USING AN AFRICAN LANGUAGE IN TEACHING GEOMETRY AT FET PHASE: A CASE STUDY OF THREE EASTERN CAPE SECONDARY SCHOOLS

Clemence Chikiwa
Rhodes University, RUMEP
South Africa
c.chikiwa@ru.ac.za

Marc Schafer
Rhodes University
South Africa
m.schafer@ru.ac.za

ABSTRACT-This paper explores the use of an African language, isiXhosa, in the teaching and learning of geometry in three secondary schools in the Eastern Cape, South Africa. The article is guided by Vygotsky's socio-cultural theory and focuses on the consistencies and inconsistencies, benefits and constraints that participating teachers experienced when using isiXhosa as a teaching and learning tool in Grade 11 mathematics classrooms. Data in this study were collected through classroom observations and interviewing three Grade 11 mathematics teachers. The study found that teachers in the observed classes practiced high frequency repetition of mathematics concepts through translation from English to isiXhosa and vice-versa. The study further found that while some translations were accurate and consistent with English mathematics register, some were inconsistent and imprecise. This paper argues that while the use of home language is a potential resource that can enhance teaching and learning of mathematics at secondary school level, its use should promote conceptual teaching and learning, and increase students' epistemological access to mathematical knowledge. The paper concludes that while isiXhosa is a potential teaching and learning resource in mathematics, teachers should be trained to use the language systematically and consistently during their teaching. This study recommends that adequate and appropriate resources should be developed and made available to teachers and their learners. Development and use of such resources should be coupled with both pre-service and in-service teacher professional development programs.

Key terms: Geometry, Language, Code Switching, Repetition, Mathematics register, Translation.

1. INTRODUCTION

The teaching of mathematics in secondary school classes where learners are taught in their second or third language is complex and has been a subject of research and debate in the past two decades. Teachers in these classes uses various strategies in the interest of enhancing conceptual teaching and learning of mathematics in multilingual classes. One of the strategies teachers use is code switching into the students' home language. Code-switching refers to the alternate use of two or more languages in the course of a single utterance, conversational exchange or speech event (Gardner-Chloros, 2009). During the use of this practice, teachers alternate between learners' home language and the language of teaching and learning (LoLT) during their teaching. Researches refute the assumption that students' home language is not necessary and should be ignored in multilingual classes (Barwell, 2008), instead, use of home language in mathematics classrooms has been found to be beneficial (Setati, 2002). Cummins (2000) proposes that students who can converse in two or more languages will perform better than their peers who cannot. Those without a high proficiency in any language will underachieve (Barwell, 2008). Thus in the wake of the use learners' first language in South African's mathematics classrooms, this paper sought to address the following questions:

What teacher language practices are present in multilingual mathematics classrooms?
Are these language practices ensuring consistency and precision during the teaching of mathematics?

Teacher code switching is being done through various strategies such as borrowing, repetition, redundancies, transparent switching among others. In this paper, focus is on repetition and how teachers are using it in the teaching and learning of geometry at secondary school level.

2. LITERATURE REVIEW

2.1 Code switching

A teacher should not only aim at being understood by his learners, but at making it less likely to be misconstrued. One of the goals of mathematics teaching is to promote successful communication and grasp of mathematical concepts by students. The use of languages other than the LoLT in the teaching and learning of mathematics to provide learners with access to mathematical concepts has gained much attention in research over the last three decades. This phenomenon is much more prevalent in countries where teachers are teaching in a language that is not their first language nor is it the students' native language. Teachers in multilingual classrooms have come up with language innovations and strategies to aid conceptual understanding and access to mathematics.

One of the strategies is code switching which Cook (2001) argues that is a natural phenomenon in settings in which the speakers share two languages. Cook (2001) contends that teaching methods that enable the teacher to use learners' first language and the LoLT concurrently (for example, incorporating code-switching) create particularly authentic learning environments. With most of the world becoming multilingual (Jegede, 2012), coupled with factors associated with globalization and migration of people within countries and beyond countries and continents, the use of more than one language in speech in daily lives has become a common phenomenon. The selective drawing on language varieties available to speakers as dictated by their intentions, by needs of the speech participants and various conversational settings (Bullock & Toribo, 2009) has led to alternate use of more than one language in conversations.

2.2 Communicative functions of code switching

Teachers' ability to communicate in a way that students understand increases effective learning of intended concepts. Code switching in content subjects such as Mathematics and Science is regarded by some researchers (Setati, 2002) as an interactional resource that teachers and students use to understand each other. Code switching as purported by Setati (2002) is a resource available to all multilinguals. Martin-Jones (2003, p. 6) explains that "bilingual teachers and learners routinely use code-switching as an additional meaning-making resource within the ongoing flow of classroom talk." Metila (2009) noted that teachers and students would code switch from English to Filipino for various communicative functions. These included code switching for easier self-expression, for more effective communication and the ability of code switching to provide an idea's equivalent term in the other language during problem solving.

In much research on code switching functions, researchers focused mainly on the communicative functions of teacher code switching in the classroom. Examples include Merritt et al.'s (1999) exploration of teacher code switching between English and KiSwahili in Kenyan primary schools. Halai & Karuku (2013) identified communicative strategies that teachers in Tanzanian multilingual mathematics classrooms used during teaching. They noted that teachers' code switching was used for various reasons such as explaining concepts, asking questions, managing classroom behavior of students and for qualifying key components of a phrase or sentence in a mathematics problem. One major conclusion of Gulzar's (2010) study was that "… the teachers do not know about the limits of the use of code switching and for which functions they can/should code switch to cater for the needs of the students" (p. 38). Gulzar (2010) encourages well planned and systematic use of code switching because insensible use of teacher code switching can have long-lasting harmful ramifications on the students' learning in a multilingual classroom. In this paper, we argue that while code switching through repetition is useful, how it is used by teachers during teaching is crucial.

2.3 Repetition during teaching

The teaching and learning benefits associated with use of repetition such as its assistance in improving speed and increasing confidence (Woody, 2001), and how it strengthens connections and associations

in the brain (Saville, 2011) among others, are well documented and cannot be overemphasized. Saville (2011) acknowledges that while repetition is a powerful teaching tool its incorrect use can lead to poor habits that are difficult to break resulting in boredom, frustration and stagnation. Research indicates that simple repetition should be done purposefully for it to yield a better performance (Woody, 2001). Thus there is need for teachers to become adept at finding new and better ways to imbue purpose into teaching approaches such as repetition in mathematics learning. In ancient Greece, Aristotle commented that "the more frequently two things are experienced together, the more likely it will be that the experience or recall of one will stimulate the recall of the other" (Ross & Aristotle, 1906, p. 35). With such an understanding in mind, repeated pairing of LoLT and home language is expected to help students understand concepts and that home language will stimulate the remembrance of the concept in LoLT.

One strategy that teachers use is to repeat concepts and information previously stated in the LoLT. Teachers in multilingual classes use repetitive code switching in order to transfer the intended concepts and knowledge clearly to the students. Sert (2005) noted that following the instruction in target language, the teacher code switches to native language in order to clarify meaning, and in this way stresses the importance on the foreign language content for efficient comprehension. While the tendency of repeating the instruction in the native language has its own advantages, it may lead to some undesired student behaviours during learning. Sert (2005) cautions that when students get used to instructions being translated into their native language, they may lose interest in listening to the former instruction presented in the LoLT. This may have negative academic consequences as the students will have limited exposure to the mathematical language discourse in the LoLT. Jacobson (1995) discovered that if teaching is done in both mother language and target language, students may end up focusing primarily on transformed first language representations rather than on the original second language forms. Students will "tune out" (Chikiwa & Schäfer, 2015) and wait for explanations in the mother language to follow. Some do what Cook (2001) refers to as specialized or selective listening. Here students wait for explanations in the transformed form to their first language. Repetition thus needs to be done in such a way that the benefits outweigh the disadvantages.

2.4 Translation

Related to code switching and repetition is translation done by teachers during the teaching process. In the process of code switching, teachers in many cases repeat concepts previously stated in LoLT by use of translation. In multilingual mathematics classrooms, "translation is used to refer to the act or process of rendering the meaning of what is said or written in one language into another language orally" (Halai & Karuku, 2013, p. 28). They conclude that with such a definition, the distinction between code switching and translation becomes very narrow and tenuous. Chitera (2011) explains that because textbooks used for classroom teaching and learning are written in the colonial language, teachers often translate from the colonial language to the learners' local language in trying to make concepts accessible to these learners. Translation occurs when two languages are involved deliberately and purposefully, one as the source language and the other as the target language.

Probyn (2015) explains that 'translation' in the multilingual classroom refers to repetition by the teacher of lesson content or instructions in the learners' home language and concurs that both code switching and translation are forms of language alternation. In translation, the purpose is to present the same information in two languages. Merritt et al. (1999) view translation as word substitution and assert that the goal of translating terms or a couple of terms during teaching is to ensure that students know and understand what is being talked about. Thus there is a close relationship between code switching, translation and repetition. Halai (2011) cautions that teachers will need to ensure that translation does not lead to mistranslation of mathematical meanings. Halai's (2011) study observed Urdu first language speakers who translated mathematics word problems in a way that led to the loss of the embedded mathematical objective ultimately affecting students' mathematics concept learning. Chitera (2011, p. 237) also mentions that "one of the challenges with the process of translation is to

ensure that mathematics is not diluted or watered down" in the process of this oral translation by teachers in the classroom. She identified other additional challenges associated with translation such English words becoming more complicated when words are not translatable between English and the local language of the learners, non-existence of some terms across languages, and lack of consistency in frequency of use if the term exist in indigenous language.

Code switching and translation in mathematics multilingual classroom remains the immediate resources in such classrooms despite the challenges they are associated with (Chitera, 2011). They are to a greater extent unavoidable. Halai and Karuru (2013) concluded that undeterred by its current challenges, translation is a valuable resource for promoting conceptual understanding in mathematics. From this discussion, and hence in this study, the distinction between translation and code switching in teacher language practices is blurred, narrow and tenuous. This paper focuses on teacher language practices through code switching, repetition and translation.

3. THEORETICAL FRAMEWORK

This study seeks to understand the use of indigenous languages in the classroom through code switching. This paper is largely informed by the socio-cultural theory as envisaged by Vygotsky, particularly the critical role of language in classroom communication and cognitive development. Central to Vygotsky's socio-cultural theory is recognition of the pivotal role played by the tools of which language is major. For Vygotsky, the purpose of teaching, learning and development is more than acquiring and transmitting a body of knowledge; it involves the acquisition of tools (Bodrova & Leong, 2007) and language is the most important tool (Vygotsky, 1986). Turuk (2008, p. 245) adds that "Vygotsky advocates that humans do not act directly on the physical world without the intermediary of tools." All higher mental processes are mediated by psychological tools of which language is the key tool. Vygotsky views and acknowledges language as the most important psychological tool that influences children's cognitive development (Bodrova & Leong, 2007). Vygotsky's socio-cultural theory permitted this study to view the teaching of geometry in multilingual classes from the dynamic interdependence between content, teacher language practices and the society in which one is situated. Vygotsky's principles provided my study with lenses through which teacher language practices in multilingual mathematics classes may be viewed and understood.

4. SAMPLE AND RESEARCH PROCESS

This study used a case study approach that enabled the researcher to gain a detailed view of teacher language practices manifested during the teaching of Analytical geometry in multilingual classrooms. Three Grade 11 mathematics teachers from three districts in the Eastern Cape Province of South Africa participated in this study. Each teacher and his/her class constituted a case. Data were obtained through observing five consecutive lessons per each of the three teachers and interviewing these three Grade 11 mathematics teachers purposively selected from three schools in three districts of the Eastern Cape Province. The three teachers were identified as Teacher A, Teacher B and Teacher C. Each teacher was observed for five consecutive lessons in a week teaching Analytical geometry. Lesson observations were used to identify language practices of these teachers. With the consent of the Department of Education, school principals of participating schools and the teachers, lessons were video recorded focusing only on the teacher. At the end of each lesson, each teacher was interviewed. The interviews were following up on language practices teachers demonstrated during the lesson. The videos were transcribed and analyzed in two stages, first quantitative followed by the qualitative analysis. Trends and patterns that emerged during the quantitative analysis were later followed up during the qualitative data analysis process.

Validity

Validity is the degree to which data collected in the research truly measures that which it was intended to measure (Creswell, 2015). Multiple sources of evidence, that is lesson observations and interviews, were used during data collection thereby increasing the validity of the data in this study. Transcriptions

were done by an experienced transcriber and were verified by two isiXhosa first language speakers who are English language specialists.

5. RESULTS

5.1 Teachers' isiXhosa use through code switching

During the teaching of Analytical geometry to Grade 11 students, the participating teachers' total use of isiXhosa through code switching across the five lessons is illustrated in Figures 1. Most of this code switching involved teachers repeating concepts in isiXhosa previously uttered in the LoLT or vice-versa.

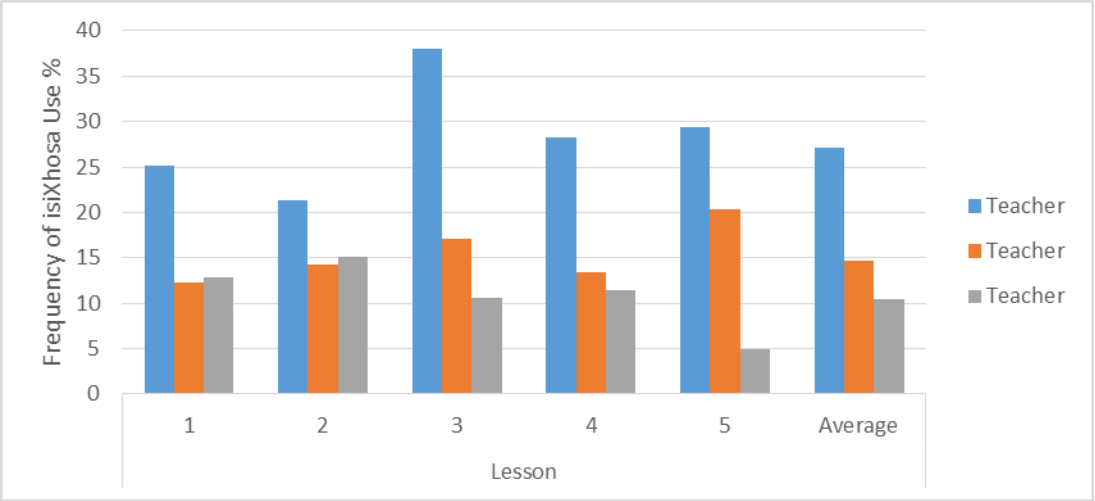

Figure 1: Teachers' isiXhosa use through code switching

Teachers' use of isiXhosa during the teaching of geometry fluctuated across the five lessons. Of the total words spoken by Teacher A on average, Figure 1 shows that 27% of them were in isiXhosa while for Teacher B and C they were 14% and 11% respectively. For each of the teachers, at least 10% of the words spoken in each of the lessons were in isiXhosa. During interviews, Teacher A who used isiXhosa translations more frequently than others had this to say: *"I repeat my English statements in isiXhosa to help my learners grasp the maths am teaching. Most of my learners are not so good in English and I switch to Xhosa to make sure everyone understands the lesson."* Thus for this teacher, repeating in isiXhosa was to increase access to geometric concepts. Teachers were aiming at maximising on the benefits of repeating information in isiXhosa. Teacher C whose use of isiXhosa was less compared to the other two cautioned that "*when we teach students especially at FET, we should remember that they will write their exam in English. We should assist them to be more familiar with maths in English."* Use of students' home language should thus be done with other learning factors in mind in an endeavour to provide a balance and integrated approach to teaching multilingual classes.

5.2 Repetition during Code Switching

Code switching during repetition was used to re-utter teacher's and student's contributions, it was also used to repeat, rephrase, summarize, elaborate, and translate the teachers' own utterances and students' contributions. During interviews, Teacher B was asked why he repeated information and he said *"I was trying to make it clearer, I wanted a response from them, I wanted to make sure that they understand, to check their understanding of what I'm teaching and they were able to respond."* The patterns of repetition that manifested themselves during the teaching of geometry took the following forms: isiXhosa first then English; isiXhosa then isiXhosa again; English then isiXhosa. In some cases, the repetition was consistent and precise, and some it was not. In each of these cases, interest was on the maintenance of meaning when teachers would repeat questions or explanations in a different language. We also focused on the consistency and precision of each of the teacher's utterances during code switching.

5.3 Consistent and precise repetition

The question or explanation was considered consistent if the words formulating it were used consistently. We considered questions and explanations to be precise if the code switched language was complete and unambiguous. We also considered those questions and explanations that accurately conveyed intended information as precise. The next extracts show how the teacher repeated the question through direct translation. The only slight difference we noted in the translated question is the omission of 'two.' The teacher just said *eza-angles* and did not specify how many angles that were involved as is the case with the English version. But the question was consistent and precise. This was achieved by the use of direct translation.

Teacher A: How do you identify the two angles that are equal in that triangle? *Nizibona ngantoni eza angles zi-equal kula triangle* (how can you identify the two equal angles in that triangle)? (Lesson 2).
Teacher A: Can you see BOD? What type of an angle is BOD? /Silence/ S*iyambona u*-BOD? *Uyintoni u*-BOD *pha kula* triangle? (Can you see BOD? What is BOD in that triangle)? (Lesson 5).

In the second extract above, direct translation was also used to achieve consistency and precision during repetition. The symbol for the angle in question is borrowed, which is *u-BOD*. In the ensuing extract, both the explanation and repetition were done in isiXhosa. The form of repetition used is isiXhosa to isiXhosa. The word '*wahlula*' meaning 'divided' is used synonymously for 'bisect.' The second part of the explanation where the teacher is repeating is more elaborate than the first. Teacher A explicitly states that '*wahlula la-angle phakath*i' meaning the angle is divided into two equal parts. The teacher consistently used borrowing code switching (BCS) and transparent code switching (TCS) strategy (Chikiwa & Schäfer, 2015) in this case. Also the translation for 'bisect' is precise in this context. Thus the repetition in this explanation was both consistent and precise.

Teacher A*: Ebengu*- (it was) 52, then *la*- (that) AF *wafika wohlula* (divided), bisector, *wafika la*- (that) AF *wohlula la*- (divided that) angle *phakathi* (in the middle) *yangu*- (it became) 26 and 26. (Lesson 2).
Teacher A: You identify *i*-angles *ezi* (that are) opposite to that exterior angle *nhe* (right). Identify *i*-angles *ezi* (that are) opposite to that exterior angle *siyavana ke* (do you understand)? (Lesson 2).

Borrowing was used by teachers to maintain consistency when code switching. A form of borrowing where only a prefix was added to an English term was common with all participating teachers. Examples include *i-angle* and *ezi-opposite* in the extract above. This practice required less effort and thinking as all that was needed was to place the right prefix. This I referred to as a practice teachers exercised to remain 'safe' by minimizing risk of losing meaning during code switching. Teacher questioning using isiXhosa and repeating in isiXhosa was also evident in Teacher B's language practices. The extracts below show how Teacher B repeated a question using isiXhosa to isiXhosa form of repetition.

Teacher B*: Zeziphi i*-gradients *ezilinganayo phayana* (which gradients are equal there)? Z*eziphi ezi-gradients zilinganayo* (which gradients are equal there)? (Lesson 1).
Teacher B: *Xa ufuna ufumana i-equation* (when you want to get an equation) yes, even this one, *naxa ufuna ufumana i*- (when you want to find an) equation with this one, you can also use it when you want to find the equation. (Lesson 4).

In the extracts above, both BCS strategy (*i-gradients; i-equation*) and TCS (*ezilinganayo; xa ufuna ufumana*) were used to phrase the questions and explanations. The questions were consistent in that the words used were the same in all cases. These terms are also precise in that there is no loose of meaning in either case. The meaning of the first question has been maintained in its translated form. This practice of mixing BCS and TCS in one sentence was frequently practiced by Teacher B. In the

extracts below, Teacher B explains mainly in isiXhosa and repeats his explanation in isiXhosa. The two forms, BCS and TCS, were used in these explanations.

Teacher B: Check *ubangaba ufumene i-obtuse angle. Yichekishe ubanangaba ufumene i-obtuse angle. So ubanangaba awufumennaga i-obtuse angle it means there is something wrong* (check if you got an obtuse angle, if you didn't find an obtuse angle it means there is something wrong) (Lesson 2).
Teacher B*: Uchekishe ukuba uzawufumana eyiphi na i-value.* (And check what value you are going to get). S*ebenzisa i-positive uchekishe uba uzawufumana eyiphi i-value.* (Use a positive and check which value you are going to get.) (Lesson 2).

In the first extract, he used English for the word 'check' first, and the same word is borrowed in the repeated form of this question using *yichekishe*. The word 'obtuse' is borrowed in both cases. The instruction is repeated again mainly in isiXhosa using the opposite of the word 'find' which is *'awufumenanga'* meaning 'if you did not find.' In the second extract, the meanings were preserved through borrowing and hence there was consistency and precision in the teacher language. We argue that heavy reliance on BCS especially with strongly bounded (esoteric) mathematical terms such as 'value' and 'positive' assisted the teacher to ensure precision. The TCS terms that were consistently precisely used here are terms used in everyday life like *fumana*. Hence again we argue that Teacher B's choice of terms during teaching was to ensure that he remains safe from losing meaning during code switching. While repetition was less used by Teacher C, in some of those instances it was consistently and precisely used. In the extract below, the code switched version is more elaborate though consistent with the earlier version.

Teacher C: We can find F using which triangle? *Singamfumana u-F lo, sisebenzisa eyiphi i*-triangle (which triangle can we use to find F)? (Lesson 2).

The use of '*u-F lo'* in the code switched version suggests that the teacher was actually identifying the actual location of F on the diagram. Such identification may give clues to some students as they relate the position of that F and the rest of what is given in that diagram. As was noted with other participants, Teacher C also used the isiXhosa to isiXhosa form of code switching and was consistent in using it. Examples are illustrated in the extracts below:

Teacher C*: Simfumene kengoku u-* (so now we've found) A. *Simfumene u-* (we've found) A. (Lesson 2).
Teacher C: Which one can we start with? *Ndingaqala ngeyiphi* (which one can we start with)? (Lesson 2).

The TCS term used in the first extract, '*simfumene*' whose root word is '*fumana*' is an everyday term. It is used outside the classroom by both the teacher and his students. The phrase '*ndingaqala ngeyiphi'* which is the code switched form of the question in the second extract is also a combination of everyday terms. Thus these terms were consistently used in this case. In this section, teachers managed to maintain consistency and ensure precision during repetition through borrowing. All participating teachers in this study used borrowing during repetition and this helped them to be consistent and precise during repetition. Secondly, as noted above, teachers maintained consistency through the use of TCS strategy. This happened mostly with terms that teachers and students use in everyday life outside the classroom. Esoteric terms, terms that are strongly mathematical, were consistently borrowed.

5.4 Inconsistent and imprecise repetition

In the extract below, the English version is in form of a summary of what Teacher A was explaining about what AB subtends. In this extract there is inconsistency in the way the teacher is explaining. It is not clear as to which component subtends which one. The language practices used here could have contributed to this inconclusive and unclear explanation.

Teacher A*: Siyambona uba u-* AOB *u-subtender u*-arc AB *siyambona sonke* (can you see that AOB subtends arc AB)? /Yes/ Also *u*-ACB *naye* can you see *uba u-subtendwa nguban,i ngu*-AB (ACB is also subtended by arc AB), they are subtended by the same chord AB or by the same arc AB. (Lesson 5).

The absence of what AOB and ACB stands for in Teacher A's language further makes the statements imprecise and inconsistent. Leaving out such information resulted in those statements becoming unclear. This trend was also observed in other lessons. In the extract below, the teacher asks the question in isiXhosa first and then repeats it in English. The English version of the question includes some information that the shape being referred to is a right angled triangle. This is not mentioned in the isiXhosa version.

Teacher A: *Ngawaphi lamacala kuthwa ayalingana* (which ones are the two equal sides)? Which sides do you think are equal in that right angled triangle? Which sides are equal? (Lesson 4).

The isiXhosa version is imprecise and inconsistent because of the absence of the phrase 'right angled triangle' which directs learners to the polygon under consideration. The phrase 'right angled triangle' which the teacher omitted was in all other situations borrowed. The omission could be caused by the lack of its isiXhosa equivalent in the teacher's vocabulary since the teacher wanted to use the isiXhosa language only. Another reason could the presence of the reference diagram on the chalk board. The teacher's mention of the term 'right angled triangle' in the English version shows that this phrase was necessary to give clues to the students and to make the question clear. Hence there was a lack of consistency and precision in this case. The form of repetition used by Teacher C in the extract below is isiXhosa to isiXhosa. The first question has less information than the second question. The advantage in this case is that both questions are in their home language hence the students who 'tune out' may still benefit in this case.

Teacher C: B*esithe yintoni kanene u*-OA? (What did we say OA was)? *Wazi ntoni ngo*-OA *no*-OB (what do you know about OA and OB)? (Lesson 3).

While the teacher was seeking the same answer that these were radii of the same circle, the phrasing of the questions was not consistent. 'What did we say' and 'what do we know' may elicit two different answers from students which will not answer the intended question correctly. The repeat version of this question brings in OB which was not mentioned in the earlier question. Thus there was no consistency in the phrasing of these questions. In the extract below, Teacher B used BCS (*ucheckishe*) and TCS (*uzawufumana; ufumana*) strategies to formulate his questions. This was evidently common with Teacher B during the teaching of geometry.

Teacher B: Check that, press tan 53.13 *ucheckishe uba uzawufumana bani* (and check what answer you will get). Press tan 53.13, what do you get there? *Ufumana bani pha, ufumana bani* (what did you there)? (Lesson 2).

The second question in English required students to punch in *tan53.13*◦ on their calculators. The third question now requires what they have found. The checking aspect which appears to be the main reason why they are using their calculators is not being repeated in the questions posed in isiXhosa. Considering that Teacher B mentioned in the interviews that he used isiXhosa to clarify statements previously given in English, this made his questions inconsistent in this particular case. In the extract below, key terms were borrowed. These included *besiyilinke* (how did we link), *i-angle* of inclination and *ne-gradient*. This was commonly practiced by Teacher B in his teaching.

Teacher B*: Besiyilinke njani i*-angle of inclination *ne*-gradient? (How did we link the angle of inclination with the gradient?) B*esiyilinka njani i-gradient?* (How we linked the gradient?) (Lesson 2).

However, in this case the repetition used during code switching in the second question leaves out the phrase '*i-angle of inclination.'* Thus the use of the word link in the second question loses meaning because gradient is meant to be linked to something in this case. This question is inconsistent due to insufficient information that has been used to formulate it. Cases of inconsistency were prevalent in situations where teachers, in their repeated statements, were leaving out some of the information. Words like 'angle,' 'arc,' 'line,' and 'chord' were omitted resulting in ambiguous questions or statements. Also such situations were prevalent when teachers were referring to symbols representing sides, angles and lines.

6. SUMMARY OF FINDINGS AND RECOMMENDATIONS

In this study, while some repetition, code switching and translations were accurate and consistent with English mathematics register, some were inconsistent and imprecise. Consistently and precisely translated were everyday non-technical terms. Terms commonly associated with Analytical geometry teaching at grade 11 level were borrowed in all cases. Borrowing code switching during repetition was predominantly practiced. Teachers used this strategy to ensure consistency and precision during repetitive code switching. Borrowing strategy was used by participating teachers to reduce risks of using incorrect translation in their repetition. This resulted in prevalent borrowing of geometry technical terms. Such a short coming can be mitigated if teachers are encouraged to use transparent terms during their switching (Chikiwa & Schäfer, 2015).

Repetition has its advantages which teachers should take advantage of. Arens (1999, p. 117), in the study of how repetition affects people found that repeated messages "penetrate listeners' perceptual screens by rekindling memories of key information" from prior statements. Hawkins, Best, and Coney (1995) noted that "repetition increases the strength and speed of learning," and added that "the more times we are exposed to information or practice a behavior, the more likely we are to learn it" (p. 280). This study recommends that teachers in their language practices need to consider proper use of repetition during teaching. Imprecise repetition will result in incorrect information being stored in memory. And thus this will result in further negative consequences since, as argued by Saville (2011), repetition is one of the definite ways to ensure that the intended message is stored into the long-term memory of the listener. This is why code switching during repetition will need to be done judiciously in order to enhance learning.

Lack of precision manifested itself in teacher repetition when information previously given in English was repeated in isiXhosa or vice-versa. Research has shown that students tune out their weaker language (Bullock & Toribio, 2009), that is the English portion of the teacher instruction, and tune in when their stronger language is used (Jacobson, 1995). While repetition can be useful especially in multilingual class, teachers need to use it with caution for when a word usage becomes too repetitive, it may make the message boring and uninteresting to the students. Hawkins et al., (1995) warn that "Too much repetition can cause people to actively shut out the message, evaluate it negatively, or pay no attention to it" (p. 281). Students in the classrooms observed were mainly from rural and township backgrounds whose English proficiency was not well developed to their grade level. Inconsistencies in teacher repetitions would disadvantage such students whose proficiency in the LOLT is weak. Gogolin and Ludi (2015, no page) advises that "if multilingualism is really to be taken seriously, schools must not condemn traces of multilingual ability but … help those concerned not to tune out the other language (English in this case)." Such a practice requires proper teacher training in matters of indigenous language use in multilingual classes.

This study recommends that materials in students' home language need to be developed in order to help encourage transparent code switching instead of the current phenomena where code switching through repetition is mainly done through borrowing. Such development of teaching materials should be coupled with proper and structured pre-service and in-service teacher professional development

programs. Deliberate steps need to be taken to incorporate use of African languages through practices like code switching in training mathematics teachers of multilingual classes.

REFERENCES

Arens, W. F. (1999). *Contemporary advertising.* Boston, MA: Irwin, McGraw-Hill.

Barwell, R. (2008). "What Works? Research into Practice" in *The Literacy and Numeracy Secretariat Research Monograph Number 34*. Ottawa, University of Ottawa.

Bullock, B., & Toribio, A. J. (2009). Themes in the study of code switching. In B. Bullock, & A. J. Toribio (Eds.), *The Cambridge Handbook of Linguistic Code Switching.* Cambridge: Cambridge University Press.

Bodrova, E., & Leong, D. (2007). *Tools of the Mind: The Vygotskian Approach to Early Childhood Education.* (Second ed.). New Jersey: Pearson Education, Inc.

Chikiwa, C. & Schäfer, M. (2015). Teacher Code Switching in a Multilingual Mathematics Classroom: A Focus on Precision, Consistency and Transparency. In S. Maoto, B. Chigonga & K. Masha (Eds). *Deepening the quality of mathematics teaching and learning: Proceedings of the 21st Annual National Congress of the Association for Mathematics Education of South Africa (AMESA), Volume 1, 29 June to 3 July 2015, pp. 99-102.* University of Limpopo, Polokwane, RSA.

Chitera, N. (2011). Language of learing and teaching in schools: An issue for research in mathematics teacher education? *Journal of Mathematics Teacher Education, 14*(3), 231-246.

Cook, V. J. (2001). Using the first language in the classroom. *Canadian Modern Language Review, 57*(3), 402-425.

Creswell, J. W. (2015). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research (5th ed.).* Boston, MA: Pearson.

Cummins, J. (2000). *Language, Power and Pedagogy: Bilingual Children in the Crossfire.* Clevedon: Multilingual Matters

Gardner-Chloros, P. (2009). *Code-switching.* New York: Cambridge University Press.

Gogolin, I., & Ludi, G. (2015, April). Multilingualism: Becoming multilingual more creative and multilingual. *Redaktion Magazin Sprache*.

Gulzar, M. A. (2010). Code switching: Awareness about its utility in bilingual classrooms. *Bulletin of Education and Research, December 2010, 32*(2), 23-44.

Halai, A. (2011). Students' code switching in mathematics problem solving: Issues for teacher education. In M. Setati, T. Nkambule, & G. L (Ed.), *Proceedings of the International Commission on Mathematical Instruction Study 21 Conference: Mathematics and language diversity* (pp. 125-133). Sào Paulo, Brazil: ICMI.

Halai, A., & Karuku, S. (2013). Implementing language-in-education policy in multilingual mathematics classrooms: Pedagogical implications. *Eurasia Journal of Mathematics, Science & Technology Education, 9*(1), 23-32.

Hawkins, D. I., Best, R. J., & Coney, K. A. (1995). *Consumer behavior: Implications for marketing strategy.* Chicago, IL: Richard D. Irwin.

Jacobson, R. (1995). Allocating two languages as a key feature of bilingual methodology. In O. Garcia, & C. Baker (Eds.), *Policy and Practice in Bilingual Education: A Reader Extending the Foundations* (pp. 166-174). Bristol, UK: Multlingual Matters.

Jegede, O. O. (2012). Roles of code switching in multilingual public primary schools in Ile-Ife, Nigeria. *American Journal of Linguistics, 1*(3), 40-46.

Martin-Jones, M. (2003). *Teaching and learning bilingually: Towards an agenda for qualitative classroom-based research.* Retrieved July 27, 2014, from www.aber.ac.uk/mercator/images/marilyn.pdf

Merritt, M., Cleghorn, A., Abaji, J. O., & Bunyi, G. (1999). Socialising multilingualism: Determinants of code switching in Kenyan primary classrooms. In C. M. Eastman, *Code switching* (pp. 103-121). Cleveland: Multlingual Matters.

Metila, R. A. (2009, December). Decoding the switch: The functions of codeswitching in the classroom. *Education Quarterly, 67*(1), 44-61.

Probyn, M. J. (2015). Pedagogical Translanguaging: Bridging Discourses in South African Science Classrooms. *Language and Education, 29*(3), 218-234.

Saville, K. (2011). Strategies for using repetition as a powerful teaching tool. *Music Educators Journal*, 69-75.

Sert, O. (2005, August). The functions of code switching in ELT classrooms. *The Internet TESL Journal, 11*(8).

Setati, M. (2002). Researching mathematics education and language in multilingual South Africa. *The Mathematics Educator, 12*(2), 6-12.

Turuk, M. C. (2008). The Relevance and Implications of Vygotsky's Sociocultural Theory in the Second Language Classroom. *ARECLS, 5*, 244-262.

Vygotsky, L. S. (1986). Thought and Language. In A. Kozulin (Ed.). Cambridge, Mass: MIT Press.

Woody, R. (2001). "Learning from the experts: Applying research in expert perfomance to Music Education". *Update: Application of Research in Music Education, 19*(2), 11-14.