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THE LINGUISTIC COMPONENT IN MATHEMATICS ASSESSMENT AND ATTENDANT TENSIONS AND DILEMMAS: THE TEACHERS' EXPERIENCES.

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ABSTRACT

This paper reflects on the experiences, tensions and dilemmas of two South African Grade 4 mathematics teachers as they taught mathematics and administered annual national assessments to Grade 4 English Second language learners. The paper emerges from a broader PhD study which investigated the linguistic challenges experienced by three classes of 106 Grade 4 learners and their two teachers in the 2013 mathematics national assessments. The paper specifically explores the teachers' perceptions and experiences of the national assessments. Semi-structured interviews elicited, among other things, teachers' perceptions of the Grade 4 learners' assessment experiences, the language of the mathematics assessments and the learners' reading skills. Findings indicated that teachers felt that the language of the assessments was too difficult for English second language learners, considering their limited linguistic proficiency and exposure. Teachers also experienced dilemmas and tensions about whether or not to assist learners during the assessment, and whether or not to code switch during mathematics teaching, among others. The study recommends consideration of learners' language proficiency in learners' assessment, and a provision for teachers' mediation of the linguistic component to ensure accessibility of test items and guarantee that mathematics assessments assess mathematics rather than language.

Key words*:* assessment; language proficiency; linguistic mediation; teacher mediation

INTRODUCTION

Of the myriad problems the South African education system faces, a large amount of research attests to the persistence of learners' poor performance in literacy and mathematics (Department of Education, 2013, 2014; Reddy, Zuze, Visser, Winnaar, Juan, Prinsloo, Arends & Rogers, 2015; Spaull, 2016, Pretorius & Spaull, 2015). In 2015, Grade 12 mathematics results were quite disturbing, with only 20% learners achieving a 50% and above (DBE, 2016). This means the majority of the learners who were learning mathematics at Grade 12 were not able to apply mathematical skills, yet Kilpatrick, Swafford and Findell (2014) argue that at this level, learners are expected to apply their knowledge, to demonstrate different mathematical skills and to apply mathematical reasoning to daily problems so as to compete in the future world. The 2014 DoE results of the Annual National Assessments revealed that in 2014, the average

performance of learners in mathematics declined from 68% in Grade 1 to 37% in grade 4 and 11% for Grades 9. Learners' poor performance was more marked from Grade 2 to Grade 3, where teachers are not allowed to assist their learners with reading during assessment (as was done in Grade 1 and 2). The decline in performance was also evident in Grade 4 (in 2012, 2013 and 2014) where the language of teaching and learning changed from the learners' mother-tongue to English.

This study focused on Grade 4 learners who experienced unique transitions which include moving from 'learning to read' in Grade 3 to 'reading to learn' in Grade 4 (Chall, Jacobs & Baldwin 1990). The DoE (2007) expectation of Grade 4 learners reading fluently at independent level is based on learners whose home language is English, when in actual fact most of the learners are English Second language speakers. This is tantamount to linguistic marginalisation of the bulk of the learners who have to learn in, and read expository texts in, a language they have neither adequate proficiency nor exposure. The expository texts are dense with vocabulary specific to content subjects and are very unlike narrative texts which consist of simple everyday language and which they would have had greater exposure to.

In South Africa, the majority of learners at Grade 4 would only have had scant exposure to English as a subject, for a few hours a day. With that limited exposure and proficiency, they are catapulted into Grade 4 where they use English as a language of learning and teaching without even having acquired the basic vocabulary in English to communicate and learn in, let alone using English in writing assessments at the end of that year (Sibanda, 2017).

In 1979 Cummins proposed the Threshold Hypothesis which explains the cognitive effects of bilingualism in children. The hypothesis postulates that English second language learners, for instance, need to cross a certain threshold in English language proficiency for any competences developed in their home language to transfer to the second or target language (Cummins, 1979). Hence, the learners should be competent in both first and additional languages for transfer to happen. However, considering the limited exposure to English language in most of the South African young learners, it is doubtful that these learners attain the threshold in the additional language, English, for the transfer of linguistic skills to take place. A case can therefore, be made in this paper that, by Grade 4, most South African learners are not proficient in English language. Furthermore, using English for learning, teaching and assessment poses challenges for learners, especially in mathematics which has its own complex language. By Grade 4, learners' competence in English is not yet well developed and they are also not well-developed in their mother-tongue, as Spaull (2016) notes. Grade 4 therefore, becomes a critical stage with significant transitions and requiring much learner support.

Within this background, this paper seeks to explore the Grade 4 teachers' experiences of the linguistic experiences of Grade 4 mathematics assessments some Grade 4 learners wrote in 2013 mathematics annual assessments. The study also illuminates the tensions and dilemmas teachers face in relation to the teaching and learning of mathematics.

LITERATURE REVIEW

Assessing English Second Language learners' mathematical competence in English is problematic because whatever method of assessment is used, it assesses the learners' English proficiency to some extent (Kopriva, Gabel, & Cameron, 2011). Abedi (2010) argues that assessments which do not take into consideration the learners' language proficiency are not reliable because they cannot tell what learners really know. Abedi (2006) and Abedi, Hofstetter and Lord (2004) found that much of the underachievement by English language learners in the U.S. context is caused by the linguistic challenges presented by the assessments. Similarly, in South Africa, Graven and Venkat (2013) have questioned the fairness of annual assessments in terms of the inaccessibility of the language of several annual national test items.

The language challenge in mathematics

Mathematics has words, symbols, sentences and grammatical structures which are essentially part of the language (Bergqvist, Dyrvold & Osterholm (2012). It also has highly specialized mathematical terms which have a variety of meanings from those used in everyday language (Bell, 2003). In addition, the technical vocabulary and grammatical structuring associated with it make the oral and written language challenging in its own right (Schlleppegrell, 2007, p. 145). Hammil (2010, p. 1) describes mathematics as "informationally dense and structurally complex" and also observes that the ideas are expressed in dense noun phrases and relationships described by verbs and extensive use of logical connectives. Hence, Halliday's (1989) assertion that it is not only English additional language learners who struggle with mathematical English, but also English home language (HL) learners. If English HL speakers are also challenged by reading despite their oral fluency in the language and their tacit knowledge of the language, the challenge can only be greater for those learning in English as an additional language with little exposure to the language. Cummins (1980) observes that it takes five to eight years for a child to master the linguistic skills necessary for academic language in a second language, like English. The assumption then was that the few hours a day exposure to English as a subject in the three years of schooling which the Grade 4 learners had, would hardly have prepared them for the challenges of assessment in English which they needed between five to eight years to master. Abedi (2010) notes that if learners are to perform well in mathematics, they should possess competence in both everyday language and mathematics specific language. This calls for the teacher to mediate mathematical texts and assessments considering the manifest disadvantage limited linguistic exposure placed on the learners.

NAVIGATING THE LINGUISTIC CHALLENGES IN MATHEMATICS INSTRUCTION AND ASSESSMENT

The application of ZPD and scaffolding

In his theory of the zone of proximal development (ZPD), Vygotsky (1978) argues that a child learns through the best use of potential as well as through assistance, support, or

instruction. ZPD is what the learner can do independently and what they need assistance in order to be able to do. When learners are in this zone, they can be successful with instructional help. If ZPD is that which a learner can do alone at a particular time, then that which cannot be performed even with assistance of more knowledgeable one is out of the ZPD and should be avoided. Thus, what children can accomplish with the help of an adult tells more about their mental ability to learn in the future than tests they undertake without any assistance (Denhere et al., 2013). Adults assist children by cuing, showing them how to do something, explaining, or exemplifying in order to make concepts understandable. Barbu (2014, p. 139) suggested "an increased comprehensibility of mathematical presentation, a focus on vocabulary and a scaffolding approach in presenting new facts.

Code switching may also be used as a way of scaffolding the learners en route to independent comprehension in the language. Moschkovich (2010) and Webb and Webb (2013) found code switching to be useful in enhancing learners' comprehension and discussions that were done in home language, as well as in arithmetic computations, and it is therefore, recommended. It allows learners to express themselves in their home language. Adler (1998, p. 30) however, views code switching as a dilemma in which

on one hand teachers feel that explaining the mathematical concepts in the native language of the English Second Language Learners might help them to better understand the material. On the other hand, since all the official testing as well as the future mathematical applications are written in English, the students will have to relearn the same concepts in this language.

Adler then suggested that it is important for mathematics teachers to know why they are doing code switching and how and when to do it. Brock-Utne (2005) observed that although the language of instruction is English in most schools, it has been found that in many South African schools, the mother tongue is the best way to communicate with learners. The same author also observes that code switching in classrooms where the language of instruction is supposed to be English is critical because if teachers speak in English only, it is like teaching dead stones (Brock-Utne, 2007). Barbu (2014, p. 140) then concludes that "*code switching* is an efficient use of English Language Learners' language skills and should be encouraged."

The issue about oversimplification and the balance that is needed

In this study, and in other studies before, teachers were concerned with assessments whose language was too complex for Grade for learners and they suggested the simplification of mathematics, as well as science texts so that they can be accessible to English Second language learners. Rollnick (2004, p. 117) however, disagrees with this and points out that, "Oversimplification can lead to loss of meaning and even accusations that the texts no longer reflect the discipline they are trying to reflect." Rather, she suggests that teachers should mediate the texts, motivating learners while authors make the text sufficiently interesting and attractive. Gee 1996), emphasises the importance of participating in the discourse of the text if one is to access it argues that " in order to acquire an academic social language learners must be in a position to view

the acquisition of the academic language as an advantage to them and not as a burden (Gee, 2001). Hence, learners need to learn the vocabulary and the grammar of the mathematical language.

RESEARCH METHODOLOGY

A case study research approach was employed for the present study, to explore in depth the two Grade 4 teachers' experiences and perspectives on language issues of the 2013 Grade 4 mathematics ANAs. The two teachers were an opportunity sample since they were the teachers of the learners who participated in the broader PhD study, which investigated the linguistic challenges of Grade 4 mathematics ANAs. One teacher had been teaching Grade 4 mathematics for the past seventeen years and the other one for twelve years. They had also administered the annual assessments since they were introduced in 2011. Therefore, the two teachers were considered to be sufficiently experienced in both the teaching of mathematics and administration of the ANAs to Grade 4 learners. They were also conversant with the challenges that learners experienced in learning mathematics and in writing mathematics tests. Semi-structured interviews were used to gather qualitative data from the two Grade 4 mathematics teachers. Because of the relatively small sample of only two teachers across only two schools, it means that what is illuminated here could not be considered representative of the general population of teachers in South Africa but rather to typify teacher challenges in the majority of South African schools where learners learn mathematics in English. Generalisation was therefore, more to type than to population. The names of teachers used in this paper are pseudonyms. The teachers' experiences were meant to provide supplementary information for considering learner data and implications of the study. It is however, interesting that the findings that this research illuminates concur with Graven and Venkat's (2014) research findings of the experiences of the annual assessments.

DATA COLLECTION

The two Grade 4 teachers whose classes participated in the broader PhD study were interviewed using a semi-structured interview so that a follow-up on questions could be done. The interviews were done after school for 30 minutes. The two teachers, Buhle and Anathi taught Mathematics in two classes at school B and one class in school A respectively. They shared their experiences on the linguistic demands of the Grade 4 mathematics annual assessments.

FINDINGS AND DISCUSSION

The thematic analysis made of the teachers 'responses, five broad themes emerged as following:

- Teacher perceptions of the Grade 4 learners' experiences of the language of the mathematics assessments
- Teacher perceptions of the learners' experiences of the Grade 4 assessments in terms of reading skills

- Teachers' views on the assessment policy that teachers should not read questions to the learners
- Teachers' experiences of the levels of cognitive demand of the Grade 4 mathematics assessments

Teacher perceptions of the Grade 4 learners' experiences of the language of the mathematics assessments

The two teachers agreed that mathematical language is difficult for their learners to understand. Anathi and Buhle explicated their views and the quotes are taken verbatim. Anathi explained that "All the learners are Xhosa speakers. They have English as medium of instruction, and are still learning to speak the language. Maths has its own language, that some of them find it difficult to understand" while Buhle had the following to explain:

They performed badly in the past years. Maths language and its terminology all the time is their problem e.g. find sum of; they don't understand that sum is also total. During ANA they always ask for explanation from invigilator, they can't do on their own. Question papers are long and they became exhausted and leave other questions blank. Word sums are a nightmare as they don't know what operation they should use.

What the teachers observed concur with Halliday's (1989) assertion that mathematical language is not complex for English second language learners only but even for English home language speakers learning mathematics in English. More recent, Barbu (2010, p. 2) also alludes to the difficulty of using English as a language of learning and teaching even within English home language contexts when he mentions that "learning English as it is used in an instructional context is likely to be considerably more demanding than acquiring basic conversational proficiency." In the same view, Cummins (1980) put forward a hypothesis that it takes five to eight years for a child to master the linguistic skills necessary for academic language in a second language, like English. Anathi and Buhle testify that learners ask for explanations of the questions during assessments, because they are challenged by both the English language used to ask the questions and the mathematics language.

Abedi (2010) argues that mathematics learners are required to possess competence in both everyday language and maths specific language if they are to perform well in mathematics. This is contrary to what the learners the two teachers in this study describe. Buhle and Anathi perceived mathematics as constituting a unique language difficult to understand and this is confirmed by Barbu (2014) who observe that it is not easy for learners learning through their second language to achieve in mathematics because of the highly specialized mathematical terms with meanings that are different from those used in everyday language. The word 'difference', for example, is additionally difficult as it takes on another meaning from its everyday use. In this context, it means 'subtract' or 'minus'. If a learner is not familiar with the mathematical meaning of the term, it becomes a source of error itself. Examples of some answers that were given by learners in the test, which show an everyday interpretation of the word 'difference', include: they

are most in soccer they are low in cricket Learner 39); the cricket has lower players (Learner A23); the cricket is small and soccer is the biggest (Learner 8). In this respect, Buhle also gave an example of learners knowing the word 'total' and not 'sum':e. g. "find sum of; they did not understand that sum means the same as total". Thus Buhle perceived the language used in the mathematics assessment as complex. She described word problems as a 'nightmare' for learners because they did not understand the questions and did not know what to do.

In relation to the difficult language in the mathematics assessments, teachers as classroom leaders had tension and dilemma. In Buhle's words, "learners always ask invigilators (teachers) to help them with explanations of the questions which they do not understand and can't do on their own". Both teachers could not state whether they gave assistance to the learners when they ask for it although this was unlikely as it was not allowed. A dilemma was posed by this rule for the teachers had to navigate between their knowledge of the local needs (support for language and reading difficulties) and at the same time comply with the national assessment policy which did not allow the teachers to assist the learners.

Teacher perceptions on the learners' reading skills

Both teachers alluded to the fact that the reading skills for most learners were weak. Anathi thought

> the learners' reading skills are not fully developed. Some learners read words without attaching any meaning to what they read, as some of them are not used to independent reading. Learners do not understand the instructions given to them as they read words, but without understanding. Lack of reading skills affect their performance….

Likewise, Buhle added that "as they are slow in reading that makes them not to finish question paper and not to understand."

Both Anathi and Buhle perceived that the learners' reading skills are weak in relation to both reading words and reading without comprehension. Anathi's view that learners' reading skills were not developed was confirmed by interviews done to the teachers' learners in the broader study in which some of her learners could not read questions, while others read fluently but failed to understand what the questions asked of them. In this sense reading was not accompanied by comprehension. An example of a learner failing to read is as follows:

> Teacher: Benny, please read the question to me
> Benny: Draw the re ... repet ... re ... refish … reflix
> Teacher: reflection
> Benny: reflection of the a, a ... arr ... arrow on the v ... ve ... veksheken
> Teacher: vertical
> Benny: vertical (pauses, can't read the word 'dotted)
> Teacher: dotted
> Benny: dotted line

The following is an example of a learner who could read, but without understanding:

> Teacher: Can you please read the question to me?
> Peter: (Reads) Draw the reflection of the arrow on the vertical dotted line

Teacher: Do you understand the question?
Peter: No
Teacher: Is there a word that you don't understand?
Peter (Points to the word 'reflection')
Teacher: Reflection?
Peter: And verti … vertical
Teacher: OK.

Pretorius and Lephalala, (2011) contend that comprehension is what reading is all about. Anathi viewed her learners as lacking independent reading skills as she writes, "…some learners read words without attaching any meaning … do not understand the instructions …." Therefore, the whole point of reading was defeated.

Anathi also raised the issue of learners' lack of exposure to different types of reading materials. This possibly accounts for the general lack of a reading culture in South Africa as noted by Pretorius (2002) among others. According to the South African Department of Arts and Culture, and Print Industries Cluster Council (2007), many learners in South Africa are seldom exposed to storybook reading and do not have books in their homes, they do not have a reading habit.

While Anathi stated that her learners' problems concerned reading without comprehension, Buhle's learners' hurdle was said to be in reading slowly. As a result, Buhle's learners did not finish answering all the questions. Buhle also observed the need for learners to be conversant with mathematics specific vocabulary like 'difference'. Knowledge of mathematics specific vocabulary was therefore, confirmed as vital for learners to understand the questions.

Teachers' views on the reading policy-Grade 4 learners should not be read to in the assessments

The assessment policy said that during assessments, Grade 1 and 2 learners may be read to if they could not read the questions for themselves, but from Grade 3 onwards, no teacher should read for the learners (DBE, 2012). Anathi agreed that "It is fine but Grade 3s and 4s should also be included. I think they are not fully independent, they need some assistance in reading." In agreement, Buhle added that "the question papers on their own is a nightmare; also they believe on something from their educators mouth. They hear the instruction better by being told than reading, they understand better by being told."

Both teachers agreed that even the Grade 4 learners should be assisted during the assessments. For Anathi, there should be mediation in reading the mathematics assessments for Grade 3 and 4 learners as well since some learners had not developed their reading skills sufficiently to be independent. This is consistent with Vygotsky's (1978) observation that children's achievement, when assisted by an adult, improves. Teachers in this study believed that if they assisted learners in the assessments, they would have been aware of areas of difficulty for their learners. For Buhle, the assessment question papers are way beyond their capability. They did not understand them on their own. Buhle believed that learners understood better when the questions are read to them (they understand better when they are being told).

This was an important observation which needed to be considered. It makes clear that the learners have not developed some measure of competence in the English language at the oral level which allows them to comprehend statements read to them. The implication of this is that the learners have not sufficiently developed their competence in reading the written form of the language which explains their inability to comprehend what they read for themselves. This leads on to the fact that learners have not adequately developed their reading fluency which results in the short term memory being taxed as it can only hold a few items for a limited duration (Abadzi, 2008). By the time the slow reader is finished with the last words of a long question, the first words would have been lost and comprehension is compromised. When the teacher reads for them fluently, they are more likely to memorise all the words of the sentence/question and determine its meaning.

The two teachers were also asked whether learners would profit from the reading of the questions by the teachers. Anathi agreed and explained that "Most of the learners do not perform in the maths assessments. After they have written the assessments, I take normally the same questions from the assessments and they perform much better because of the explanation, but not explaining each and every question." Buhle was also of the same opinion. For Anathi, mediation through reading and explanation of the questions helped learners to demonstrate transformation and process skills. This was also confirmed by the interviews that were carried out with Buhle and Anathi's 2013 Grade 4 learners. On one hand, the learners' performance in the assessments that they wrote without assistance from their teachers was very poor. On the other hand, learners' performance in the interviews, where there was mediation from the interviewer improved greatly with most of the interviewed learners improving on more than half of the 15 questions that they answered. This confirms the teachers' comments.

Teachers' experiences of the levels of cognitive demand of the grade four mathematics assessments

Teachers were also asked their views about the cognitive demands of the Grade 4 mathematics assessments. Anathi alluded to the fact that the assessments were relevant and appropriate for Grade 4. This was because there was "quite a wide range of levels of difficulty which is good so as for learners to be able to identify, compare, solve problems or to match." Without directly answering the question Buhle explained that "Maths should be taught in English from lower grade; then we won't experience this disasters. Firstly additional language is not their mother-tongue; simple English should be used." Rollnick (2004, p. 117) however, argues against the 'dumbing down' of texts for the sake of second language learners. For her, "Oversimplification can lead to loss of meaning and even accusations that the texts no longer reflect the discipline they are trying to reflect. Teachers should rather teach this language so that learners learn them, even if it is difficult.

Anathi argued that the cognitive level of demand of the problems given in the assessments was appropriate for Grade 4 level. If the range of levels of difficulty was considered appropriate for the learners, the implication is that Anathi sees the problem

as one that lies with learners who cannot read and who do not understand the language of mathematics. It was important for her that the levels tested learners in different learning outcomes. Although earlier in the interview she criticised the language of the assessments for being difficult for the learners to understand, she agreed with the variety of different activities and learning outcomes that the assessment test, which she claimed to be 'relevant and appropriate for Grade 4.

For Buhle, the main issue compromising learners' performance was the difficult language and similarly the language of instruction for learning. While not explicitly addressing the issue of cognitive demand, she advocated simple language in the assessments, however, relinquishing herself from the role of teaching the terminology and language of mathematics. Buhle raised a tension here in relation to the teaching of mathematics in mother-tongue. According to her, mathematics 'should be taught in English from lower grades'. This implies access to mathematics in the English language earlier in their schooling. However, learners would then have difficulties learning mathematics in English in the foundation grades.

Buhle's statement "… additional language is not their mother-tongue" shows that she noted difficulties with learners learning mathematics in an additional language. Buhle confessed to using isiXhosa in class when teaching mathematics although the language of instruction was 'supposed' to be English. Thus she said the truth

To be honest in class usage of code switching is too much during teaching as I should start them from naming numbers. Questioning for them is too advanced, e.g. Arrange from descending to ascending, instead of saying start with the bigger/smaller number.

Buhle raises a tension here in relation to her use of code switching. This is because 'Questioning for them [learners] is too advanced'. The implication is that Buhle has to navigate between the knowledge of the local needs, i.e. learners who need explanations in the mother-tongue, and to comply with the language policy that from Grade four the LoLT should be English. This results in her having to rely on code switching in order to make her teaching accessible to learners. This tension concurs with the research by Brock-Utne (2007) and Webb and Webb (2013) in which they argue that learners benefit from code switching because they learn and understand better when they are taught in their home language. Another implication is that although the mathematics vocabulary is difficult to learn, it has to be taught in order to be known and for learners to be able to read and understand questions. Through judicious use of the home language and English, the LoLT, learners can be exposed to the target language and learn the mathematics language.

CONCLUSION AND RECOMMENDATIONS

Literature show how learners struggled with learning mathematics in a second language. This study has also illuminated that the two teachers concur with the literature on the learner challenges. Both teachers perceived the mathematics language to be a challenge for Grade 4 learners who had no enough exposure to the English language. From the teachers' views it was not easy for the learners to learn in an additional language, let

alone the mathematics assessment language which is complex and 'difficult to understand'. Both teachers expressed the view that reading skills for most learners were weak in relation to reading words, reading fast and fluently, and in reading with comprehension. The teachers recommended that reading skills needed to be developed by giving learners an opportunity to read a lot of material independently. The teachers also stated that learners would perform better if they were assisted with the reading of the assessment test items which they could not read on their own.

The study also illuminated a range of tensions and dilemmas that teachers faced and these included the dilemma of whether teachers should assist learners during assessments, satisfying the local needs of learners or comply with the rules of the assessment policy, not helping learners when they asked for assistance**.** The other issue was in relation to teacher managing the difficulties of teaching mathematics in English through the use of code switching during teaching. One teacher felt learners understand better if their home language is used together with English to teach mathematics, although the language policy at the school stipulated that from Grade 4, the LoLT is English. Teachers then find themselves in a quandary whether to continue teaching the learners in English which they do not understand or use the learners' home language.

A mathematics teacher, as a leader in the mathematics classroom operate out of a driving desire to meet the needs of learners. The teachers as leaders believe that all learners can succeed and that all teachers need collaborative support to help their learners realize that goal of success (Robbins & Ramos-Pell, 2010). It is also critical for teachers to be proficient in the LoLT as well as cross-cultural competence in order to teach and communicate to learners successfully (Evans & Cleghorn, 2010). It is recommended that teachers teach the difficult language to learners and assist learners to understand the language. In terms of weak readers, it is recommended that the assessment questions be read to them or the language mediated in any way as is the case with Grade 1 and 2 learners, an assessment can only be considered valid if learners access what is asked of them. If not, then the assessment becomes invalid. Assistance in reading the questions would allow learners to demonstrate their mathematical skills to best advantage. The success of learning mathematics lies within the power structure of policy making. This is a sociological issue rather than a mathematics issue. It is also an issue relating to the fact that English Second Language learners need at least 5-7 years of English language learning before they can use it effectively to learn.

REFERENCES

Abadzi, H. (2008). Efficient learning for the poor: New insights into literacy acquisition for children. *International Review of Education*, 54, 581-604.

Abedi, J. (2010). *Performance assessments for English language learners.* Stanford, CA: Stanford University, Stanford Center for Opportunity Policy in Education.

Abedi, J., Hofstetter, C., & Lord, C. (2004). Assessment accommodations for English language learners: Implications for policy-based empirical research. Review of Educational Research, 74(1), 1-28.

Adler, J. (1998). Language of Teaching Dilemmas: Unlocking the Complex Multilingual Secondary Mathematics Classroom. *For the Learning of Mathematics, 18(1)*, 24-33.

Barbu, O. C. (2014). Understanding English Language Learners' Needs in Mathematics Education. *Journal of Education & Human Development*, 3(1), 131-144.

Barbu, O. C. (2010). Effects of linguistic complexity and math difficulty on word problem solving by English learners. International Journal of Education, 2(6), 1-19.

Brock-Utne, B. (2005). Language-in-education policies and practices in Africa with a special focus on Tanzania and South Africa – insights from research in progress. In: Lin, AMY., & Martin, P. (eds). Decolonisation, globalisation, language in education. 175 – 195. Toronto: Multilingual Matters.

Brock-Utne, B. (2007) Learning through a familiar language versus learning through a foreign language – a look into some secondary school classrooms in Tanzania. *International Journal*

Cummins, J. (1980). The entry and exit fallacy in bilingual education. NABE: Journal for the National Association for Bilingual Education, 4(3), 25 -60.

Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of Educational Research*, 49, 222-251.

Denhere, C., & Chinyoka, K., & Mambeu, J. (2013). Vygotsky's Zone of Proximal Development Theory: What are its Implications for Mathematical Teaching? Greener Journal of Social Sciences. 3. 371-377.

Department of Arts and Culture, & Print Industries Cluster Council. (2007). National survey into the reading and book reading behaviour of adult South Africans: Quantitative research onto the reading, book reading and book buying habits of South Africans from age 16. [Bellville: South African Book Development Council].

Department of Basic Education. (2013). *Report on Annual National Assessments Grades 1-6 & 9.* Pretoria: Department of Basic Education.

Department of Basic Education. (2014). *Report on Annual National Assessments Grades 1-6 & 9.* Pretoria: Department of Basic Education.

DBE, Republic of South Africa 2016. *National Senior Certificate examination 2015: Diagnostic report*. Pretoria: DBE, Republic of South Africa. Available at http://www.education.gov.za/Portals/0/Documents/Reports/2015%20NSC%20Diagnostic%20Report.pdf?ver=2016-01-05-001418-000. Accessed 01 May 2017.

Evans, R., & Cleghorn, A. (2010). Complex language encounters: observation from linguistically diverse South African classroom; Language and Literacy. *A Canadian e-Journal*, 12 (2), 30-42.

Gee, J. P. (2001). Reading as situated language: A sociocognitive perspective. Journal of Adolescent & Adult Literacy, 44, 714-725.

Gee, J. P. (1996). Social linguistics and literacies: Ideology in discourses (2nd ed.). London: Taylor & Francis.

Graven, M., & Venkat, H. (2014). Primary teachers' experiences relating to the administration processes of high-stakes testing: The case of mathematics Annual National Assessments. *African Journal of Research in Mathematics, Science and Technology Education AJRMSTE,* 18(3), 299-310.

Halliday, M. A. K. (1978*). Language as a social semiotic: The social interpretation of language and meaning.* London: Edward Arnold.

Kilpatrick, J., Swafford, J., & Findell B (eds.) 2014. Adding it up: Helping children learn Mathematics. Washington, DC: National Academy Press.

Kopriva, R., Gabel, D., & Cameron, C. (2011*). Designing Dynamic and Interactive Assessments for English Learners* That Directly Measure Targeted Science Constructs. Society for Research on Educational Effectiveness.

Moschkovich, J. N. (2010). *Language and mathematics education: Multiple perspectives and directions for research.* Charlotte, NC: Information Age Publishing.

Pretorius, E., & Lephalala, M. (2011). Reading comprehension in high-poverty schools: How should it be taught and how well does it work? *Per Linguam,* 27(2), 1-24.

Pretorius, E. & Spaull, N. (2016). Exploring relationships between oral reading fluency and reading comprehension amongst English second language readers in South Africa. *Reading and Writing.* (29) 1449-1471.

Reddy, V., Zuze, T. L., Visser, M., Winnaar, L., Juan, A., Prinsloo, C. H, Arends, F., & Rogers, S. (2015). *Beyond benchmarks. What twenty years of TIMMS data tell us about South African education.* Pretoria: HSRC.

Robbins, P., & Ramos-Pell, A. (2010). Shared Leadership: A Key to Student Achievement in an Underperforming School. Teacher Leadership. A publication of the University of Phoenix.(Accessed June, 2010 at http://cdnstatic.phoenix.edu/content/dam/ altcloud/doc/Teacher_Leadership_White_Paper.pdf#_blank).

Rollnick, M. (2004).Finding the meaning, Sociolinguistic Issues in text access in Peacock, A. and Cleghorn. A. (Eds) Missing the Meaning: The development of Print and non-Print Text Materials in Diverse School Settings. New York: Palgrave, 105-120, 2004 ISBN NO: 1-4039-6091-7.

Setati, M. (2005). Mathematics education and language policy and practice in multilingual South Africa. In R. Vithal, J. Adler & C. Keitel (Eds.). *Math education research in South Africa: Perspectives, practices and possibilities.* Pretoria: HSRC.

Sibanda, L. (2017). Grade 4 Learners' Linguistic Difficulties in Solving Mathematical Assessments. *African Journal of Research in Mathematics, Science and Technology Education*, *21*(1), 86–96.

Spaull, N. (2016). *Learning to Read and Reading to Learn. Policy Brief (April). Programme to Support Pro-Poor Policy Development (PSPPD).* Research on Socioeconomic Policy (RESEP).

Webb, L., & Webb, P. (2013). Teaching strategies in language-diverse mathematics classes: A case study. *Educational Research for Social Change*, 2(2), 31-42.