words are difficult for them to understand,"* says teacher#2. Sikhondze and Goosen (2010) highlight that learners often do not comprehend certain mathematical concepts due to the language used in teaching and learning. Hence teachers resort to the use of code-switching to help the learners to understand the subject content. Although most teachers agree that code-switching helps learners understand and improve their performance, some teachers hold a different opinion. When classes have learners speaking more than one language, code-switching may not necessarily be practical and yield the expected results. Teacher#1 stated that code-switching does not assist in improving learners' performance. Instead, it

makes teaching more complicated when the class has learners speaking more than one mother tongue since it requires teachers to be multilingual. In agreement with the previous teacher, teacher#4 indicated that one word might have a different meaning depending on the mother tongue. If the teacher does not clearly understand the learners' mother tongue, it can be a problem to pass the real meaning of the word to the learners (Foley, 2010).

This study also explored the integration of code-switching when designing lesson plans to enhance the teaching of Mathematics. The literature revealed that the South African Curriculum and Assessment Policy Statement. It indicates that the curriculum for teaching and learning does not pay attention to integrating code-switching in lesson planning. However, it promotes the integration of subject topics, as has been said about integrating code-switching when designing mathematics lesson plans (DBE, 2014). In seconding the previous teacher, teacher#1 alluded to the fact that it will be time-consuming to use different mother tongues to explain different mathematical concepts and would therefore preferable use EFAL as an official LoLT when designing Mathematics lesson plans. Teacher#4 said: *"I do not include code-switching when designing Mathematics lesson plans."*

Despite focusing on the prescribed LoLT (EFAL), integrating code-switching in lesson plans is also viewed as an exercise that will be time-consuming. There is, therefore, no suggestion of the integration of code-switching when designing lesson plans as a communicative teaching technique. Even though code-switching is not a policy, teacher#6 indicated that she would instead use code-switching during teaching and learning as and when it is required, other than integrating it when designing lesson plans. This teacher, concurring with Liu and Zhang (2014) alludes to social constructivism is a communicative technique, philosophy, and communication theory. Teacher#2 indicated that she receives lesson plans written in English from the district subject facilitator, which do not integrate code-switching. However, she uses a pencil to explain some words in the learners' home language. Vergnaud (1988) alludes to the fact that the lesson plan's organisation should simplify Mathematics concepts for learners to solve problems. Therefore, the researchers' view is that teachers should integrate code-switching when designing lesson plans as a communicative teaching technique to enhance learners' understanding of Mathematics subject content.

According to Pandor (2006), the introduction of Home Language as a LoLT in Foundation Phase classrooms in South Africa was primarily intended to promote the use of a mother tongue by implying that learning a second language (EFAL) is easier if the learner has already mastered the home language. Although code-switching is not an official policy-based means of communication in teaching and learning, when responding to code-switching benefits in the teaching and learning of Mathematics, most teachers indicated that learners benefit from code-switching when teaching and learning mathematics in Grade 4. Teacher#4 indicated that since most learners in Grade 4 have difficulties comprehending most of the mathematics terms in EFAL, their home language makes it easier for them to understand since they were being taught in the home language while in Grade 3. Teacher#6 indicated that most learners have limited vocabulary to express themselves adequately in English. Therefore, it is easier to interact with them using their mother tongue without forcing them to speak English. This view was supported by Metila (2009) who echoes that code-switching assists the teacher to maximise learner participation, creating an atmosphere that allows them to express their ideas and assist teachers in simplifying the challenging subject matter. Simasiku et al. (2015) states that code-switching has demonstrated an effective teaching and learning technique in schools that use a second language as a medium of instruction. This view supported teacher#2, who stated that code-switching helps learners recall some of the words used during teaching and learning when writing assessments.

Despite all the benefits of code-switching, most teachers echoed several challenges of using code-switching in teaching and learning mathematics in Grade 4. This view is supported by Mooko (2004), who indicates that code-switching poses a challenge, mainly when some of the mathematics terms in (EFAL) are to be explained in the mother tongue (Setswana). Expressing their frustrations regarding code-switching, teacher#4 and teacher#1 stated that their classes are composed of learners who speak different mother tongues, making it difficult to code-switch when teaching. In their view, the shortage of vocabulary to address the heterogeneous classes poses a challenge to the teachers and learners. Also, code-switching is viewed as time-consuming since the teacher should be mindful of covering the syllabus. This view is supported by Cook (2002), who contends that code-switching in a multilingual classroom may cause problems since students do not necessarily share the same native language. Teacher#1 alludes to the fact that not all learners in a class may understand the teacher correctly, which may disadvantage them when writing an assessment. Setati (1998) says that the real meaning of mathematics terminology can easily be misinterpreted when explained in the mother tongue. Teacher#2 views code-switching as a communicative teaching technique that can create laziness in thinking and discourages learners from engaging in English outside their classroom.

On the other hand, teacher#6 alluded to the notion that it is disturbing when learners code-switch from English to their mother tongue when answering questions during the test and or examination. These views are supported by Jantjies and Joy (2016), who states that a mother tongue could also delay learners in acquiring more knowledge. They would then forever be dependent on code-switching and work against the teacher's covering of the syllabus.

Conclusion

The findings of this study provided the scholars and the participants' views regarding the use of code-switching as a communicative teaching technique to enhance teaching and learning of mathematics, the integration of code-switching when designing lesson plans, the benefits of code-switching in the teaching and learning of mathematics, and the challenges of using code-switching in the teaching and learning of mathematics. The study revealed that Grade 4 mathematics teachers use code-switching as a communicative teaching technique to enhance learners' understanding of mathematics concepts. Okwueme et al. (2015) indicate that hands-on activities enhance teachers' application of constructivism and promote learners' critical thinking and learning techniques. This implies that code-switching should not be seen as a last resort that teachers are compelled to use but to promote a learner-centered teaching approach.

This study also concludes that using home language or mother tongue in the Foundation Phase is a possible communicative teaching technique that encourages learners' understanding and mathematics performance. However, the introduction of EFAL in the Intermediate Phase, mainly Grade 4, poses severe challenges to learners since many have a limited mathematics vocabulary in English. Besides, teachers find it time-consuming to code-switch to the mother tongue to explain certain mathematics concepts. Some learners resort to writing in a mother tongue other than EFAL. The study reveals that learners fail to explain certain mathematics concepts during the assessment, which poses a threat as learners progress to higher grades.

On the other hand, code-switching has been seen as a technique that benefits learners, particularly concerning mathematics concepts. Learners can construct meaning through the use of code-switching. The use of the mother tongue during code-switching makes it easier for learners to understand mathematics concepts. It has also been revealed that teachers do not integrate code-switching when designing lesson plans. Most teachers claim that they would rather code-switch as they teach but do not integrate it since code-switching is not a language policy.

Recommendations

In-service training on code-switching by the Department of Basic Education in South Africa to Grade 4 mathematics teachers can empower them to plan effectively and improve communicative teaching techniques. This study suggests several courses of action regarding code-switching as a communicative teaching technique to enhance teaching and learning of mathematics in Grade 4 primary learners. In this way, mathematical instrumental learning, which focuses on code-switching as a communicative teaching technique to enhance mathematics teaching in Grade 4, will be influential. Although the current study is based on a small sample of participants, the findings suggest that there is a need for Grade 4 teachers to improve their communicative teaching techniques such as code-switching to improve learners' performance. This study recommends the integration of learners' native languages with EFAL during an assessment to benefit learners' performance. The researchers also suggest that the Department of Education formalise the integration of code-switching in teaching and learning by amending the curriculum policy. Future research should focus on the study's broader scope, paying attention to both primary and secondary schools.

Limitations

This study focused on mathematics teachers who are teaching at primary schools in Alexandra Township, South Africa. Researchers omitted secondary school mathematics teachers in this study. In Alexandra Township, South Africa, there are twelve primary schools. However, in this study, a minimum of six participants from six different primary schools was sampled to participate. The researchers' discretion was used when determining the research participants, and those selected had the necessary teaching experience and information required to answer the research questions.

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Authorship Contribution Statement

Mawela: conceptualization, data collection, drafting manuscript, analysis/interpretation, and editing of manuscript.
Mahlambi: discussion of findings, conclusion, recommendations, acknowledgement, and editing of manuscript.

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