AN INVESTIGATION INTO THE MATHEMATICS TEACHING PRACTICES OF NON-ISIXHOSA-SPEAKING TEACHERS TEACHING ISIXHOSA-SPEAKING 3RD GRADERS THROUGH THE MEDIUM OF AFRIKAANS

A thesis submitted in fulfilment of the requirements for the degree of

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DECLARATION

I, Susanna Knoetze, the undersigned, hereby declare that the content of this dissertation constitute my own original work, which has not previously been presented to another institution, either in part or as a whole, for the purposes of obtaining a degree. Where use has been made of the work of others, this has duly been acknowledged and referenced.

S. Knoetze

Signature ………………….…………… Date ………16 February 2015………..

ABSTRACT

There is a considerable body of literature on the challenges faced by learners who speak an African language at home but who are taught through the medium of English. Less research has focused, however, on contexts where isiXhosa-speaking learners have Afrikaans as their Language of Learning and Teaching (LoLT), especially in Foundation Phase classrooms where teachers may not speak their learners' home language. Such learners face the triple challenge of simultaneously learning a second language, learning to read in that language, and also learning new content and concepts through it.

Using a multiple case study design, this investigation explores the mathematics teaching practices of Afrikaans-speaking Grade 3 teachers teaching isiXhosa-speaking learners through the medium of Afrikaans. Separate contextual profiles of the teaching practices of the participating teachers at the three schools are presented. Data were derived from school, classroom, and lesson observations (at least five complete mathematics lessons of each teacher), plus interviews with the teachers and with their school principals.

By drawing on Vygotskian sociocultural theory and the interactive model of second language acquisition, this study highlighted the teaching practices of the three teachers as they mediated their learners' mathematical conceptual development. An inductive data analysis approach was used to isolate recurring themes and patterns. Four main themes were identified: structuring of teaching and learning, facilitating of interaction, language use and implementation of mediating strategies.

Analysis of the data shows that all three teachers' language use displayed high levels of modified input, and high levels of context-embedded support. The levels of scaffolded learner talk were, however, found to be much lower than the levels of teacher talk, especially as far as academic registers were concerned. The teachers' mediation strategies also displayed high levels of teacher-directed input which, on the whole, did not provide optimal opportunities for learners to develop independent levels of academic discourse.

The study highlights the need for further research to inform teacher education and development with regard to more effective support structures to assist teachers with the sorts of challenges outlined above.

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ANA	Annual National Assessment
BICS	Basic Interpersonal Communication Skills
CALP	Cognitive Academic Language Proficiency
CAPS	Curriculum and Assessment Policy Statement: Grades R-3: Mathematics.
DET	Department of Education and Training
DoE	Department of Education
FP	Foundation Phase
HoA	House of Assembly
HoD	House of Delegates
HoR	House of Representatives
IRF	Initiation-response-feedback interaction pattern
LiEP	Language-in-Education Policy
LoLT	Language of Learning and Teaching
LSEN	Learners with Special Needs in Education
NICLE	Development programme of the South African Numeracy Chair (SANC) at Rhodes University
NQF	National Qualification Framework
PIRLS	Progress in International Reading Literacy Study
RSA	Republic of South Africa
SAQA	South African Qualification Authority
SAQMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SASA	South African Schools Act
SFG	Systemic Functional Grammar
SGB	School Governing Board
SLA	Second Language Acquisition
NQF	National Qualifications Framework
UG	Universal Grammar

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TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION TO THE STUDY

1.1 Introduction

This study was located within a larger research programme[1] aimed to develop an understanding of the interplay between Foundation Phase quality teaching and quality teacher education practices. It is beyond the scope of this thesis to provide details on the research programme. Suffice to say that this study sought to contribute to discourses on quality teaching in mathematics by gaining insight into what the teachers do in situations where they teach through a second language that they are not proficient in or able to speak. In particular, it investigated teaching practices in Grade 3 mathematics classrooms to examine strategies teachers employ to mediate mathematical concepts when (a) the language of learning and teaching (LoLT)[2] is not the home language of the majority (if not all) of learners, and (b) they are unable to speak the mother tongue of those learners.

1.2 Background and motivation of the study

The education policy of a country reflects its political options, traditions, and values as well as its aspirations for the future (Hartshorne, 1995). The position of language is also inextricably linked to the prevailing political power, with language policies highly charged and political. The language policy in South Africa is no exception to this reality. During the apartheid era, prior to 1994, the implementation of language policies in general, and the Language-in-Education policy of this country in particular, had to do with issues of "political dominance, the protection of power structures, the preservation of privilege and the distribution of economic resources" (Hartshorne 1995:306). Language policies at the time were shaped by a separatist ideology characterised by racial and cultural boundaries. Regarding education after 1979, the House of Assembly (HoA) administered schools for white learners with those for coloured and Indian

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[1] The Foundation Phase (FP) Research Programme was part of the consortium of four universities (Rhodes University, University of the Western Cape, Nelson Mandela Metropolitan University and Walter Sisulu University) known as the Cape Consortium. While the FP Research Programme formed an important part of the Cape Consortium, each participating university agreed to institution-based outputs that included postgraduate throughput at the masters and doctoral level and publications.

[2] "LoLT refers to the language or medium of instruction via which learning and teaching (including assessment) for all subjects is facilitated. Any of the 11 official languages (plus Sign Language) may be used for this purpose. The LoLT in a school is determined by School Governing Boards (SGBs) who select the LoLT of their schools in accordance with section 6(2) of the South African Schools Act" (Status of the language of learning and teaching (LoLT) in South African public schools, 2010:13).

learners run by the House of Representatives (HoR) and House of Delegates (HoD) respectively. Schools for black African[3] learners (but excluding those schools in the various homelands) were administered by the apartheid government's Department of Education and Training (DET). Each department of education had individual language policies, governed by the ideological position of the day, making these, as Hartshorne proposes, "an instrument of social and political control" (1995:306). In brief, English and Afrikaans were the official languages of the country with African languages not catered for, despite the majority of the population being African language speakers.

Language policies for white, coloured and Indian schools were relatively stable in that they chose one of the two official languages as the medium of instruction from Grades 1 to 12, with the other being taught as a compulsory subject. In contrast to this relative stability, the language policies for schools attended by black African learners experienced many changes; leading to deep-set inequalities and instabilities and in addition, introducing major complexities related to learning through a second language. At the outset, English was used as the medium of instruction in schools for black African learners, but mother tongue instruction for the early grades was later introduced. In 1959, according to Hartshorne (1992:302), the National Party "(for) its own ideological stance", extended mother tongue instruction to senior grades. While not the focus of this study, the implications of mother tongue instruction are acknowledged because they were far-reaching for black African learners.

The linguistic diversity of the South African nation and the effects of the history of education have had a critical influence on both the present education system and on perceptions on the use of mother tongue instruction[4] (Murray, 2002). The apartheid government's enforced extension of mother tongue education for black African learners from the 1950s onwards was one example of how language had, in the past, been used to set the boundaries of ethnic identities. The segregated education system still marks itself on the education landscape today, despite, as is

[3] In line with racial classification of the apartheid era departments of education racial classification the term black refers to black Africans. However, acknowledging contemporary contestations of racial classification or labelling, this study will be using the term 'black African'.

[4] Mother tongue education appears to be irrevocably stigmatised because of its historical associations with an inferior curriculum and the institutionalised racism of apartheid making it an unachievable ideal in South Africa (Plüddemann, 2002).

argued in this chapter, almost 20 years of new education and language policies and structures in the new democratic South African government.

As a way of addressing the inequitable, fragmented, and unequal education legacy inherited from the apartheid era, the first South African democratic government of 1994 introduced various structures and policies. The National Education Policy Act (1996) was aimed at facilitating the democratic transformation of the national system of education in the interest of the South African population and led to the formation of a single national Department of Education with provincial departments administering all schools under their jurisdiction. In particular, the National Qualifications Framework (NQF)[5] was introduced, a framework that introduced new forms of qualification and certification as well as provided an organising structure to merge all education departments into a single system as well as integrate vocational training and mainstream education. According to Chisholm (2004:14) "[t]he NQF was predicated on the notion of the integration of education and training, an initially exciting idea whose assumptions about the relationship between education and economic growth soon chimed with the assumptions of human capital orthodoxy." While this structure provided the organising framework, the South African Schools Act (1996) provided the legislative structure for a uniform system for the organisation, governance, and funding of schools.

A number of researchers (Chisholm, 2004; Soudien, 2004) have argued that the South African Schools Act (SASA) has not delivered on its aim to address the separatist past by creating a unified, non-racial and just dispensation in a democratic South Africa. Schools have, through the new decentralisation, been realigned according to socio-economic groupings with the authority given to School Governing Boards (SGBs) to decide on a number of school-related issues, decisions on school language policies being one of their key responsibilities. However, experience has borne out that language policies designed by SGBs have not necessarily served the interests of the majority of learners in schools. The designing of language policies could be

[5] According to the official website of the South African Qualifications Authority (SAQA) the NQF was designed to "combine education and training in South Africa into a single framework, and bring together separate education and training systems into a single, national system … It came into being through the South African Qualifications Authority Act (No. 58 of 1995, Government Gazette No. 1521, 4 October 1995)".

seen as a crucial environmental factor that continues to be controlled to serve ends other than those required by ideal learning conditions (Chisholm, 2004).

Three forms of legislation are pertinent to this study. First, the SASA (1996) that provided open access to all schools for all racial groups; second, the South African Constitution (South Africa. 1996) that declared 11 official languages[6]; and third, the Department of Education's Language-in-Education Policy (DoE, 1997:1-2) that formally acknowledges the right by schools to choose their medium of instruction and of all learners to receive education in the official language of their choice where this was reasonably practicable.

Three tensions emerge from a read of these policies that form the basis of the questions this study responds to. The first tension has to do with the tension between open access to schools based on principles of democratisation and acknowledgement of diversity of race, culture and language on the one hand, and freedom of choice on the other hand. Put differently, this issue relates to the tension between open access to schools for all learners irrespective of race, class, gender or mother tongue and the degree of choice parents are able to exercise regarding these aspects. It is important to note that, prior to 1994, the legislative structures governing the education system of South Africa did not allow for learners from one racial group to move to schools designated for another race groups. During the period just before the 1994 elections and to a greater extent after 1994, learners had the freedom to migrate to schools of choice, with parents by and large, exercising the freedom to choose schools to send their children to.

During the apartheid government prior to 1994, white schools had better funded, privileged with the best resources and with better training for teachers[7]. In the same way, Indian and coloured schools were better funded and resourced than black African schools. As Motala et al (2007:13)

[6] Human rights are given clear prominence in the Constitution. They feature in the Preamble with its stated intention of establishing "a society based on democratic values, social justice and fundamental human rights" http://www.southafrica.info/about/democracy/constitution.htm#.UrVYlfQW1sA#ixzz2o69RsKjW. The declaration of 11 official languages is one of the manifestations of the Constitution's protection of human rights. The implication has been that they had all been awarded equal power and that learners have the right to learn in the official language of their choice.

[7] Hindle (2007:149) states that before 1994, the government spent four times more on a white learner than on a black African learner. "It was widely recognised that there was a serious quality problem in most schools serving African learners, and this was attributable to years of under-investment in these schools. Classes were large, teacher training was poor, and learning support materials were inadequate, both in terms of their quantity and their quality."

state, “[U]nder apartheid, significant numbers of children went to school, especially in the primary grades, but Bantu Education also severely limited the quality of education, and the apartheid regime consistently under-resourced black African schools”.

A second tension exists between the ideal of mother tongue tuition for optimal learning and parents’ freedom to make choices about schools and by inference, make decisions on language of instruction for their children. In other words, once the democratic government took effect, parents with the necessary financial resources sent their children to schools that they perceived as offering a higher quality education than racial policies previously limited them to. These perceptions have continued to influence the decisions by parents on school selection and have led to an increase in learners learning through a language that is not their mother tongue or home language.

Despite the 1997 Language-in-Education Policy (LiEP) that proposes mother tongue instruction as the ideal for optimal learning, many parents of African-language speakers favour English[8], and in other cases Afrikaans[9], as LoLT. Migration by learners is especially animated amongst black Africans, in part due to parents’ perceptions regarding the quality of education in schools other than those previously designated to their children. Thus, such perceptions can be regarded as the main driving force behind the shift in learner demographics in particularly ex-Model C schools[10]. Makoni (cited in Murray, 2002) suggests, though, that African parents’ choice to send their children to English and Afrikaans schools is not always viewed as deficit. He argues that in Africa, multilingualism is the norm and second language learning is seen as one of the functions

[8] Possible reasons for retaining English in particular as a LoLT, according to Probyn (2006), include the social, economic. and political power of especially English in the country, the under-development of African languages as languages of science and technology, the link of African languages as media of instruction with the apartheid education systems and a lack of learning materials in African languages.

[9] The reasons for the choice of Afrikaans as a LoLT for learners who speak an African language has not been thoroughly researched, but the assumption is that parents prefer what they regard as better functioning schools to home language instruction for their children. According to the teaching staff at a school that participated in this study, some isiXhosa-speaking parents also seem to regard the fact that their children will be able to speak three languages as offering better potential for access to jobs. An in-depth study of the views of parents and learners regarding the choice of Afrikaans as a medium of instruction is needed to acquire a better understanding of the background to these choices.

[10] In 1991white state schools were allowed to change their status, provided that the majority of the parents voted in support of the suggested choice. According to Pampallis (1993) three school models were available: Model A involved the privatisation of the school, a Model B school remained a state school but could admit up to 50% black African students and a Model C school received a state subsidy but would be required to raise the balance of its budget through fees and donations.

of education. According to him, the notions of additive and subtractive bilingualism[11] do not necessarily capture the complexities of the African setting.

According to Murray (2002:438) citing Young, "African students and their parents… seem to maintain a strong allegiance to their home languages…and seem to see them as just that – the languages of the home…" while English as the LoLT is regarded as the language of aspiration. The position of Afrikaans as LoLT is, based on my interviews with principals and teachers, similar. Therefore, it would seem that black African parents, who choose to enrol their children in schools where Afrikaans is the medium of instruction, maintain their home language for communication and regard Afrikaans as the language of access to a preferred form of schooling. The implication is that children are placed in schools where the teachers are usually unable to speak or mediate through languages represented in their classroom.

Parents of African learners, it seems, also do not view mother tongue development at schools as a priority. According to Plüddemann (1995), a parent survey conducted at Collegiate Junior School in Port Elizabeth where a programme for teaching isiXhosa to all the learners was introduced, indicated that less than half the isiXhosa-speaking parents regarded first language support for their children as important. Thus it can be said that tension has developed between open access to schools, the choices parents make, and the schools' right to choose their medium of instruction. The consequence of this is that the LoLT of the school might not be the learners' mother tongue. While parents have a choice to send their children to any school, the implications of shifting boundaries for learners of different race groups are that those whose home language is not the LoLT of the new school are compelled to adjust to the linguistic challenges of the new context. They not only have to become proficient in the LoLT of the school, but also learn through it. As Broom (2004: 510) suggests, for black African learners such a move is especially demanding as "[t]hese children found themselves in a second language immersion situation where many of the teachers had little knowledge of their African languages or cultures." She makes the point that teachers in such schools, usually monolingual or bilingual

[11] The term additive bilingualism is defined by Cummins (2000:37) as "the form of bilingualism that results when students add a second language to their intellectual tool-kit while continuing to develop conceptually and academically in their first language". By contrast, subtractive bilingualism involves a loss of or diminished proficiency in a first language, especially in cases where learners enter a school where a more powerful language is introduced as the LoLT.

English/Afrikaans speakers, are required to handle the language differences and variations in the levels of proficiency in their multi-racial classrooms.

The above leads to the third tension at the heart of this study, namely mismatch between teacher competency in a language other than the medium of instruction and the languages represented by learners in class. Taylor and Vinjevold (1999:221) describe this mismatch in language competencies of teachers and learners by proposing that, "[t]he rapid changes in the linguistic profile of schools were not accompanied by changes in the language policies of the schools nor by changes in teaching staff. This has meant that in many classes teachers do not speak the languages of a majority or significant minority of their pupils. This is particularly problematic at the Foundation Phase." She continues by making the point that teachers, faced with learners who understand very little of what they say, try to keep control at all cost. Such teachers often resort to teacher-centred lessons with learners seldom receiving opportunities to initiate ideas or contribute to class interactions.

The tensions described in the above led to the concerns raised in this study and led to the research questions posed. Taylor and Vinjevold (1999) indicate that the changed situation highlighted by the third tension is especially pronounced with regard to Foundation Phase learners. In the previous dispensation when choice of school was not an option, all learners in the Foundation Phase in black African schools especially, were by and large learning through the medium of their mother tongue during the first three years of schooling. When open access to all schools was established, learners from different races, sometimes with varying mother tongues, found themselves in the same class, primarily but not exclusively in ex-Model C school environments. Decisions by parents who have the financial capital to move children from previously racially segregated schools has meant that this phenomenon has become a reality in many South African schools despite learners not necessarily having exposure to the new medium of instruction and despite teachers not necessarily possessing the required levels of competence in languages other than the medium of instruction. Many such learners are now confronted with learning a new language, learning to read in the new language and learning subjects like mathematics through the new language. This situation highlights, in practical terms, the tension created by the SASA's provision of access irrespective of race on the one hand and freedom of choice by parents on the other hand.

It is, therefore, fair to say that the freedom of choice regarding access that has given rise to the migration of learners in general, and learners who speak African languages in particular, have led to the creation of complex school contexts, especially in the Foundation Phase. As a result of this disjuncture between their mother tongue and language of instruction, learners as well as the teachers who teach them, face major linguistics challenges in the mediation process.

Multilingualism is not a new phenomenon in South African classrooms. Pertinent to this study though is the issue of learning in the Foundation Phase through a medium of instruction that is not the mother tongue, animated as it is, by the principle of access provided for by the SASA. The result is that currently, a number of teachers are faced with multilingual classes displaying linguistic diversity that include learners with varying levels of proficiency in the LoLT. While multilingualism is understood to be an advantage[12], in situations where some learners learn in a second language, teachers are required to negotiate the subsequent complexities of teaching and to cater for "the language differences and variation in levels of language competence in their multi-racial classrooms" (Broom, 2004:510). It is at the juncture where these imperatives collide that this study situates itself.

1.3 Problem statement

According to the Status of the language of learning and teaching (LoLT) in South African public schools (2010), there are 3-million learners in the Foundation Phase of which 600 000 (20%) receive instruction in languages other than their home language or mother tongue. Open access to schools and parent choice has thus resulted in a large number of Foundation Phase learners

[12] "The new Language-in-Education policy is conceived of as an integral and necessary aspect of the new government's strategy of building a non-racial nation in South Africa. It is meant to facilitate communication across the barriers of colour, language and region, while at the same time creating an environment in which respect for languages other than one's own would be encouraged… This approach is in line with the fact that both societal and individual multilingualism are the global norm today, especially on the African continent. As such, it assumes that the learning of more than one language should be general practice and principle in our society. That is to say, being multilingual should be a defining characteristic of being South African. It is constructed also to counter any particularistic ethnic chauvinism or separatism through mutual understanding." (South Africa. Department of Education, 2007)

learning through a second and sometimes even a third language. Questions arise concerning teaching practices in response to such learning environments with two issues serving as the motivation for this study. The first concerns parent choice that includes sending their children to schools where they learn through a language that is not their mother tongue and second, the issue of low scholastic performance in general and low performance specifically in the Foundation Phase.

Regarding the first, amongst black African parents who have the financial means, the trend has been to choose to send their children to English medium schools. A number of studies have investigated this phenomenon, from different vantage points. Some researchers focused on perceptions regarding the status of the different languages in South Africa. For example, in their study of language attitudes in the Eastern Cape, for instance, De Klerk and Bosch (1996) found that while isiXhosa speakers valued their home language and associated it with a need for affiliation and being part of a group, they linked proficiency in English with their desire to gain social recognition and economic advantages. A more recent study by Barkhuizen (2002) that examined learners' perceptions regarding the role and status of isiXhosa and English found a distinct preference for English as the LoLT during and after school. Another study by De Wet (2002) investigated full- and part-time BEd Honours students' perceptions about the status of languages. Her survey, with the exception of the Afrikaans and Tswana respondents, found that none of the other language communities regarded their home language as a tool for effective teaching and learning. While the respondents were aware of the value of home language in educational activities, an overwhelming majority felt that English was the most important language in the South African political and economic arenas and that it was their preferred LoLT.

Yet another group of researchers have investigated the link between home language and second language proficiency in teaching practices. Probyn (2001) investigated the perceptions and practices of secondary school teachers teaching mathematics through the medium of English as a second language. She reported that teachers experienced stress in teaching through a language in which they displayed low levels of proficiency. They were able to articulate a range of strategies to meet learners' cognitive and affective needs with teachers finding the process of reflection on practices facilitated by the researcher helpful to developing the quality of their teaching.

In a study in 2008, Probyn explored classroom language teaching practices of five Grade 8 science teachers teaching isiXhosa learners. Her findings confirmed that the LoLT creates a barrier to learning where learners learn through a language other than their mother tongue. Despite the difficulties, teachers preferred English as the LoLT. In interviews teachers in this study confirmed that they had not been trained to teach through a second language and referred to the challenge they experienced in teaching science content and English at the same time. Teachers indicated that they were able to use code switching quite extensively in their lessons. Probyn (2008) concluded that teachers used mostly teacher-centred whole-class teaching with some practical work and, on average, little reading and writing happened in observed classes.

A number of studies investigated the link between English as a preferred LoLT in the Foundation Phase and levels of achievement. In a study on the reading achievement by Grade 3 learners in a cross-section of 20 urban primary schools, Broom (2004) found that both language and contextual factors play a role in levels of achievement. The results learners achieved in an English oral and reading test indicated that the first language speakers performed consistently higher than the second language speakers in the same school and that the performance of second language learners in historically privileged schools was dramatically better than in township schools.

Following an examination of some large scale and small scale studies (including Broom's study referred to above) related to the impact of learning in an additional language, Fleisch (2008) concluded that although research evidence points unanimously to a covariance between learners' underachievement and their being taught in a second language, other factors also play a role. He quotes Reddy (2006:90) who makes the point that "teaching practices and the decisions made by the teacher regarding the nature and level of linguistic discourses in the classroom are critical factors that can influence effective learning through a second language". Studies on the nature and influence of teaching practices as a first step can contribute to a better understanding of the factors that play a role in learning through a second language.

While the dominant trend amongst parents is still a choice for English as LoLT, there are a growing number of learners who are learning through the medium of Afrikaans[13]. The Status of the language of learning and teaching (LoLT) in South African public schools (2010) states that there were 307 511 Foundation Phase learners whose home language was Afrikaans, but that more than this number of learners (316 316) were found to be learning via the medium of Afrikaans. This translates into about 9 000 Foundation Phase non-mother tongue learners learning through the medium of Afrikaans (Status of the language of learning and teaching (LoLT) in South African public schools, 2010). Even though this is in relative terms not a large number, the growing phenomenon necessitates an investigation, already taken up in different ways by a number of researchers. Alexander (2003) alluded to the position of Afrikaans as LoLT for non-mother tongue learners and Probyn et al (2002) included schools with Afrikaans as LoLT in their study on language policy and practice in schools in the Eastern Cape. While this might be the case, few if any studies focus on teaching practices in classes where children learn in a medium that is not their mother tongue, where teachers cannot speak the home languages of the majority of learners in their class. Particularly, no studies focus on mathematics teaching practices in such classes, the focus of the current study.

The second main motivation for this study has to do with the issue of the low scholastic performance by learners in general and in the Foundation Phase, specifically. Fleisch (2008) describes the South African education system as one which is currently ‘in crisis’. The low achievement by South African learners is well documented. The achievement of primary school learners, for instance, as reflected in both the PIRLS 2006 (Howie et al, 2008) and SAQMEQ III (Hungi et al, 2010) does not compare favourably with performances in countries globally and in the southern region of Africa. The Annual National Assessment (ANAs) involving standardised tests in literacy and numeracy, administered by the Department of Basic Education and written by all Grades 1 to 6 and 9 learners in public schools, is aimed at verifying the development of

[13] While not the focus of this study, the way in which the position of Afrikaans differs from English forms part of its contextual background. Afrikaans is not, like English, a global language. Like South Africa’s other official languages, Afrikaans does not offer the same levels of economic and social status as English, a status that, as pointed out, appears to override the disadvantages of not learning in one’s mother tongue. In a post-apartheid South Africa, the previously advantaged position of Afrikaans, its political baggage, and its unsure future as a language of tuition from school level to the level of higher education also distinguish its position in comparison to English.

language and mathematics skills appropriate for the grade. Repeatedly, low scores are recorded across the country in general and in the Eastern Cape in particular. According to the official statistics for the ANAs, Grade 3 learners in the Eastern Cape achieved an average of 50.2% for Language and 54.9% for Mathematics in 2013.While these mathematics scores are slightly higher than the language scores, the results are aggregated for all Grade 3 learners and dis-aggregated statistics were not available for the purposes of informing this study.

A study by Simkins and Patterson (2005) focused on, amongst others, Grade 3 isiXhosa-speaking learners who learnt mathematics through the medium of Afrikaans. Their study found a causal relationship between educational success and the medium of instruction, especially in cases where the LoLT is never or seldom spoken at home. The choice of mathematics as a focal point stems from the fact that it, together with literacy, enjoys a high status as gateway subjects of the Foundation Phase years.

A number of studies have investigated mathematics teaching in multilingual classes (Adler, 1998; Howie, 2003). However, much of this research focuses on senior phases with few, if any, focusing on mathematics teaching practices in the Foundation Phase where learners are learning a new language as well as learning to build literacy and numeracy skills in a new language. While learning through the LoLT, such learners are required to master subject content such as mathematical content knowledge and a mathematical register as well as become proficient in the LOLT. According to Saats in Barwell (2009), classrooms where the teacher does not share the home language of the learners pose a further challenge to both teachers and learners. She makes the point that the former are not able to use the informal form of the language to establish a rapport with learners. They are also unable to code-switch for explanations and to use the home language as a learning resource. Saats states that a need exists for research involving case studies to inform pedagogical action and curriculum design in multilingual but linguistically distinct classrooms, a gap this study responds to.

1.4 Context of the study

As this study was conducted in schools in the Eastern Cape, a closer look at the particular features of the region's education landscape was necessary to situate the schools under study and provide another level of motivation for the research choices made.

The three main languages for the Eastern Cape are Xhosa, Afrikaans and English and Table 1 below shows the distribution of first home language in the Eastern Cape.

Table 1: Eastern Cape : Distribution of the population by first home language

isiXhosa	Afrikaans	English	Sesotho	isiZulu
83.4%	9.3%	3.8%	2.4%	0.8%

Census (2011)

The Makana district where the study was conducted reflects the provincial profile in that it broadly correlates with the language distribution above, as indicated in Table 2 below.

Table 2 Makana : Distribution of the population by first home language

isiXhosa	Afrikaans	English	Sesotho
71.5%	14.8%	10.5%	3.2%

Census (2011)

According to the principals of the schools that participated in this study, an emerging feature in the Makana district is the growing number of learners not learning through their mother tongue. Even though the trend is towards selecting schools where English is the medium of instruction, there are a growing number in schools where Afrikaans is the LoLT. Efforts to elicit statistics from the Department of Education to substantiate these context and trends continue.

The trend of learner migration in the Eastern Cape and in particular Makana affects all schools. With a limited number of English schools in the Grahamstown district, Afrikaans schools become the next option. This, according to the principals of the participating schools, is especially true for black African parents whose perceptions about quality education, in line with trends observed elsewhere in South Africa, act as the main motivating factor related to parent choice in this geographical area.

In the Grahamstown schools (one Afrikaans medium and one parallel English and Afrikaans medium) where I did my initial observation, I became aware of instances where the majority of learners in the Afrikaans classes were isiXhosa speaking. On the whole, the teachers were Afrikaans-speaking and not proficient in isiXhosa. My initial observations at the Afrikaans medium school alerted me to the fact that when the isiXhosa-speaking learners started in the Foundation Phase they were required to learn through the medium of Afrikaans, and that most of them did so with very little background in the school's LoLT. They were, as a consequence, required to learn Afrikaans as a second or third language, learn to read in Afrikaans and also to learn all their content subjects in Afrikaans.

1.5 Research goal

The aim of this study was to examine the perspectives and teaching practices of teachers who teach isiXhosa-speaking learners mathematics through the medium of Afrikaans. It aimed to identify and analyse the available resources teachers make available to support learners who learn mathematics through a language they are yet to master. By gaining insight into the teachers' mathematics teaching practices and perspectives, the findings of this study may be used to create better support for teachers who teach within such contexts and, at the same time, also inform initial teacher education and in-service teacher training.

Thus, the goal of this study was to contribute to knowledge and understanding gained both internationally (Cummins, 2008; Long, 1996; Collier, 1989) and in South Africa (Malherbe, 1978; Marivate, 1993; Heugh, Siegrühn & Plüddemann, 1995) as well as an understanding an area thus far under-researched, that is, where children learn mathematics in Afrikaans in a context where teachers are not proficient in learners' mother tongue. The research questions below guided this study.

1.6 Research questions

Main research question

What are the teaching practices in classes where isiXhosa-speaking learners are learning mathematics through the medium of Afrikaans?

Supporting questions

1. What are teachers' views regarding teaching learners who are learning through a second language?
2. What are teachers' views regarding teaching mathematics to learners who are learning through a second language?
3. What strategies and forms of mediation do teachers use in teaching mathematics to learners who are learning in a medium that is not their mother tongue?

1.7 Thesis outline

In this chapter I have outlined the historical background and context of the study as well as the problem statement in which I focused on the teacher and learner challenges in contexts where teaching is conducted through a second language, especially during the Foundation Phase. I then described the research goal before stipulating the main and supporting research questions.

Chapter 2 introduces the conceptual and theoretical background to the study by, in the first place, examining the definitional framework and theoretical underpinnings of the concepts of learning, learning a second language and learning through a second language to help inform an understanding of teaching practices where learners are taught mathematics through a second language.

Chapter 3 continues the exploration of the study's conceptual and theoretical background by shifting the focus to the notion of teaching as a professional practice within a community of practice. The chapter further presents research on the role of the teacher in facilitating language and content knowledge development to gain a better understanding of teaching practices where mathematics is taught through a second language.

Chapter 4 provides the study's methodological orientation. I discuss the research design of the study and describe how I collected and analysed my data. I then discuss considerations of validity, ethics as well as the limitations and significance of the study.

Chapter 5 I provide separate profiles of the three participating teachers regarding their personal and professional background, their classroom contexts and their perceptions regarding teaching in general as well as regarding teaching isiXhosa-speaking learners through a second language.

Chapter 6 reports on the conditions that shaped the teachers' mathematics practices. I concentrate in separate discussions on the ways in which the teachers plan for and structure their teaching in terms of mathematics aims and outcomes, focus, logic, duration and sequencing. The discussion also includes an overview of how learners were structured with reference to teacher talk aimed at directing learner's actions, regulating behavior and developing subject content. The discussion is concluded with a look at the nature and extent of learner talk. The final focus of the chapter consisted of a description of the general patterns regarding the mediation strategies employed by each teacher. In this section I focus on the prevalence and consistencies in each teacher's use of adjusted language, resources and questioning strategies.

Chapter 7 focuses on the analysis and discussion if the data collected regarding the conditions that shaped the teachers' mathematics practices and well as the strategies they used to mediate the development of learners' language and mathematics content knowledge. The most striking features of their practices are discussed in terms of four main themes, namely structure, interaction, language and strategies to mediate mathematics.

In the final chapter I provide concluding reflections on the study and summarise issues raised in the preceding chapters. I conclude with recommendations and suggestions for possible avenues for further research in this critically important area of teaching learners through the medium of a second language.

CHAPTER 2 PERSPECTIVES ON LEARNING, LEARNING A SECOND LANGUAGE AND LEARNING THROUGH A SECOND LANGUAGE

2.1 Introduction

The underlying premise in establishing the theoretical and conceptual framework for the study lies in an understanding of the complex interplay and integral link between teaching and learning. Teaching, teaching practices, and learning were thus important concepts in this study that sought to understand teaching practices in mathematics classes where learners are learning through a language other than their mother tongue. For this reason, the conceptual and theoretical frameworks are in chapters, with each including research related to how such concepts have been taken up in understanding teaching learners mathematics in a language that is not their mother tongue.

The current chapter focuses on learning, learning a second language and learning through a second language. It begins with a conceptual overview on learning using epistemological perspectives to frame the discussion. I do this to not only illustrate how different worldviews shape ways in which the process of learning is understood but also to situate teaching and its concomitant practices and show the implication each worldview has on conceptions of teaching. I continue this chapter with a discussion on how various worldviews shape understandings of learning a first language and a second language before giving attention to views regarding the process of learning through a second language. This chapter is in anticipation for the next, which focuses on teaching practices and critically reviews studies that into learners being taught mathematics through a second language. The latter highlights gaps in the literature and as such situates this study.

2.2 Perspectives on learning

Learning as a human process is complex. Therefore, defining it is challenging because it involves not only acquiring, modifying, and reinforcing knowledge, behaviour, skills and values, but it can be approached from many different viewpoints with roots in psychology, education, and philosophy. Duffy and Jonassen (1992) propose that there are two dominant yet contrasting epistemologies about the world that influence how learning is understood. The first, an objectivist tradition holds that knowledge exists in the world quite independently from experience and instruction. It assumes that a universal body of knowledge is produced outside the individual, who is merely a consumer and reproducer and is not necessarily a constructor of knowledge (Jonassen, 1994). As Applefield, Huber and Moallem (2001) state, an objectivist view of learning understands it as a process through which knowledge of the world is gained by experiencing the world and then internalising it. As I detail in the next section of this chapter, the implications of such an epistemological orientation for teaching are that the teacher is understood to be a transmitter of knowledge who deposits information and skills in the empty memory bank of a passive learner (Freire, 1983). Learning is concerned with receiving information from the 'knower' and the role of language viewed as "a 'conduit' by which the process of transmission occurred" Gibbons (2006:16). The consequences for learning are that concepts are assumed to be absorbed by children in a teacher-controlled environment.

The second, a constructivist worldview, holds that knowledge and meaning are constructed by individuals and that there is no 'correct' meaning to strive for (Moore, 2000). Gruber and Voneche (1977) point out that constructivism, as a term, originated mainly from Piaget's reference to his views as a constructivist but that this does not signify a unified point of view. Learning, according to the constructivist view, involves "a meaning-making search in which learners engage in a process of constructing individual interpretations of their experiences" (Applefield, Huber & Moallem, 2001:5). The central principles of this interpretive epistemological orientation have led to particular theories about learning that are discussed in the next section of this chapter. The implications of a constructivist view for teaching are that the teacher teaches through interaction and co-construction of knowledge. Although theorists are not unanimous on the role of language in the construction of knowledge, some constructivists view language as a critical tool because interactions between teacher and learner "will not simply shape young learners' talk, but help to construct processes of cognition" (Gibbons, 2006:23).

Both orientations reflect tensions, the former (objectivist) which centres on viewing knowledge as an unchanging entity relying on transmission as opposed to viewing it as an entity constructed through people's interactions with the world around them. A second tension exists between viewing learning as something that happens in individuals' interaction with their environment as opposed to something that happens in the brain (Wells, 1999). The various theories of learning that have developed; each with roots in a particular view of the world and of knowledge production, give attention to two central processes regarding learning, albeit foregrounding these in different ways. These include the interaction between the individual and their environment and the internal psychological acquisition processes taking place within the individual. The main theory of learning that emerged from the objectivist tradition is the behaviourist theory while the constructivist view of knowledge formation produced constructivist theories of teaching and learning, explained in more detail below.

2.3 Theories of learning and of learning a language

As indicated above, the behaviourist learning theory, one of the dominant theories in education in the 1940s and 1950s, subscribes to an objectivist view that knowledge consists independently of the knower. Behaviourism highlights the importance of empirical data obtained through careful and controlled observation and measurement of behaviour. According to the behaviourist approach, heavily influenced by Pavlov, Skinner and other physiologists, learning happens through conditioning. Behaviourist theory focuses on the environment and on objectively observable aspects of learning. The basic assumptions are that learning is manifested by a change of behaviour, that the environment shapes behaviour, and that principles of contiguity and reinforcement are central to explaining the learning process (Moore, 2000).

During the 1960s, the behaviourist approach to learning was criticised as being too simplistic leading Gestalt psychologists to look beyond behaviour and to posit brain-based learning[14]. Perceived inadequacies of behaviourism and behavioural thinking thus prompted a shift towards a more cognitivist[15] approach to learning. In opposition to the behaviourists who tried to understand behaviour by dissecting it in terms of habits, conditioned responses, and stimulus-response combinations, the Gestalt perspective focused on the view that humans experience the

[14] Brain-based learning theory is based in the structure and function of the brain. As long as the brain is not prohibited from fulfilling its normal processes, learning will occur (Caine and Caine, 1993).

[15] Cognitivism is the study in psychology that focuses on mental processes, including how people perceive, think, remember, learn, solve problems, and direct their attention to one stimulus rather than another. Psychologists working from a cognitivist perspective, then, seek to understand cognition. Rooted in Gestalt psychology and the work of Jean Piaget, cognitivism has been prominent in psychology since the 1960s; it contrasts with behaviourism, where psychologists concentrate their studies on observable behaviour (http://www.chegg.com/homework-help/definitions/cognitivism-13).

world as meaningful wholes or configurations. Learning within such a perspective is viewed as a cognitive phenomenon in which the experienced whole differs from the sum of its parts (Hergenhahn & Olson, 1997).

The Gestalt psychologists, led by Wertheimer, Kohler and Koffka, examined the ways in which information is processed to produce learning. The emphasis was increasingly placed on the individual learner and learning was viewed more and more as an internal mental process. They focused on a study of memory and, more specifically, on the ways in which information travels from the sensory to the working memory. The multi-store model, based on the work of Atkinson and Shiffrin (1986) proposed that human memory involves three stages, namely sensory memory, short term memory, and storage in long-term memory. In order to retain information, memory has to go through these stages, supported by the phases of encoding, storage and retrieval. Anderson and Pearson's (1984) schema theory emphasised the importance of the use of schemata or prior knowledge linkages as tools to ensure effective storage of information in the long-term memory and so allow for an understanding of the world.

Linked to views by Gestalt theorists, constructivist theorists challenged the ideas of behaviourists. According to Gergen (1985), the constructivists' interpretive[16] view holds that knowledge is not something that can be derived from the nature of a historically specific world, but rather through an interaction with the world. While distinctions can be identified within the constructivist perspective, commonality lies in the way knowledge is seen to be actively built up (or constructed) and that all experiences, including language experiences and social interactions, contribute to knowledge.

Two major strands of the constructivist perspective are traceable, namely, the cognitive constructivism of Piaget (1971) and the social constructivism of Vygotsky (1986). Both share an interpretive, epistemological position and certain common underlying assumptions about development. They hold that development occurs "as a result of the complex interplay between the uniquely human characteristics of the child and the environment in which the child

[16] Interpretive or anti-positivist approaches are concerned with "… the things we directly apprehend through our senses as we go about our daily lives, together with a consequent emphasis on qualitative as opposed to quantitative methodology" (Cohen, Manion & Morrison, 2011:17).

develops…" (Lightbown and Spada, 1999:22). Drawing attention to points of mutual agreement, Jonassen (1994) refers, for instance, to the notion supported by both Piaget and Vygotsky that, in constructivist learning environments, knowledge is constructed rather than reproduced. Both, he argues, concur the construction of knowledge involves reflection on experience in a meaningful context rather than abstract instruction out of context. Vygotsky (1978:78) expresses it as follows:

> [W]e have seen that where the child's egocentric speech is linked to his practical activity, where it is linked to his thinking, things really do operate on his mind and influence it. By the word 'things' we mean reality. However, what we have in mind is not reality as it is passively reflected in perception or abstractly cognized. We mean reality as it is encountered in practice.

While Piaget and Vygotsky both insist on the importance of the interaction of an active individual with an active environment, their constructivism differs in the emphasis placed on where knowledge is constructed. For Wertsch (1998), most discussions on the difference between Piaget and Vygotsky focus on the proximal locus of development, i.e. the most important area where development takes place. For Piaget (1971), this area is said to be in individual children. For Vygotsky (1978), it is situated in social processes, most particularly in the cultural products that are transferred from one generation to the next.

To elaborate, Piaget views cognitive development as a process in which the learner actively constructs or builds new ideas or concepts based on current and prior knowledge or experience. In studying children's cognitive behaviour in their interaction with adults, he concluded that children are from early childhood active, independent meaning makers who construct meaning rather than receive it. Through the processes of assimilation and accommodation they connect and are affected by their interaction with their social and physical environment. These processes not only help them to develop an increased understanding of the world, but also involve a change in the ways in which they think about the world (Moore, 2000). Cognitive development, according to Piaget (1971) as explained by Moore (2000), is thus an active process through which a child develops 'spontaneous constructions'. According to him, children move through different stages of development that enable them to handle progressively more complex concepts. They move "from 'concrete', egocentric thinking which is strongly dependent on the physical proximity of the physical world, towards 'formal', abstract reasoning which takes place increasingly 'in the head'" (Moore, 2000:20).

Piaget places the child at the centre of his studies and, through his experiments and investigations, aims to gain an insight into their thinking. While he focuses on the importance of providing the child with a stimulating learning environment, he does not give much attention to pedagogy and the mediating role played by the teacher in the learning situation. The processes of assimilation and accommodation, he believes, also influence the child's language development. Piaget does not view language development as separate from the development of the mind. Language is simply seen as one of the symbolic systems employed by children to represent the knowledge acquired through their interaction with their environment (Lightbown and Spada, 1999).

In contrast, Vygotsky (1986) emphasises development as a collaborative process that takes place within a specific cultural and social context. All cognitive functions originate in, and are explained as, products of social interaction. Development is more than the child's assimilation of new knowledge; it is the process by which the child is integrated into a knowledge community. The primacy of culture in shaping development and learning is seen by Vygotsky as a social and cultural practice involving the transmission and development of cultural products and processes (Wertsch, 1998).

Howe (1996) explains that Vygotsky sees social interaction as the origin of mental development. A child's interaction with adults or more advanced peers is necessary for this development and it requires the active involvement of all participants. Vygotsky assumes that instruction influences development and that the teacher (or knowing other) can intentionally nurture and teach children only in collaboration with them. This process requires the teacher's (or knowing other's) assistance to move ahead of development into what he called a "zone of proximal development"[17] or ZPD.

The notion of mediation is central to Vygotsky's understanding of cognitive development, and as Wertsch puts it, is based on the assumption that human beings have a "need and ability to

[17] The ZPD refers to the cognitive gap between what a person can do on his own and what he can do jointly with an expert. Learners learn through the joint participation with an expert how to use language to develop thinking (Gibbons 2006).

mediate their actions through artefacts and to arrange for the rediscovery and appropriations of these forms of mediation by subsequent generations" (Wertsch, 1998:252). Vygotsky (1978) claims that human activities are mediated and facilitated through the use of tools such as cultural practices and material or symbolic artefacts. One such tool, and the most far-reaching, is language. The link that Vygotsky sees between language use and thinking provides a key to the understanding of the role that language plays in learning. To him, mental activities are made evident in social speech and are later internalised to become inner thought as a child's thinking moves from the social to the mental plane. The child develops self-directed mental activity such as problem-solving and reflection. Vygotsky puts it this way,

> Any function in the child's cultural development appears twice, on two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an interpsychological category, and then within the child as an intrapsychological category … Social relations or relations among people genetically underlie all higher relations and their relationships (Vygotsky, 1981:163).

In other words, according to Vygotsky, learning occurs through interaction with the world. In particular, language (or signs) and social and cultural interaction plays a pivotal role in the development of mental functioning. From his viewpoint, the formation of concepts and, consequently, thinking in concepts leads to the "discovery of the deep connections that lie at the base on reality, to recognizing patterns that control reality (and) to ordering the perceived world with the help of… logical relations" (Vygotsky, 1978:48).

He viewed speech as a powerful tool to analyse, classify, order and generalise, with the word acting as the carrier of concepts. Talk is seen by Vygotsky as a critical component in the thinking process because it does not simply act as a mirror of a child's inner thought processes, but actually constructs and shapes thinking. The development of higher mental functions are therefore not just dependent on intellectual maturation, but on the use of culturally created semiotic tools which occur in joint activity with more experienced members of a culture (Wells, 2000). It is because Vygotsky focuses on the link between cognition and language that his views help to inform this study of teaching mathematics through a second language.

The following section therefore explores further the link between learning, cognition and learning a language. Before the process of learning a second language is explored, the process and main theories of first language learning are discussed. In my discussion of language acquisition, I pay attention to the way in which different theorists have developed views on language learning based on various epistemological approaches. Initially, I focus especially on the behaviourist theory (with special reference to Skinner's view of language acquisition) with its foundation in an objectivist view of learning (with language learning being no exception), and then on theorists who base their understanding on a constructivist view of learning and the consequences this has for language learning.

While Vygotsky sees language as a crucial element in the process of learning because it functions as a reflexive object that works outwardly and inwardly, he does not have a comprehensive theory of language. I, therefore, first look at Chomsky's (1967) constructivist theory of language acquisition and how linguists and applied linguists such as Krashen (1989) and others apply his views to second language learning. The work of researchers like Lantolf and Thorne (2007) and Halliday (1993), who look at specific ways in which the principles of sociocultural theory can inform a study of second language acquisition (SLA) and learning through a second language, is also discussed. Their work provides an important link between the study of learning and the study of learning language. The discussion of theoretical outlooks on learning a second language pays attention to these researchers' views on SLA to help provide a means to understand the way teachers teach learners through a second language.

2.4 Learning a first language versus learning a second language

Language acquisition is a field of study that many linguists, psychologists, and educationists have engaged with in order to develop a deeper understanding of how language is acquired and learnt, first, in the early years by young children and second, in later years in a variety of different environments. Lightbown and Spada (1999) draw attention to the fact that a high degree of similarity has been found to exist in the patterns displayed in first language acquisition in different languages. They highlight the link between cognitive development and language development by arguing,

> As children progress through the discovery of language in their early years, there are predictable patterns in the emergence and development of many features of the language they are learning. For some of these features, these patterns have been described in terms of developmental sequences of 'stages'. To some extent, these stages in language acquisition are related to children's cognitive development. (Lightbown & Spada, 1999:4)

While research such as that conducted by Lightbown and Spada (1999) produced evidence concerning the link between cognitive and language stage of development, perspectives on language learning are multifaceted and have been influenced by many different epistemological viewpoints. As is the case with the theories on learning alluded to above, the dominant perspectives that have shaped views on language acquisition include behaviourism, cognitive constructivism and social constructivism. The first of these, with its roots in objectivism, is associated with Skinner's (1965) focus on learning and behaviour. The cognitive constructivist perspective is associated with Piaget's work on active learning, and the social constructivist approach is associated with Vygotsky's socially constructed learning. All of these views are, in essence, psychological as they study the nature and expansion of the individual mind in terms of identifiable universal patterns of development (Moore, 2000).

In the previous section reference was made to ways in which each of these three theories of learning viewed the language learning. In the following section, the impact of these views on first language acquisition is investigated focusing on the work of Skinner and Chomsky.

2.4.1 Learning a first language

The positivist and constructivist theories of learning have served as a basis for researchers to develop different approaches to first language acquisition. The two main views discussed in this section are the behaviourist and innatist approaches.

The behaviourist approach

As mentioned earlier, behaviourists view all learning, verbal and non-verbal, in terms of "imitation, practice, reinforcement (or feedback on success) and habit formation" (Lightbown & Spada, 1999: 9). As the main proponent of a behaviourist approach to language learning, Skinner (1965) believed that people learn a language best by being rewarded for correct responses. His position emphasises the importance of positive reinforcement and "the use of highly structured materials through which students can work step by step towards externally imposed goals" (Moore, 2000: 4). Skinner proposed that language learning happens ideally where learners imitate carefully selected structures and patterns in an encouraging environment because children who receive positive reinforcement for the correct use, for example, of a word, will be motivated to develop an understanding of such a lexical unit and will be able to use it in similar situations in the future.

The innatist approach

Critics of behaviourist theory posit that such a perspective of language learning does not do justice to the full complexity of the process of language acquisition. Many feel behaviourists explain part of the process, but do not provide the whole story. Chomsky (1967), for example, delivered seminal critiques on Skinner's language theory, questioning his insistence on creating a teacher-controlled, risk-free environment with externally conferred rewards. According to Chomsky (1967), such an environment could inhibit the development of learners' 'internal' language motivation and their active creative involvement in learning. Chomsky claims that children possess an innate ability to discover the underlying rules of a language system. This ability he called Universal Grammar (UG); a set of principles common to all languages. In the case of learning a mother tongue, he argues that language input from parents and other speakers serves as a trigger to activate this innate knowledge in children's brains.

Chomsky's theory of Universal Grammar finds congruency in Johnson's (2001) account of applied linguistics studies into the process through which children learn a language. Johnson mentions the following common features that have been identified in the way a first language is learnt. First, children engage in a creative construction process with adults or experts. Second, children learn language in a fixed order. Third, they simplify language and, fourth, children listen before they speak. The latter means that children usually go through a quiet period after listening and before speaking. Adults and experts as the language providers, on the other hand, simplify their words and sentences and remodel or refashion their language to the appropriate level when they speak to children. They speak in a clear understandable way, use repetition and model their interaction.

The understandings above of how a first language is acquired underpin and inform theories of second language acquisition (SLA), an area of study which the following section explores.

2.4.2 Learning a second language and links to first language

While a first language is acquired from birth onwards, SLA mostly – but not exclusively – begins when a child enters formal schooling. This could involve learning a second language as a subject or as the LoLT. At this point, children have already acquired a first language with varying levels of proficiency regarding basic structure, vocabulary, and metalinguistic awareness. According to Lightbown and Spada (1999), second language learners in a school context display qualities such as prior conceptual knowledge, greater cognitive maturity, and greater metalinguistic awareness but, as a result of pressure and limited time, second language learners are seldom afforded silent periods to process language input. In such circumstances, it may be argued, learners risk becoming demotivated when they make mistakes.

School-aged learners who need to learn curriculum content through a second language have a potential advantage in that the subject content serves as meaningful language in context that provides more effective opportunities for language learning. Gibbons (2002) argues that an integration of language and content from the start of a school career creates opportunities for the type of authentic exchanges that can help to develop both language and content in a systematic manner.

The features of first language learning processes outlined by Johnson (2001) above can serve as a departure point for understanding the process of learning a second language and thus, for understanding the practices of teachers who teach through a second language. Researchers such as Van Lier (1988:20) argue that the extent to which 'first language-like' conditions are created in a second language classroom plays an important role in terms of optimal SLA and that a classroom where a second language is learnt "must be as 'unclassroom-like' as possible" to allow for effective second language development.

Notwithstanding the importance of environment, researchers such as Cummins (1996) have argued that speakers' proficiency in a first language has a crucial impact on their learning of a second language. In his research, he found that high levels of first language proficiency are conducive to the learning of a second language, and that the link it provides needs to be taken into consideration when SLA in a classroom context is explored. Apart from looking at first language learning as a way of informing an understanding of SLA, the process of learning a second language can be investigated from the perspective of theoretical orientations as I detail below.

2.4.3 Theories and perspectives on second language acquisition

The section above briefly explored theories on language acquisition, the similarities and differences between first and second language learning and the relationship between levels of first language proficiency and second language learning. In an attempt to gain a more nuanced understanding of the process of SLA, the discussion here returns to how theories of learning shape the way we consider how to teach second languages. To this end, the focus shifts to the behaviourist audio-lingual approach, the innatist communicative approach and the interactionist position.

The audio-lingual method

Skinner's (1965) audio-lingual approach to SLA is a teaching method embedded in behaviourism and holds that learning a language involves responding to the environment and to positive reinforcement of behaviour. According to this positivist view of learning a second language is acquired through an imitation of grammar structures. In a classroom where a second language is learnt, the lessons involve static drills of grammar structures which learners have little control over and which they practice until they are able to use them spontaneously.

The innatist approach

Although Chomsky never made his theory of language acquisition applicable to SLA, other theorists claim that the notion of an innate UG supports the process of SLA. Various linguists conducted research on intrinsic language abilities. For example, Corder (1967) proposed that second language learners make use of intrinsic internal linguistic processes to learn also a second language. Selinker (1972) made the claim that second language learners possess individual linguistic systems that are independent from both the first and second language, while Bialystok (1994) examined the cognitive processes involved in the acquisition and use of a second language and identified two central processing components, namely analysis of knowledge and control of processing which, according to her, jointly function to develop proficiency. Such work enabled research on second language acquisition to advance, with innatist theoretical perspectives being applied to language teaching by applied linguists and educationists like Krashen (1989).

Krashen (1989) advocated that in place of the audio-lingual approach adhered to by behaviourists, a communicative approach based on innatist perspectives needs to be explored. He attempted to apply Chomsky's innatist theory to SLA and through his Monitor Model that embeds the acquisition-learning hypothesis, had a great influence on second language teaching practice from the 1970s onwards, especially in the United States.

According to Krashen's (1989) acquisition-learning hypothesis, older second language learners develop language skills in two ways, namely through 'acquisition' and 'learning'. He describes 'acquisition' as a spontaneous process through which learners acquire language in much the same effective way as they pick up their first language. 'Learning', on the other hand, is a process in which more conscious attention is given to language form and language accuracy. He developed two hypotheses in this regard, namely the input and affective filter hypotheses. According to the input hypothesis, which is concerned with 'acquisition', not 'learning', second language learners can develop their language skills when they receive sufficient comprehensible input that is one step ahead of their current linguistic proficiency. By comprehensible input Krashen means the target language input that listeners can understand even when they do not understand all the words and structures in the message and are not yet able to produce by themselves. To expand the notion of comprehensible input, Krashen (1988) added what he called the affective filter hypothesis, according to which learners' motives, needs, attitudes, and emotions have an influence on their ability to make proper use of the received input. Put differently, learner motivation and confidence play an important role in successful language acquisition Krashen claimed that learners' affective filter can be inhibited when they are expected to speak before receiving an adequate amount of input and when they are not allowed a silent period to internalise the language that they have heard.

Krashen's claim that comprehensible input leads to language acquisition was questioned and criticised by other researchers (Swain, 1985; Skehan, 1998). Based on her research in French immersion programmes in Canada, Swain (1985) found that sufficient learner output is also of critical importance in the process of SLA. By output is meant verbalisation and production of language in speaking and writing. The lack of progress in some of the classes where the research was conducted, she claimed, was caused by limited opportunities for extended output and collaborative dialogue. Put differently, when learners are given opportunities to produce language, they are encouraged to process the language more deeply, because they focus on form more than when they merely listen. Swain (1985) argued that comprehensible input was important, but not sufficient. Understanding, she believed, was not quite the same as acquiring. She claimed that understanding and producing language were different skills that needed to be learnt. She advanced the Output Hypothesis that holds that learners also need to produce language, as this forces them to learn by focusing on language form. But she was critiqued (Ellis, 1999) for not paying attention to the interaction that takes place between a knowing other and the one learning a second language. In other words, researchers outlined below made placed emphasis on the context and manner of interaction.

The interaction hypothesis

A third perspective on SLA, by interactionists, views conversational interaction as a critical element in the learning of a second language. According to Hatch (1992), Pica (1994), and Long (1983), most SLA takes place through interaction. They agree with Krashen (1988) that comprehensible input is the principal source of linguistic knowledge, but also believe that the input should be used in modified interaction rather than simply involve listening. While Krashen (1988) claim that input is the sole requirement to activate the innate language system researchers such as Ellis (1999) believe that second language learners are more likely to achieve better levels of comprehension of new input when they receive regular opportunities to communicate through interaction. In this regard, Ellis emphasises the importance of frequency as well as simplification and modification of input. To this he adds the importance of elaborated teacher speech involving expansions and acknowledgements to maximise second language learning.

While Krashen’s focus was on language input and Swain (1985) added the attention to output, the interaction hypothesis by Long (1983) emphasised the importance of the second language learner’s awareness of language processes. As he puts it, through communication and other mechanisms such as attention and noticing, the language input is mediated and meaning is negotiated. Regarding the latter, Long (1996) sees negotiation for meaning as a process whereby input through a medium such as listening or reading is connected with learners' internal language capacity which enable them to produce output. Long (1996:418) defines negotiation of meaning as:

> [t]he process in which, in an effort to communicate, learners and competent speakers provide and interpret signals of their own and their interlocutor's perceived comprehension, thus provoking adjustments to linguistic form, conversational structure, message content, or all three, until an acceptable level of understanding is achieved.

According to him, conversational interaction in exchanges between learners and a proficient speaker involves negotiated language as the learners receive feedback on their production of language and models of language. Feedback is a fundamental ingredient, and as part of interaction, can be to a greater or lesser degree explicit and implicit; from explicit statements about errors and correct language to implicit reformulations that make learners aware of an error as well as the correct alternative. The effectiveness of feedback depends on the extent to which it heightens the learner's awareness of the language. This can be achieved through their active participation in the process of negotiation. The components of negotiation include: (a) confirmation checks that in some way sanction that the message has been correctly understood, (b) clarification requests that seek to clarify preceding utterances, and (c) comprehension checks that attempt "to anticipate and prevent a breakdown in communication" (Long, 1983:136).

An example of the latter would be when the proficient speaker asks whether the learner would like to repeat what he has just said. Interaction and feedback also serves to make learners more sensitive for future input and to help learners create hypotheses about structure that can be either confirmed or refuted in subsequent interactions. In this regard, the production of feedback can be seen as a forum for receiving further feedback. As the learner's metalinguistic awareness is strengthened through feedback and other methods of interaction, an ability to produce more accurate and more complex forms is developed. In summary, language produced by learners consists of, in the majority of cases, output modified after feedback because, as Gass and Mackey (2006:13) put it, "[t]his sort of modified output has been argued to promote language learning since it stimulates learners to reflect on their original language."

This section of the study outlined theoretical orientations to learning a second language, the presentation of which aimed to provide an important layer to situate the study conceptually and theoretically. As Chapter 3 will demonstrate, these theories have serious implications for views on teaching in general and for considering teaching mathematics through a second language in particular; another layer that situates the study conceptually and theoretically. Before proceeding to an investigation of such views, however, it is illuminating to examine how learning occurs through a second language, as I turn my attention to briefly in the next section.

2.5 Learning through a second language

The interactive model outlined above focuses on interaction in terms of SLA, but provides little understanding of learning through a second language. For a better understanding of the latter, a look at Lantolf's (2000) and Halliday's adaptations of Vygotsky's sociocultural theory is helpful. On the one hand, Lantolf and Thorne (2007) explore the manner in which the main constructs of sociocultural theory inform their concept of SLA. Their perspective holds that second language learning, in schools in particular, involves a process of becoming members of a specific language community through participation and interaction. On the other hand, Halliday (1991)'s social-semiotic approach to language, called systemic functional grammar (SFG), looks at the ways in which variations in language behaviour express social structures, for example, in classroom discourse.

Lantolf and Thorne (2007) examine how constructs such as mediation of cognitive and material activities through semiotic artefacts, for example the use of language, make the development of higher order mental functions like learning possible. One form of mediation, namely regulation, is made possible through the internalisation of external assistance. External assistance in the early years involves the regulation of objects like toys and in later stages involves implicit and explicit mediation of language by adults and peers. In children's early years, regulation, they claim, depends heavily on the subordination of a child's actions and thinking to adult speech which helps to lift the child's mental and physical development to higher levels. As a result of this, children eventually develop the ability to regulate their own activity through three stages, namely object-regulation, other-regulation and finally, self-regulation. By the time children reach the third stage, they are better able to accomplish activities with minimal or no support. This parallels the interactive model of SLA, according to which learners "gradually build up their knowledge through exposure to thousands of instances of the linguistic features they eventually learn" (Lightbown & Spada, 1999:42). Through subordination of their language actions to more proficient speakers of the second language and through modified interactions with these speakers, children develop their language further. Teacher-learner and learner-learner interaction is viewed, therefore, as a crucial means for the shaping of young learners' language and for providing the key means through which learning occurs and, as it relates to this study, has implications for learning through a second language (Mercer 1995; Wells 2000).

As already mentioned earlier in this chapter, Vygotsky's theory offers a view of learning that is collaborative within a social and cultural milieu. Drawing on Vygotsky's work, Halliday (1993) and linguists such as Hasan (2005) and Matthiessen (2004) developed a social-semiotic approach to language which they named systemic functional grammar (SFG), a useful tool to analyse interactional patterns and therefore useful also to investigate teaching practices in classes where learning happens through a second language. According to Halliday (1993) language use is influenced by the linguistic context and register of the communication. This register involves the field of the discourse, the tenor of the discourse, and the mode of the discourse.

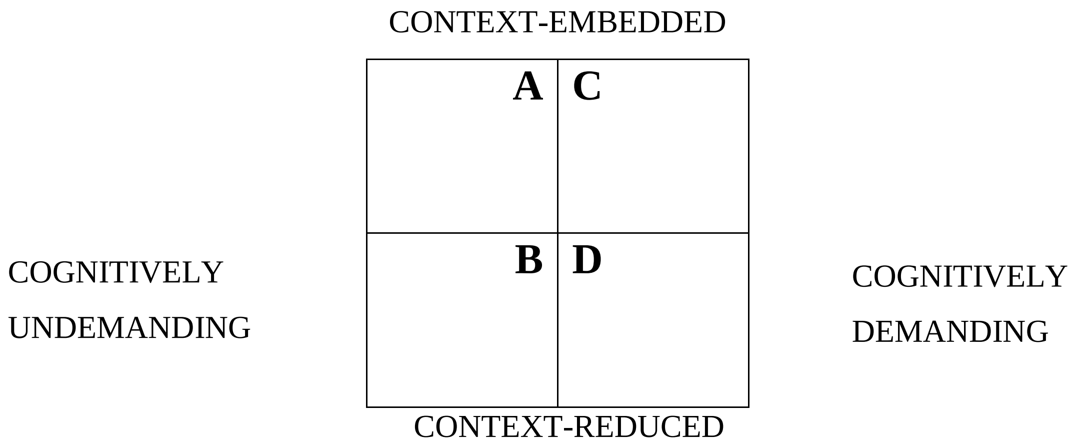
As Halliday (1993) explains, the field of discourse is the cultural activity and the language that is used to talk about that activity, an appropriate example of which for the purposes of this study would be the field of mathematics. The tenor of discourse refers to the relationship between participants, for example, between the speaker and the listener or the writer and the reader. This relationship can be influenced by factors such as status, affect (how participants feel about one another) and contact (how well they know one another or how often they see one another). The mode of discourse, which is especially relevant to classroom research, is the channel of communication, namely spoken and written language. Halliday (1993) elaborates by claiming that a systematic relationship exists between these categories of register and three types of meaning which he describes as ideational (comprising experiential and logical meaning), interpersonal and textual meaning. The ideational meaning corresponds with the contextual field of discourse and involves making sense of the environment and the world of ideas. Interpersonal meaning relates to the tenor of discourse and is concerned with getting to know the world through participating in it and interacting with others. It involves attitudes to the subject matter itself and interpersonal relationships. Textual meaning corresponds with the mode of discourse and is concerned with shaping and organising different kinds of texts.

Halliday's (1993) distinction between these three strands of meaning that together help people make sense of each other and the world through language, is relevant to this study as it focuses on an understanding of the complexities of learning a field of discourse through a second language. As a framework this view of the links between different types of language and types of thinking involved in learning can help to explore learning through a second language.

Learners learning through a second language, it can be said, are faced with the simultaneous need to not only learn everyday vocabulary and academic content through the second language, but also the language skills that are integrally linked to the notion of everyday thinking and academic thinking identified by Vygotsky (1986). Vygotsky makes a distinction between spontaneous concepts that develop from a child's everyday experiences and scientific concepts that are acquired within the structured and specialized discourse of the subject. When learners enter their school life, they cannot be regarded as equally familiar with the everyday and academic ways of thinking and of meaning, a sociocultural circumstance embraced by what Bernstein (1999) describes as horizontal and vertical discourse. According to him horizontal discourse refers to context-dependent everyday or common-sense knowledge (local and tacit) while vertical discourse refers to subject-specific knowledge (coherent, explicit and systematic). The challenge for teachers is to provide linguistic and conceptual bridges between familiar and concrete knowledge and unfamiliar and abstract knowledge, and between everyday speech and more academic vocabulary. Consequently, co-constructed classroom discourse would ideally begin with the development and strengthening of the second language learners' grasp of everyday language and increasingly shifts to the development and strengthening of language associated with academic registers as described by Halliday (1993). In terms of the interaction model of SLA (Long, 1983) a feedback cycle of teacher talk and learner talk could serve to strengthen the development of both the second language and the processes of cognition.

As has been established, second language learners' levels of proficiency in everyday and academic language are critical factors in learning through a second language. In this regard, Cummins (2008) makes an important distinction between, on the one hand, Basic Interpersonal Communication Skills (BICS), namely, the surface skills of listening and speaking which are easily and quickly acquired by second language students and, on the other hand, Cognitive Academic Language Proficiency (CALP), the latter of which is defined as the language needed by learners to succeed academically in all content areas. This distinction was made on the basis of research findings that indicated that bilingual learners who appeared to be proficient conversationalists, often performed below grade expectations where academic language was concerned. According to Cummins (2008:72-73) his studies in Canadian schools and studies in other countries found that, while many children develop conversational proficiency (i.e. BICS) within one to three years of direct conversations in the target language, a period of about five to seven years is required to reach peer-appropriate levels of academic language skills. Cummins (2008) argues, therefore, that educators should guard against conflating conversational and academic proficiencies. When second language learners display a high degree of fluency and accuracy in everyday spoken language, it does not necessarily mean that they possess the corresponding academic language proficiency. They might need more time to develop these skills to a sufficient level to cope with the increasing academic demands in the classroom. Through their teaching practices teachers need to create instructional environments that, as Scarcella (2003) suggests, can accelerate the development of second language learners' academic language proficiency. For the purposes of this study, it is the academic demands of mathematics that are under investigation and that will be further explored in Chapter 4.

Cummins (2000) elaborates on the BICS/CALP distinction in a model which categorises the cognitive levels and situatedness of language in the instructional practices to show how second language learners can be assisted to develop academically.



According to the diagram above tasks set by a teacher can, along one continuum, range from cognitively undemanding to cognitively demanding. Along the other continuum, tasks can range from context-embedded to context-reduced. A context-embedded task is one in which the learner has access to additional concrete or semi-concrete support and oral cues. A context-reduced task is one where there are no other sources of help other than the language itself. C quadrant tasks, which is both cognitively demanding and context-reduced, are likely to be the most difficult for learners, especially for second language speakers in their first years of learning a new language. It is essential, however, that teachers help learners to acquire academic language registers by addressing the content as well as the language use in tasks to ensure academic success (Cummins 2000).

Cummins' distinctions between everyday and academic language proficiencies are important to consider in a study such as this one, which examines teaching practices where teaching and learning take place through a second language as they provide a means towards a better understanding of the phenomenon. The development of language skills involves a movement from everyday language to academic language. In the following section, the way in which these two processes are relevant to the unique context of mathematics, is explored.

2.6 Learning mathematical concepts and developing a mathematical register

As this study is concerned with teaching practices where mathematics is taught to second language learners, the interrelatedness of everyday knowledge and language with academic knowledge and language in the field of mathematics needs exploration. The Oxford Dictionary

(2010) hints at this interrelatedness of concrete and abstract thinking processes when it defines mathematics as "the abstract science of number, quantity, and space, either as abstract concepts (pure mathematics), or as applied to other disciplines such as physics and engineering (applied mathematics)". Similarly, Schoenfeld (1992:28) describes mathematics as a search for patterns and argues that "doing mathematics…involves observation of patterns, testing of conjecture and estimation of results". This process, he holds, does not only involve abstract calculations but, at the same time, involves concrete interactions with the real world with the aim of solving problems. The connection between mathematical thinking and language is highlighted in the Curriculum and Assessment Policy Statement (CAPS) for Grades R-3: Mathematics document's reiteration of mathematics as 'a language' and as a "human activity… observing, representing and investigating patterns and qualitative relationships…" (CAPS, 2010:12).

From a sociocultural perspective, alongside the accepted definitions of mathematics as a field of abstract concepts, the challenge for mother tongue speakers, and to a much greater extent for second language learners, is to learn not only the concepts and procedures of mathematics, but also the language needed to express and support thinking involving these concepts and procedures. The process of learning mathematics through a second language, it can be said, adds a complex conceptual layer to the learning of mathematics. As Adler et al (1997:17) put it, the mathematics teacher faces "the major demand of continuously needing to teach both mathematics and English[18] at the same time". In addition to this, they note that learners are challenged by the fact that they "have to cope with the new language of mathematics as well as the new language in which mathematics is taught."

According to Pirie (1998:8), a learner's ordinary language "denotes the language current in the everyday vocabulary of any particular child" while mathematical communication includes mathematical verbal language, symbolic language, visual representations and unspoken but shared assumptions. The aim of the teacher is to first create an awareness and understanding of these links and gradually enable learners to express themselves with the language and symbolism of the mathematics register. Halliday (1975:65) describes register here as "a set of meanings that is appropriate to a particular function of language, together with the words and structures which

[18] For the purposes of this study, this reference to English is taken to refer to 'a second language'.

express these meanings.” He describes mathematical register as the sense of meaning that belongs to the mathematical use of everyday language.

According to Dawes and Mulligan (1997:8) mathematical register has developed over time from everyday language to fulfil the function of expressing mathematical concepts. They state,

> Words were borrowed from other languages (radius, pi) or from ordinary English (for example product, difference) and new terms (parallelogram) had to be coined. It is particularly important to note that many words were needed to express concepts, not objects. A word like ‘half’ has no unique representation in the real world. Such concepts can of course be embodied in real world objects, but these are not unique. For example teacher and child can talk about half of a cake, half a cup of flour, and half of a set of 8 marbles. The mathematical concept ‘half’ is the same in each case but the real world embodiments are very different.

There is therefore an important linear link between everyday register and mathematical register and mathematics teaching, especially teaching through a second language, as it involves a movement between these two types of register.

2.6.1 Research on teaching mathematics through a second language

The sociocultural view that ascribes a central position to language and speech in the learning of mathematics has serious implications for the learning and teaching of mathematics through a second language. In this regard it is necessary to look closely at the nature of the language that a teacher uses to articulate mathematical ideas. Drawing on the work of Pimm (1991) and Cobb (1998), Setati (1998) describes discourse in a mathematics classroom as a combination of everyday language and mathematical language. Mathematical language displays informal everyday qualities and formal components that involve “the standard use of terminology which is usually developed within formal settings like schools” (Setati, 1998:12). She refers to Sfard et al’s (1998) further distinction in formal mathematical language between calculational and conceptual discourses as a further useful categorisation. Calculational discourse is the discussion of any type of calculational process and conceptional discourse focus on the discussions making the reasons for calculating in a specific way explicit. These definitions can be extended to include procedural discourse where the learner executes procedures without questioning it, and calculational discourse where the learner does a calculation or procedure without discussing the underlying reasons for the procedure. In opposition to this conceptual discourse would involve discussions about a problem and about how and why a particular problem works. These distinctions can help to describe a teacher’s language practices and to form an understanding of its role in the facilitating of learning. In the words of Setati (1998:13): “In mathematic classrooms, teachers model ways of doing and talking (about) mathematics and therefore the discourse that they engage learners in can either facilitate or constrain learners’ access to communicating mathematics.”

Factors that impact learning mathematics through a second language

Learning mathematics through a second language holds various challenges but, according to Barwell (2009), no conclusive proof exists that, under the necessary conditions, learners will not be able to master these various forms of mathematics language. He refers to the study conducted in South Africa by Howie (2003) in which she found that the level of English proficiency was the most significant factor in explaining differences in scores attained by learners in the study’s mathematics test. Barwell argues, however, that there are so many factors involved, including variations in language proficiency, language structure and background as well as social, cultural and political conditions that it is difficult to establish whether performance in mathematics is mainly determined by multilingual factors.

Tensions in a multilingual mathematics class

As far as the teaching decisions that a teacher makes in a multilingual class are concerned, Adler in Barwell (2009) identifies three tensions that play a role: the tensions between mathematics and language, between informal and formal language, and between students’ home language and the official language of schooling. The teacher needs to decide, for instance, whether to rather keep the attention on correct language or on correct mathematical language and whether to prepare learners by focusing on relevant mathematical language before teaching the mathematical concepts. Mathematical language articulates the meaning of concepts and it is especially through mathematical talk that specialised terms and specific register (different meaning attached to everyday words) are understood.

According to Setati (2002), a complex relationship exists between multilingualism and mathematics learning. For the teaching and learning process to be effective, it needs to focus on the reception and production of language through code-switching, exploratory talk and discourse-specific talk. She uses the metaphor of a journey to describe how teachers and learners move from informal exploratory talk in learners' main language to discourse-specific talk and writing in English. Few teachers and learners, according to her findings, completed this complex journey and the constraints differed across classroom context, level and subject being taught.

Mathematics challenges in the Foundation Phase

In the Foundation Phase, the teaching and learning of mathematics through a second language involve further challenges for both teacher and learner. On one hand, mathematics teachers of second language learners in the early years face the demand of continuously needing to teach both mathematics and the second language at the same time. Learners, on the other hand, "have to cope with the new language of mathematics as well as the new language in which mathematics is taught" (Adler et al, 1997:17). This is especially challenging in primary classes where the LoLT is only "heard, spoken and written in the formal spoken school context" (Setati & Adler, 2002:244). Learners are found to move overtly and sometimes covertly between languages in these mathematics classes, because they speak their main language and also speak the LoLT. At the same time they are required to move between different distinct mathematical discourses. Learners who learn through a second language are, however, seldom able to draw on their main language in situations where there is a need for exploratory talk and thus meaning-making (Arthur 1994). Conceptual exploration is therefore a challenge for learners in a class where the LoLT is not their first language.

Teaching strategies required where mathematics is taught through a second language

Lyster and Ranta (1997) found that in a classroom such as the mathematics classroom where the teacher focuses on both content and language, a wider range of teaching strategies is required to focus on more than just overall meaning. Because of the need for accuracy and precision, teaching strategies also need to concentrate on the negotiation of form in mathematics discourse. This, therefore, requires a more pedagogical and less conversational negotiation: the teacher needs to be the specialist here, showing knowledge of content and of mathematics discourse and ways that will strengthen the learners' ability to use that discourse.

In a mathematics class teachers need to reinforce the content in the learners' utterances and at the same time give them clear messages about language form. Lyster (1998) found that in content classes such as mathematics the corrective function of recasts appeared to be less noticeable than the discourse functions they served. Learners need to be able to distinguish one context from another therefore teachers need to draw explicit attention to the recasts so that they are noticed. This involves using particular forms of signalling which will help to foreground the form of language (in this case mathematical language) with learners often being reminded that they are learning to 'speak like mathematicians'. This involves metalinguistic talk relating to the form of the recast item. From a sociocultural view, opportunities therefore need to be created for learners to participate actively in the reformulating of utterances.

Setati and Adler (2002) argue that, in the light of the various studies of the teaching of mathematics through a second language that support the sociocultural conception of mediated learning, the communicative and cognitive functions of speech are of critical importance. Mercer (1995:4) expresses the following view in support of this statement: "Learners need to talk to learn and such talking to learn is a function of fluency and ease in the language of communication. In other words, talk is understood as a social thinking tool". The use of language, and classroom talk in particular, involved in the learning of mathematical concepts and procedures in a second language can be summarised as follows:

- The strengthening and development of everyday concepts and academic concepts by using language as a tool (through interactions with teacher and peers)
- The strengthening and development of everyday language (BICS) and the acquiring and strengthening academic language (CALP) through comprehensible input, comprehensible output and adjusting of output.

The tension between the second language learners' need to use language as a tool for the learning of mathematical concepts and their insufficient proficiency levels in the LoLT is highlighted by Adler (1997) in her research on participatory learning. She argues that, while the goals of the participatory-inquiry methodology is to move away from an authoritarian teacher-centered approach to learning and teaching and to mathematical knowledge itself and to improve socially unequal access and success rates, the practical implications are complex. In a group work activity, for example, learners are expected to interact by talking to each other but, with low levels of proficiency in the LoLT, they are often unable to do so and therefore to take full advantage of collaborative learning.

In classes where teachers are fully proficient in the LoLT, they are able to use and model exploratory language and in so doing to help learners develop their language proficiency. According to research done by Adler (1997), teachers seldom challenge learners to use extended communications so that learner talk often remains limited to words and short sentences. For this purpose, Dawes and Sams (2004) suggests that teachers embark on a gradual and conscious exploration of the listening and speaking skills that learners need to develop for successful collaboration. In the following chapter, which focuses on the nature of teaching practices, this matter will be discussed in greater detail.

2.7 Summary

This chapter located the study's investigation into teachers' practices and pedagogical strategies within a discussion regarding the process of learning as it can be understood according to different theoretical approaches based on particular world views. The influence of these world views on the way in which first language learning and second language acquisition takes place was discussed before looking at the process of learning through a second language. By looking, in the last instance, at the process of learning mathematics, this chapter aimed to inform an understanding of teaching as a social practice, which is the focus of the next chapter.

CHAPTER 3 TEACHING AS A SOCIAL PRACTICE

3.1 Introduction

In the previous chapter, theoretical views on learning based on different epistemological approaches were explored as a departure point for an understanding of the process of cognitive and language development but also to understand language learning and its intersection with learning academic content through a language that is not the mother tongue of learners. Thus, the way in which these world views influence understandings of first and second language acquisition were explored, as well as the process of learning through a second language. In the final instance, the processes of learning mathematics and of learning mathematics through a second language were briefly discussed. The constructivist view of mediated learning (Vygotsky, 1986) and the interactive model of SLA (Long, 1996) were highlighted as perspectives that help to inform an understanding of these two mental processes. Together with Cummins' (1996) distinction between different levels of everyday and academic language proficiency, they provide an angle from which to view learning through a second language, namely through collaboration with teachers as experts and with peers. Such a stance assumes that this type of interaction gears learners towards more advanced cognitive development and language use.

In this chapter, the notions of practice of teaching and of teaching practice are explored. As the focus falls on teaching as a social practice, the discussion outlines the conceptual and theoretical background to a distinction between the concepts of social practice, professional practice and classroom practice. In particular, teaching is examined as a professional practice within a community of practice. This chapter, together with the previous situates the fundamental concerns in this study and as such provides the theoretical and conceptual lenses necessary to frame the study.

3.2 Perspectives on teaching

In order to understand teaching as a practice, it is necessary to explore different conceptions of teaching before looking at the notion of practice. In the discussion on perspectives on learning in Chapter 2, two main world views of learning in an educational environment were highlighted. According to the objectivist tradition, learning is seen as the process of acquiring a fixed body of knowledge that exists independent of experience. Constructivists, on the other hand, view knowledge as constructed through interaction with the world. These epistemologies of knowledge are also relevant in the exploration of different ways in which teaching can be understood.

From an objectivist point of view, teaching is seen as a process of transmission of knowledge with teachers seen as transmitter or purveyor of ready-made concepts which the children ought to absorb (Gibbons, 2006). Behaviourism, the main theoretical perspective already outlined in Chapter 2 that has its roots in an objectivist world view, views teaching as involving the transmission of facts as learners learn “sets of relatively passive responses to environmental stimuli” (Daniels & Shumow, 2003). The behaviourist pedagogy, according to Cummins (1996), is an approach that has dominated teaching and relies on the use of memorisation and repetition thus producing, as it does, low-level skills and competencies. The teacher is positioned as the transmitter of knowledge, with learners for the most part seen as recipients rather than constructors of knowledge. The pace, mode of transmission, and content is usually predetermined with learners playing a passive role in the teaching/learning interface.

Of particular relevance to this study as it relates to language learning, is the behaviourist assumption that language has to be ‘learned’ before it can be ‘used’ (Gibbons, 2006:17). From a behaviourist perspective, teaching learners who need to acquire the second language as well as learn through a second language would involve a linear process of moving from simple to complex forms of isolated knowledge structures. It would also include considering the period of time in which learners need to ensure they master one level before they are ‘allowed’ to move to a more complex level. The assumption would be too that learners master before they can apply the language. Drill and practice are characteristic exercises in teaching from a behaviourist perspective, with the use of controlled learner tasks accepted as the norm. It is can be seen from the description above, that such a perspective puts teachers at the centre of the teaching and learning endeavour, maximising their control of what, how and when learning takes place.

The constructivist view, in opposition to the above, regards teaching as the facilitation of learning and as a constructive activity in which language, especially the spoken language, plays an important role. As already stated in Chapter 2, Piaget (1971) and Vygotsky (1978) both position the teacher as central to facilitating rather than dictating what, how and when learning takes place. Learning rather than teaching is privileged in such a perspective with learners taking a central role in their own learning. The social and cultural context of learning plays a crucial role in such a perspective. Constructivists, especially those subscribing to a sociocultural perspective, thus view teaching as a social process of guided discovery in which the position of both the teacher and the learner and their interaction is viewed as relevant. It is the moment of interaction between teacher and learner that is emphasised as the space where learning takes place. Sociocultural teaching practices value, in particular, the role played by language as more than a mere medium for teaching but as a tool that can contribute to cognitive growth (Wells, 2000). Particular emphasis is placed on the context that supports learning, with meaning-making rather than skill mastery, the main outcome of learning. The teacher position is central but not to dictate the pace or mode of learning as in the first perspective. The crucial position of the teacher is to fulfil the role of facilitator or mediator.

Irrespective of the epistemological orientation that frames notions of teaching, this study took as a point of departure the notion that teaching and learning are social practices; operating as they do in particular spaces and time. With this in mind, it became important to understand the concept of practice before turning the attention to teaching as a professional and social practice, both of which I expand upon in the next two sections below. What follows is an exploration of the development of practice theory which, under the influence of Vygotsky (1978, 1986), shifted the concerns of researchers from largely cognitive explanatory theories to social theories of practice. Such a shift had consequences for understanding teaching as a social practice as I highlight later on.

3.3 Conceptions of practice and professional practice

The notion of practice was developed during the 1970s to refer to acts that possess specific inherent rules, limitations and structures (Reckwitz, 2002). Practice theory did not develop into a unified set of concepts, but there were two main generations of social theorists who developed a theory around practice (Postill, 2010). According to the first group, which includes Bourdieu (1977), Foucault (1979) and Giddens (1984), the concept of practice is concerned with the view that social phenomena are caused by the intersection between individual (or collective) action (agency) and social structures. Some foreground the role of structures in this interface, while others give more attention to individual and collective action. The second group of more contemporary social theorists, including Schatzki (1996), Reckwitz (2002) and Warde (2005), set about testing and evaluating the foundations established by the first generation of theorists, as well as extending and applying their theories. They proceeded, for instance, to apply practice theory to new areas of human activity such as the material culture of the home and the motor industry. Schatzki (2001:3) viewed the social world as "a field of embodied, materially interwoven practices centrally organised around shared practical understandings". His argument that actions can only be understood by looking at contexts where they manifest and by looking at the interrelatedness of practices was taken further, as will be illuminated below, by Kemmis (2011) in his exploration of practices such as education and teacher education.

While both groups of practice theorists each foreground different features in conceptualising practice, they all share the view that practice is "socially-, discursively-, culturally- and historically-formed" (Kemmis, 2011:3). The implication is that a practice does not exist in isolation, but is in essence embedded in a social context. The main tension in theorising practice in a social context has therefore been between individual and social factors that impact the development of practices. According to Kemmis, it is this tension between the "individual and extra-individual features which suggest how complex and manifold 'practice' is" (Kemmis, 2011:26). Notwithstanding the commonality in perspective, each of the social theorists contributes a unique viewpoint on the notion of social practice.

As far as the first group is concerned, it can be said that Bourdieu and Giddens take a stance in which the human body is viewed as the point of connection in people's societal engagement with the world (Postill, 2010). Bourdieu, in his development of a practice theory, focuses on culture as "the permanent internalisation of social order in the human body" (Bourdieu cited in Eriksen & Nielsen, 2001: 130). Grenfell and James (1998), who investigated the implications of Bourdieu's view for education, state that Bourdieu held that "human action is constituted through a dialectical relationship between an individual's thoughts and activity and the objective world" (Grenfell and James 1998:14). In describing this relationship he identified the concepts of ‘habitus’, ‘field’ and ‘capital’. Bourdieu (1977:95) describes ‘habitus’ as “an acquired system of generative schemes objectively adjusted to the particular conditions in which it is constituted”. Habitus refers, in other words, all the aspects of culture such as habits and skills possessed by individuals and groups within societies. ‘Field’ as a concept is defined by Bourdieu and Wacquant (1992:72) as “a network, or configuration, of objective relations between positions objectively defined…” Field is, in this sense, the social settings or structures within which groups and individuals exist. According to Bourdieu society is structured in a dynamic rather than a static and objective manner with the potential to respond to social arrangements in a reciprocal and constituting way. In other words, structures structure us while we structure the structures. Education, Bourdieu proposes, can be viewed as a field that consists of identifiable interconnecting relations and principles such as purpose and equality of access. As a result, educational actions are regulated by certain rules and principles and forces of supply and demand or ‘products’ of the field (Grenfell & James 1998:11).

Giddens (1984), on the other hand, focuses on how social relations are structured across space and time. According to his theory of structuration social practice is viewed as the reproduction of social systems not “as a political outcome, [but] rather… as an active constituting process, accomplished by, and consisting in, the doings of active subjects” (Giddens, 1993: 121). Individuals and groups are seen as active participants and language is regarded as a powerful tool at their disposal to create a particular social practice. More recently, Postill (2010) outlined Giddens’ view of structure as a central concept in which principles of order are produced and reproduced through institutionalised action and routinisation. In these ways a social order is established and reproduced.

These views of social practice have influenced the way we think about teaching as a social practice. Of particular relevance to this study is the influence that the ideas of the second wave practice theorists such Schatzki (1996) had on the application of the notion in education. Schatzki describes the individual’s discourses and actions, which he calls sayings and doings, as the enactment of a practice. As such, rather than an attempt to explain how practice is constituted, the second wave of practice theorists sought to examine their application in particular fields.

One such theorist, Kemmis (2009), an influential educational theorist, took up the ideas above and applied them to frame teaching as a particular type of social practice. He incorporated the ideas in his investigation on the way in which the conduct of practice is shaped particularly in educational contexts. Kemmis situates teaching as a professional practice that he proposes, is driven by the logic of the profession. He extends his ideas to explore the nature of teaching as a social practice.

In his analysis of the notion of professional practice as a subset of social practice, Kemmis (2009:21) builds on some of the key features identified by the first and second wave of practice theorists. He notes that the notion of professional practice is, just like a definition of social practice, highly contested in the literature. He favours MacIntyre's (in Kemmis, 2009:22) description of professional practice as "any coherent and complex form of socially-established cooperative human activity through which goods internal to that activity are realized, in the course of trying to achieve those standards of excellence which are appropriate to, and partially definitive of, that form of activity". To this, Kemmis (2009:22) adds that professional practices are "embedded in sets of social relationships, as meaningful activities that bear on particular parts of the world to produce products and transformed states of affairs." A professional practice, he claims, is characterised by specific discourses, work and social relationships that he describes as sayings, doings, and relatings. A professional practice, like that of a nurse or a teacher, involves professional practice knowledge, but also, of equal importance, practical reasoning. These considerations, according to Kemmis (2005), determine the way we think in the course of 'doing' a practice. He describes the kind of thinking done by professional practitioners as practical reasoning 'searching for saliences' (Kemmis 2005:392). As he puts it, professional practitioners "… search for ways of understanding and acting that will be appropriate in addressing… practical problems… drawing on their life-experiences not in a static or rationalistic way, but reflexively: changing their reading of the situation as it unfolds in and through practice…" (Kemmis, 2005:392).

Kemmis (2011) identifies a number of features that distinguish professional practices. First, behaviour or action in a professional practice is viewed in terms of 'meaning and purpose'.

Accordingly, practitioners' actions (doings) and language or discourse (sayings) display certain intentions that serve as a motivating force in their practice. In an educational practice, practitioners are on an individual level influenced and motivated by their own "social framing of intentions and meanings that form and inform practice – via values and norms" (Kemmis, 2011:12). Different practitioners draw on different resources of meaning, based on how they view their role within the practice. On a social level, practitioners like teachers also rely on discourses framed in traditions that give the practice its character, meaning, and significance. In other words, traditions in education in general and specialised content areas such as mathematics in particular, have an influence on specific teaching practices.

A second feature of professional practice is that it displays distinctive 'structures' that shape professional and individual identity as well as the organisation of time and space. These differ from one profession to the next and can also differ in interpretation from one practitioner to the next, depending on the influences such as the discourses, social relationships, and material-economic arrangements that are unique to each of them. As Kemmis (2011:13) puts it, "[F]rom the point of view of a professional practitioner, his or her practice draws on a particular history of personal experience; it involves a particular view of what an appropriate professional identity is, and a particular way of being a 'subject' (a knowing and knowledgeable person); a particular kind of agency about how he or she can act on the world, and with what likely effect (and what likely resistances); and it involves the exercise of learned skills and capacities (some learned, perhaps, over several years of formal professional preparation)".

A third feature is the 'situatedness' of a practice that involves, on an individual level, the manner in which participants enact the practice, "using their bodies in different ways" (Kemmis, 2011:15). It involves ways in which practitioners situate themselves not just in terms of space and time, but also in terms of the general values and norms of the practice and space in which the practice is embedded. In social terms, 'situatedness' refers to the material and economic context, spatial or temporal environment or identity and subjectivity in terms of the perspectives of different participants (Kemmis, 2011). In other words, a central part of teachers' practices involves the social environment in which these practices take place as well as the ways in which the teachers respond to their environment, in terms of their personal perspectives and significant social perspectives regarding particular values and norms.

Fourth, practices can be viewed as being ‘temporally-located’. In other words, they take place through and over time and at particular times in the lives of the people involved. Kemmis distinguishes between extra-individual features of the temporal location of a practice, for example its historic context of traditions of thought and discourse, and individual features. The latter refers, for example, to the personal timescales and perspectives of the teachers, as well as the practical timescales of units of work and the pace at which these units are completed by the teachers (Kemmis, 2011).

A fifth feature, the ‘systemic’ nature of practice, refers to the relationships and roles ascribed to the different participants. Put differently, the systemic nature of practices means that the participants fulfil different and, in certain cases, interactive roles within the practice. In an educational setting, for example, teachers and learners are non-negotiable elements of the practice; each playing particular roles that have been well established over time. Each display varying levels of formality, power, and interaction. In this field, other role players such as parents, administrators, and curriculum and policy makers form part of the system in which teachers and learners are discursively framed, and as such ensure the durability and sustaining nature of the practice (Kemmis, 2011).

Sixthly, practices are viewed as a ‘reflexive’ activity as participants observe their conduct and modify their performance. To a greater or lesser extent the participants discuss and negotiate the processes and events that occur within the practice and their communication patterns serve to establish relationships with the potential to adjust and transform the conditions of a practice. In a classroom, for instance, a teacher may choose to involve learners in a reflective process where the underlying pedagogical principles of a lesson are made explicit and, as a result, enable learners to take an active part in reflexive activities.

Finally and as a seventh feature, practices involve “different ways of understanding practice and… different ways of reasoning about it” (Kemmis, 2011:23*)*. The notion of ‘reasoning’ relates to the way practitioners perceive the link between knowledge and action and the way in which they employ different forms of reasoning at specific moments in their practices. An example in education would be where a teacher, in a quest to act appropriately and effectively in a teaching and learning situation, bases her actions on practical considerations while, at the same time, taking into account relevant pedagogical theories and traditions.

This section's review of characteristic features of practice provides a useful framework for a look at the distinctive qualities of professional practices such as teaching. It is necessary, however, to heed Kemmis' warning that the use of such a "reflexive-dialectical scheme merely helps to illuminate the complexity and richness of the space of practice" (Kemmis, 2011: 10).

3.4 Teaching as a social practice

In the light of Kemmis's (2011) view on professional practice, teaching practice can be described as "socially and historically constituted and reconstituted by individual human agency and by social action" (Kemmis, 2011:4). The implication here is that each teacher's objective and subjective individual background, together with the objective and subjective social background of the practice, influences the way their teaching practice is organised. The teacher's objective individual background, for example, includes aspects such as teacher training and professional experience, while the subjective individual background includes aspects like personal and collective values. Teachers' objective social background consists of the different social and historical relationships they form within their particular contexts, while their subjective social background involves the way in which their specific practice is socially structured by themselves. Kemmis (2011:2) argues that "[H]istories, cultural and discursive resources, social connections and solidarities, and locations in material-economic arrangements and exchanges are all implied in the construction of practices". According to this view, "the context needs to be thought of as part of 'practice'" (Kemmis, 2011:8).

Kemmis' understanding of teaching as a professional practice has particular relevance in this study and has implications for thinking about teaching practices and their intersection with classroom discourse as I highlight in the next section.

3.5 Teaching practices and classroom discourse

In this section the nature and value of classroom discourse as a component of teaching practices is investigated. The notion of classroom discourse is derived from the term 'pedagogic discourse' as used by Bernstein (1999) as it refers to the two sets of language choices used to establish shared understanding between the teacher and learners in a classroom: regulative and instructional registers in a classroom. A regulative discourse, according to Bernstein, has to do with the goal and purpose of a learning activity while instructional discourse refers to the language to do with the subject content that is taught. In an adaptation of this distinction made by Bernstein, Mercer (1995) provides a description of classroom discourse and a language with which to understand this discourse. He distinguishes between 'educational discourse' (the language practices involving the ways in which words are used in the classroom) and 'educated discourse' (language needed to become members of wider communities of educated discourse). Researchers (Gibbons, 1998; Barnes, 1992; Wells, 1992; Wong-Fillmore, 1985) have for decades agreed that the most fundamental way in which familiarity and confidence in these discourses can be developed, is through participation in classroom talk.

An investigation of classroom talk and the way in which participation in classroom talk can be facilitated links closely with the types of interactional patterns that exist in a classroom. Interactional patterns can be described as the different ways in which teachers and learners communicate through conversation in the classroom. According to Gibbons (2006) these patterns can vary in terms of their pedagogical orchestration by the teacher as opposed to its spontaneous development. They can also vary in terms of levels of participation and in terms of the rights of the participants. The latter refers to whether the relationship between participants can be described as symmetrical or asymmetrical (with the teacher having more control over the discourse than the learner).

Classroom discourse display various types of pedagogical interaction. The set of distinctions originally set out by Van Lier (1988) were subsequently adapted by Gibbons (2006) and provide a helpful perspective for the investigation of the interactional patterns in a classroom. These distinctions include, in the first place, 'teacher monologues', where the teacher holds the floor without interruption and without asking the learners to respond. It represents "a one-way transmission of information and directives" (Gibbons, 2006:114). During the 'Initiation-Response-Feedback' (IRF) interaction pattern questioning periods the teacher as 'primary knower' is looking for a specific answer from the learner. In these interactions the teacher has the first and last word. According to Gibbons (2006), questioning periods often take place after the teacher monologue when the teacher wants to check whether the learner has understood the explanation or task. They also follow after a reflection stage when the teacher checks whether the knowledge that has been built up is now shared. For the most part, however, teachers offer most of the content while learners are simply required to provide a single key term. This type of pattern is also used when the teacher focuses on a specific linguistic structure for grammatical accuracy like, for example, at the end of the unit when the learners have developed some understanding of the topic and built up field knowledge.

'Dialogic exchange' involves discourses where both participants make a contribution. Although the teacher provides the agenda for such exchanges and the interaction is therefore not symmetrical, it is more open than the restricted IRF pattern. Although the teacher determines what is being talked about, learners are nominated to contribute and this helps to create discourse with a more conversational feel. Teachers often recast what learners have said into more appropriate language. During this type of interaction the teacher leads from behind in a way that a caregiver responds in early first language learning (Halliday, 1975; Wells, 1986). The teacher's role in such interactions is one of mediation rather than transmission.

'Participatory exchanges', according to Gibbons (2006) occur when talk is genuinely co-constructed and involves true dialogue and cross-discussion. According to Gibbons (2006:117) "truly participatory talk is… rare in most classrooms', even in the case of learners being taught through the medium of their mother tongue.

The framework of dialogic interactions, outlined by Van Lier (1988) and expanded on by Gibbons (2006), provides a structure that can be used to analyse discourses observed in the classroom as I show in Chapter 6.

As far as the nature of classroom talk and its relation to thought is concerned, the term 'exploratory talk' was first identified by Barnes (Barnes and Todd, 1977) as language used for reasoning. Mercer (1996:369) describes exploratory language as the interactions where "partners engage critically but constructively with each other's ideas". He argues that this type of interaction is ideal for learning and thinking, because "knowledge is made more publicly accountable and reasoning is more visible in the talk". He sees such collaborative relationships as a social mode with good potential for the development of thinking.

In this section the position of classroom discourse and the various types of classroom interaction that are central to teaching practices were discussed. The following section looks more specifically at the features of teaching practices where learners are taught through a second language.

3.6 Teaching practices facilitating learning a second language and learning through a second language

In the following section the way in which teacher talk, questioning and group work strategies can act as mediating approaches, is explored. Teaching a second language and teaching through a second language are challenging because learners are in the process of learning both a second language and subject content in a second language. Using a sociocultural participatory approach in these contexts creates a further challenge as talk and classroom discourse are viewed as essential features to facilitate learning. These challenges include the ability to express thoughts in the second language. An important point of departure in the process of developing language and thinking skills is the comprehensible input (Krashen, 1989) that is offered by a teacher to a second language learner. Teacher talk as the primary means of classroom communication provides and models language input and at the same time, models and facilitates ways in which subject content knowledge can be accessed.

Teacher talk

Wong-Fillmore's (1985) influential and seminal research on the role of teacher talk and the impact of classroom organisation on second language learning is cited by Gibbons (2006) as one of few classroom-based studies of its kind and warrants a detailed discussion. In Wong-

Fillmore's study, explicit language use during instructional activities emerged as a key factor in classes where learners learnt effectively through a second language. The teacher talk that was used in these more successful classes displayed an emphasis on communication, comprehension, grammaticality and the appropriateness of language used in lessons. A clear separation of languages was maintained with a repeated use of patterns and routines for the teaching of content. Language was used in a way that alerted attention to the language itself in a rich manner. The teacher often used writing and working out while talking and explaining. Further important factors included the teachers' organisation and structure of lesson procedures and the careful design of learner participation according to their individual levels of proficiency. References to prior knowledge and experience appeared to successfully provide the context for making sense of new content and unknown language (Gibbons, 2006).

In the successful classes in Wong-Fillmore's (1985) study, a high prevalence of repetition was noted in the teachers' use of language when instructions and explanations were given. This often involved paraphrasing and minor changes in the sentences to give learners a chance to work out what is being said. These repetitions, together with the presentation of subject content in a variety of ways such as board work and demonstration, "added up to a 'message redundancy' that gave the students multiple access to the materials that were taught in it" (Wong-Fillmore 1985:38). Gibbons (2003) calls this strategy of providing learners with highly explicit language 'message abundancy' and adds that it is often accompanied by alternative forms of support such as visual images and gestures. The learners receive more than one chance to hear closely related meanings and understand what is being said. Ellis (1994:24) argues that "comprehensible input is not simply the result of adjustments made by competent speakers, but is the result of the interactions themselves: both learner and native speaker adjust their speech in the light of feedback that they give each other". These include implicit and explicit recasts, negotiation strategies and different forms of repetition. According to Cazden (2001), it is also necessary for teachers to sometimes delay their reaction to learner responses so that they get a chance to consciously correct their language

The interaction that takes place between teachers and learners can also be defined in terms of the way in which communication is delivered. In this regard, Gibbons (2006:49) refers to arguments by researchers both in first and second language learning (Ellis & Wells, 1980; Snow, 1986; Wells, 1986), "[t]hat it is a particular quality of interaction – its responsiveness to the particular needs of the learner and the meaning they are attempting to construct – that is significant for language development". Wells (1986) termed this quality of speech 'contingent responsiveness', a quality that is characteristic of the speech of parents of accelerated learners. It displays a number of interactional features such as expansions and acknowledgments. Van Lier (1988:91) characterises it as speech which, "… typically has links to previous utterances and to the shared world of the participants so that inter-subjectivity is achieved and maintained".

Apart from recognising the value of teacher responsiveness to learner talk and a predisposition to encourage learners' active participation in language awareness, other ways in which learner talk can accelerate second language development, have been identified. Ellis (1994) refers, for instance, to studies that found that second language development happens most effectively in cases of active learner involvement combined with teacher support, for example when:

- Children are allowed to introduce topics for conversation,
- Teachers model new syntactic structures when necessary to help children stretch their language ability, and
- Teachers' reactions to learners' responses involve expansions of missing parts in their utterances.

Ellis (1994) claims that when teachers' scaffold language, it can contribute to second language development. However it needs to be done in such a way that it can lead to further, more advanced interactional patterns. When teachers provide the basic form and content and model educational discourse, they help to create a bridge that will increasingly help learners to master educated discourse. It is, in other words, necessary that a teacher's language practices in the classroom scaffolds learners' educational discourse towards coping with educational and eventually educated discourse. If the scaffolding process is not effective, learners will not be able to take part in the type of exploratory exchanges that increasingly facilitate and strengthen learning of content and concepts. Research by Howe (1993) and Light and Littleton (1994) found that, although learners' talking about a problem helped with problem-solving and understanding, it needs to be done with careful scaffolding, otherwise collaborative talk with a partner could run the risk of being even less effective than when learners work on their own. In cases where asymmetrical ability pairs collaborate, the less confident or capable partners could be inhibited. This is especially true in multilingual classes where asymmetrical relationships are based on the differing levels in participants' LoLT proficiency. It is also not certain whether discussion automatically helps learners to generalise and apply insights to new situations. According to Mercer (1995:361) they might learn a procedural method without understanding the underlying principles. Learners need to be actively guided and encouraged to do so. They need to be taught how to collaborate and why. Language practices also need to facilitate knowledge construction in actual language events.

Questioning as a mediating strategy

Questioning has been found to be an important technique teachers employ in mediating of language and subject content. Teachers use questions to facilitate classroom interaction and, in particular, learners' oral participation in class. Studies on the nature of the questions teachers ask have shown that most teachers ask 'display' questions where the information is already known by the teacher and, to a lesser extent, 'referential' questions where the information is not known. Teachers usually know what kinds of things they want the learner to say and, especially when teaching second language learners, they make use of interaction patterns that display high levels of teacher-control (Gibbons, 2006:58). In a study conducted by Torr (1993) in mother tongue and second language primary school classes, the teachers in the second language class spoke more frequently and contributed more to the construction of discourse. They asked mainly display questions and tended to actively take over the talking as well as the thinking on behalf of the learners. In cases of communication breakdown, the teachers tended to take responsibility for getting the conversation back on track. A further point raised by Cazden (2001) regarding the issue of teacher control involves the effect of a slower interactional pace. She reports on research that found that a longer waiting time after teachers' questions had a discernible influence of the learners' development of language, logic and overall confidence. On the Southern African front, explorations of the way in which questioning facilitates the mediation of language and learning through a second language has focused greatly on classroom contexts where code-switching between the teacher and learners is possible (Setati et al, 2002; Setati & Adler, 2001; Arthur, 1994). Very little research has been done locally, however, regarding questioning strategies in classrooms where code-switching is not possible.

On the basis of the findings of her research, Wong-Fillmore (1985) argues that questions should be varied and carefully adapted to the learners' varying levels of language proficiency. The teacher, she contends, should involve learners in lessons through turn-allocation procedures. Wong-Fillmore argues that, although questions that give learners a chance to say a lot is seen as the best language practice, questions which elicit short answers are not necessarily less useful than open-ended ones. Display questions can be used to fulfil the important function of getting learners with low proficiency to participate effectively in the classroom discourse and in the thinking processes reflected in the discourse:

> Constructing responses (to open-ended questions)… calls for perhaps a higher level of control over the structures, forms and usages of the language than learners may have, especially at the early stages of learning the language. They would find it difficult to respond, even if they understood such questions and had something to say in answer to them (Wong-Fillmore, 1985:41).

Group work as a mediating strategy

Group work as a means of mediating learning through language enjoys strong support within the sociocultural educational rhetoric (Dawes, Mercer & Wegerif, 2000). The rationale behind group work is that it creates increased opportunities for peers to use and hear more complex language in increased amounts. It is aimed at helping learners relate to input, interaction and contextualisation of knowledge. Knowledge construction through group work activities, Mercer argues, is only possible under favourable conditions for clear and supportive talk. Collaborative talk can only be effective for solving intellectual problems when "partners present ideas as clearly and as explicitly as necessary for them to become shared and jointly evaluated … and when their reasoning is visible in the talk" (Mercer, 1995:98). For that to happen, learners need to develop their everyday language skills and their academic language skills and their discourse skills to a satisfactory level.

Dawes and Sams (2004) argue that the favourable conditions for collaboration also require activities to be designed by teachers in a way that allows learners to form a clear and shared understanding of the point and the purpose of the activity and also of the need and value of exploratory talk. These preconditions apply to both second language learning and learning through a second language. According to Gibbons (2006), well-structured peer group talk could offer opportunities for different types of language use and provide a positive affective environment. In addition, she refers to the value Vygotsky ascribed to the affective domain as integrally related to cognitive learning. In a second language context, the challenge is, however, that group work requires skills to interact, exchange information and solve problems. Learners with low levels of LoLT proficiency are usually not able to provide appropriate output, especially in school-related registers. The pedagogical steering by teachers in such situations is critical and needs to take into account the learners' confidence and ability and their level of apprenticeship in relation to a particular task. According to Gibbons (2006), an important challenge for the teacher is facilitating the learners' shifts between local and personal knowledge and academic knowledge as the child is scaffolded to move from informal context-embedded spoken language to more formal context-reduced written language.

In the section above attention was given to the role of classroom discourse, questioning and group work as mediating strategies for teaching a second language as well as teaching learners through the medium of a second language. In the following section, particular attention is paid to the nature of mathematics teaching practices, and in particular, studies that examine practices where mathematics is taught through a second language.

3.7 Teaching practices in teaching mathematics to second language learners

In the 1980s and 1990s research regarding learners who learn through a second language focused more on their cognitive functioning than on classroom practices. According to Adler (2001:7), researchers of that period mostly "explored the relationship between levels of bilingualism and mathematics performance, drawing extensively from, and building on, Cummins' (2000) theory of the relationship between language and cognition, and his notion of the 'threshold hypothesis[19]'." Research pointing to a strong correlation between development of language and achievement in mathematics, as highlighted by Secada (1992), was, for example, later criticised as part of a simplistic and deficit view that second language learners' school performance is determined by a complex of interrelated factors.

[19] Cummins (2000) argues that a minimum threshold in language proficiency needs to be reach before a learner can achieve academic success when learning through the second language.

The focus gradually shifted to a different unit of study, namely the discursive processes located within the classroom. Classroom practices involving specific interactions and specific uses of language received attention. Examples include the work of Moschkovich (1996) from the USA who studied the way in which Spanish-speaking 3rd graders were supported by their teacher's modelling of norms for discussion and the rephrasing of their contributions in class. Another example of researchers examining teaching practices was work by Setati's (1998) who studied teachers' code-switching patterns in Grade 4 classroom interactions in South Africa. She found that while the majority of the teachers who participated in the study were able to use code-switching and were aware of its value, they preferred to use English when teaching and only switched to the learners' home language when they did not respond to English questions. She argued that such practices could limit learners' access to mathematics and the language needed to communicate about mathematics and stated the need to provide teachers with examples of effective code-switching strategies.

According to Adler (2001), the work of Pimm (1991) also provided important insight into the importance of describing and understanding classroom practices in general and classroom discourse in particular. He investigated, for example, the use of spoken and written registers in mathematics practices and explored Halliday's notion of mathematics register through classroom communication. Other important contributions include Cobb and his co-researchers (in Adler, 2001:10) who explored how "mathematical meaning came to be co-constructed through learner-learner interaction on mathematical problems".

An influential debate emerged in 1997 where a panel discussion interrogated the general belief in the mathematics education community that mathematics needs to be learnt through communication. The panel's viewpoints were analysed in terms of their theoretical orientations and documented by Sfard et al (1998). In their conclusion confirmation was given of the fact that mathematical conversation has potential as a mode of learning: "[T]he question is not whether to teach through conversation, but rather how" (Sfard et al, 1998: 50). The view expressed by the authors confirms the importance of the current study as it investigates and aims to gain insight into the teaching practices where teaching takes place through a second language. The decisive role played by the teacher in inducting learners into the mode of mathematical apprenticeship through interaction and collaboration is a complex matter. It involves, according to Lave and Wenger's (1991) social practice theory, fashioning an identity in and as part of that community of practice. It involves learning to talk within and about a practice and so increasingly becoming a participant of that practice.

3.8 Summary

This chapter explored the notions of practice of teaching and teaching practice. As the focus fell on teaching as a social practice, the conceptual and theoretical background to teaching as a professional practice within a community of practice was investigated. The chapter presented research on the role played by the teacher in facilitating language development and mediating knowledge construction in order to gain a better understanding of the teaching practices where mathematics is taught through a second language are concerned. The chapter explored the tension that many researchers have highlighted regarding, on one hand, the sociocultural emphasis on the development of thinking through social interaction and, on the other hand, the reality in second language classes where learners possess low levels of proficiency. This is particularly complicated where teachers do not speak the learners' home language, are unable to code-switch and consequently are unable to access the conceptual knowledge that learners possess in their home language.

CHAPTER 4 RESEARCH DESIGN

4.1 Introduction

This study investigated the teaching practices of Afrikaans-speaking teachers teaching mathematics to isiXhosa-speaking Grade 3 learners through the medium of Afrikaans. In the section below I describe my research design decisions made in carrying out this study. The chapter includes the research orientation, site and sample. I continue with a description of the data gathering methods, data analysis process and the ethical considerations that were addressed. In the final instance, the limitations and significance of the study are described.

A research design is a structured framework according to which the research is conducted. According to Creswell (2007), the process of designing a research project involves a series of decisions that the researcher needs to make. The decisions regarding a philosophical foundation and methodology are defined by the particular focus of the investigation. The choice of a suitable methodological orientation is dependent on the research question that the study aims to investigate and links closely with the world view that best suits the purpose of the study. Denscombe (2007:3) argues that the choice made by a social researcher has to be reasonable and appropriate for the specific type of research "putting the researcher in the best possible position to gain the best possible outcome from the research" in order to make this outcome explicit as part of the research report.

4.2 Methodological orientation

In their description of the development of paradigmatic frameworks, Cohen, Manion and Morrison (2011) refer to two schools of thinking that have influenced particular approaches to research design, namely the positivist and interpretive theory schools. These two paradigms respectively form the bases of quantitative and qualitative approaches to research.

In brief, the positivist approach favours the view that "all genuine knowledge is based on sense experience and can only be advanced by means of observation and experiment" (Cohen et al, 2011:7). According to this view, research enquiry into social sciences needs to involve the application of methodological procedures of natural sciences. The main features of a positivist research paradigm is a logical-deductive and scientific approach to verifiable data and it assumes that the researcher needs to concentrate on external, objective and observable facts to ensure quantifiable research findings.

The interpretivist paradigm holds, on the other hand, that the social world can be understood from the perspective of individuals. Because the assumption is that reality is subjective and that knowledge can be viewed from different perspectives. Interpretivism, according to Cohen et al. (2011:17) involves efforts "to get inside the person and to understand from within." As a research paradigm it can thus be described as an attempt to gain verifiable knowledge about the world by focusing on relevant personal perspectives and experiences.

On the basis of the distinction between a positivist and interpretivist paradigm, an approach to research can be described as either quantitative or qualitative. While quantitative research is more concerned with methods that seek empirical proof for research hypothesis, qualitative research focuses on methods that offer an in-depth understanding of social behaviour (Creswell, 2007). There are certain characteristics of qualitative research that made it an appropriate methodology for the research goal and questions of a study such as this one which focuses on specific fields of practice. Some of the important characteristics as outlined by Creswell (2007) can be used to describe the methodology followed in this study: the researcher is a key instrument (in this case I collected the data); there are multiple sources of data (in this case I combined class observations with semi-structured interviews); data analysis is inductive (the data was analysed to identify patterns and themes); participants' meanings are a focus (the research sought to understand the teachers' perspectives and experiences); the research has an emergent design (the research questions were developed to accommodate themes that emerged as data was gathered and analysed); the inquiry is interpretive (I interpreted the information and brought to the interpretation my own history and beliefs); and the account of the research is holistic (a complex picture of the issue will be presented).

4.3 Research approach

This study was conducted as a case study. Such an approach was appropriate as it would provide me with the opportunity to form a detailed understanding of, in terms of Kemmis' (2011) descriptive scheme of professional practice features, the 'sayings', 'doings' and 'relatings' that constitute the practices of the participating teachers. Yin (2004:18) describes the case study approach as "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context…" Denscombe (2007:36) adds to this that the case study research method is aimed at "getting some valuable and unique insight…and discover things that might not have become apparent through more superficial research".

Gillham (2000) argues that the case study is founded on the basic philosophical assumption that human behaviour, thoughts and feelings are partly determined by their context and that how people behave, feel and think can only be understood if one gets to know their world and what they are trying to do in it. It follows from this that a study of individuals performing a practice requires a study of instances of enacted practice embedded in a particular context. Yin (2009:11) describes it as a study of a case in a context and regards it important to set the case within its context because "contexts are unique and dynamic, hence case studies investigate and report the real-life, complex dynamic…" Cohen et al. (2011:289) states: "A case study provides a unique example of real people in a real situation, enabling readers to understand ideas more clearly than simply by presenting them with abstract theories or principles…Case studies can penetrate situations in ways that are not always susceptible to numerical analysis."

Case studies strive to portray 'what it is like' to be in a particular situation and to gain insight into a phenomenon or set of events usually by employing various types of data collected (Yin 2009). The fact that a case study relies on multiple sources of evidence, such as interviews, observations and physical articles (Gillham, 2000; Yin, 1994) makes it highly suitable for educational research as all these sources are available in the school environment and help to explore the classroom culture.

According to Denscombe (2007:40) the choice of specific case studies depends on "their relevance to the practical or theoretical issues being researched" but also on other reasons such as the fact that the case is typical in crucial respects and "that the findings …are therefore likely to apply elsewhere." Even though case studies focus on individual examples rather than a wide spectrum of instances, they involve 'holism' rather than 'reductionism'. As Denscombe (2007:

34, 36) puts it, “[T]he aim is to illuminate the general by looking at the particular… It deals with the case as a whole, in its entirety, and thus has some chance of being able to discover how the many parts affect the whole.” Additionally, according to Yin (2009), one does not look at the whole subject, but just at relevant areas of interest.

In the case of this study, the case involved an investigation of teaching practices in second language classrooms. In terms of Yin’s (1994) distinction between different types of case studies this study primarily involved descriptive and exploratory types as they offer an opportunity to describe ‘how’ the participating teachers construct their classroom environments and teaching practices and ‘why’ they do it in such ways. While this particular study took into account the wider social context of each teacher’s practice, it focused on the mathematics practices as specific areas of interest. The case studies made use of what Yin (1994) calls a ‘multiple-case design’, although not for purely comparative purposes. The focus is rather on gaining an understanding of the nature of teaching practices in differing contexts where Afrikaans-speaking teachers teach mathematical concepts to isiXhosa-speaking learners through the medium of Afrikaans.

In order to ensure a thick description of my research topic, I made use of three case studies involving three Grade 3 teachers as the unit of analysis. The case studies involved spending “extended time, on site, personally in contact with activities and operations of the case, reflecting, revising meanings of what is going on” (Denzin & Lincoln, 2000 : 445). The consequence of such extended research is a richness of data that requires extended space to explore and analyse. Such expanded scope allows case studies such as those under discussion to point not only to the complexities of a specific issue but also offer the potential to lead to a deeper understanding of the broader phenomenon of teaching through the medium of a second language.

4.4 Research site and sample

The main reason for the selection of the site or location of the study can be described in terms of purposive sampling. Cohen et al. (2011) define purposive sampling as sampling that accesses ‘knowledgeable’ people to gain insight into a particular phenomenon. Because I was examining a particular phenomenon of teaching practices where Afrikaans was used as a LoLT for isiXhosa-speaking learners, I had to find a range of schools where this phenomenon manifested. The school sample included the following: a historically white former Model C Afrikaans medium school, a historically coloured single medium Afrikaans school and a historically coloured parallel medium (Afrikaans/English) school.

The selection of these particular sites can also be described as an example of convenience sampling (Gillham, 2000). Convenience sampling is described as non-probability sampling where participants are selected because they are conveniently accessible to the researcher (Babbie & Mouton, 2001). This type of sampling, in other words, involves choosing participants that are easy to access because they are close at hand. Because the case study approach would require classroom observations over an extended period of time, schools in close proximity were chosen. Two of the three teachers were known to me as I had had contact with them and the schools where they taught before. All three teachers declared themselves willing to participate in the study and gave me their full cooperation throughout the study.

The sample population is defined as the group of participants selected by the researcher. In this study the main sample population consisted of three Grade 3 teachers in three different school contexts. The research included the principals of each school and one Foundation Phase Head of Department (HOD) in the sample population to gain contextual information about each school. The decision to include the HOD in the sample population was taken on the suggestion of the principal of the particular school. He argued that in their school, which catered for learners up to Grade 12 level, the Foundation Phase operated in a more independent manner and that the HOD was ideally positioned to provide the necessary contextual data. Semi-structured interviews were conducted with all participants and the nature and purpose of these interviews and other data collection methods will be discussed in greater detail below.

4.5 The research process

The study was conducted in two phases, namely a pilot phase followed by the main study. I detail each below.

Phase 1 - pilot study

The pilot phase of the study took place in the Foundation Phase departments in two of the schools that formed part of the main study. The preliminary phase involved two full-day class visits to the preceding Grade 1 and 2 classes of two of the three schools. The choice to visit only two of the three schools was determined by practical reasons because the two schools were geographically close and easily accessible. I knew the Grade 1 and 2 teachers at the schools personally and making appointments to visit their classes was straightforward.

The data collection methods used during the preliminary phase involved class observations and unstructured interviews. The interviews were conducted at the end of each day's class observation and focussed on teaching practices in general and mathematics teaching practices in particular. Permission to conduct these visits was obtained from the school principals of the two schools.

Phase 2 - main study

The main study focused mainly on the teaching practices, contextual background and perceptions regarding practices of the three participating Grade 3 teachers. The data collection methods included classroom observations, unstructured and semi-structured interviews and document analysis of teachers' work schemes, lesson plans, mark schedules and learners' work books.

Before commencing with the main study, I conducted informal and unstructured interviews with the participating teachers to discuss my position and aims as a researcher. Apart from class observations, I conducted playground observation during break times to gain insight into the language behaviour of the participating learners. It was noted during these observations that learners at Winter Primary (the historically coloured single medium Afrikaans school) spoke mostly isiXhosa during break while greater language integration between Afrikaans and isiXhosa-speaking learners was observed at Park High (the historically white former Model C Afrikaans medium school) and Duiker Primary (the historically coloured parallel medium (Afrikaans/English) school. At the latter two it was noted that the isiXhosa-speaking learners spoke Afrikaans when playing games with Afrikaans learners, but that they spoke isiXhosa when playing with isiXhosa-speaking friends. I also read the Foundation Phase Mathematics CAPS document and examples of Grade 3 mathematics textbooks to familiarise myself with the content and with the material available to the participating teachers when teaching mathematics.

4.6 Data gathering techniques

According to Denscombe (2007:45) the case study approach "encourages the use of multiple methods in order to capture the complex reality under scrutiny". The advantage of using multiple sources of data is that it facilitates triangulation of sources. Triangulation in social studies is described by Cohen et al (2011) as a multi-method technique through which the reliability and validation of data in qualitative research is strengthened. Triangulation serves to provide richness of data while at the same time strengthen the researcher's confidence in the data that is generated. As was mentioned above, three different data collection instruments, namely observation, interviews and document analysis, were employed to achieve triangulation. These tools were used to gain an in-depth understanding of the teaching practices, contextual background and perceptions of the participating teachers. The main data collection period occurred over a period of three months during which time I observed between five and six full school days in each participating teacher's classroom.

Observation

Observation is defined by Croll (1986:1) as '[t]he systematic and as accurate as possible, collection of usually visual evidence, leading to informed judgements". Broadly speaking observation approaches can be divided into two major kinds: systematic or non-participant and participant observations. Non-participant observation is normally perceived to be as objective as possible with the least intervention of the observer in the process being observed. Participant observation, on the other hand, suggests a more detailed and involved relationship between the observer and the process under observation. I undertook a non-participant approach and by this I mean that I attempted to remain objective and removed from the classroom activities and its participants. This choice was motivated by the need to experience the real-life nature of the teacher's teaching practices. While interference was to a large extent avoided, one could argue that my mere presence in the classroom and the fact that my contact with teachers in the form of interviews after the day's teaching can be regarded as instances of intervention. The nature of data collection and the aims of this study meant that these interventions were unavoidable. Aside from this inevitability, all other observation was that of a non-participant.

During the main study I spent approximately two weeks conducting school and classroom observations in each school. As mentioned above, I observed a total of five full days in each classroom to gain insight into each teacher's general teaching practices. In order to allow the teacher and learners to grow accustomed to my presence and to cause as little as possible interruption, I spent the first three days sitting at the back of the class making field notes. I then gradually introduced a video camera and, ultimately, the video-recordings of language, life skills and mathematics lessons made up the bulk of my collected data.

As the teaching of mathematics formed the focus of my study, I spent most of my time observing mathematics lessons. I observed at least five full mathematics lessons of each teacher and video recorded four. After completion of the class observation, I transcribed the video recordings of the mathematics lessons. I then translated them from Afrikaans into English and, finally, analysed them. Three mathematics lessons per teacher were selected to be displayed as Addenda in this thesis.

Interviews

Class observation was the primary method of data collection as the study aimed to gain insight into the nature of the teaching practices and into how they manifest in the field of practice. Interviews were employed as a further method of data collection in the main study. The use of interviews in research involves the production of knowledge through conversations. According to Cohen et al (2011:412) interviews have been classified in many different ways according to a "series of continua". An important distinguishing factor of a research interview is the degree of structure that it displays and this structure is closely linked to the overall purpose of a particular interview. The main types of interviews include structured, semi-structured and unstructured interviews. In interviewing the three teachers I made use of semi-structured interviews. This was an appropriate method for accessing first-hand information relating to the intricacies involving the teachers' background, opinions and views regarding their teaching practices. The use of semi-structured interviews enabled me to set an agenda and so ensure that the same topics were covered in the various interviews with the respective teachers. This method allowed me, at the same time, to be flexible "to let the interviewee develop ideas and speak more widely on the issues raised by the researcher" (Denscombe, 2007:176). The same approach was followed in the interviews with the school principals and the HOD.

Two sets of questions were developed for the two semi-structured interviews with each participating teacher. The first interview focused on the personal and professional background of the teacher and the second on the perceptions regarding teaching in general and teaching through a second language. A single interview was conducted with the principal of each of the three schools and, as was mentioned above, with the Foundation Phase HOD of one of the schools.

The purposes of the two interviews conducted with the participating teachers differed. The first interview was aimed at gaining insight into teachers' life histories and their professional careers as Foundation Phase teachers. The second interview focused on teaching practices, perspectives on second language acquisition and on learning and teaching through a second language. The teachers were probed regarding their views on teaching mathematical concepts to second language speakers. They were furthermore asked during the interview to reflect on some of their teaching and learning moments. This provided additional insight into the reasons behind the choice of strategies used by the teacher during the lessons.

All the interviews were conducted in Afrikaans as both I and the all the interviewees were Afrikaans-speaking. Even though the participants were all proficient English speakers, it was decided not to conduct any interviews and other communications in English as it would undermine the authenticity of the communication about teaching in schools and classes where Afrikaans was the medium of instruction. This allowed me as researcher to relate to the participants through a shared language and also through the language of instruction that was being studied. The interviews were all audio-recorded and I then transcribed and translated them into English. The Afrikaans sets of questions used in the semi-structured interviews and a translation of each are provided as appendices. In the section on the limitations of the study I discuss the possible effects that translation could have on the reliability of the data.

4.7 Verification and reliability of data

In qualitative research validity and verification of data is critical, but Cohen et al (2011:180-181) argue that the validity sought in qualitative studies differs from the type demonstrated in quantitative research. They argue: "[W]e as researchers, are part of the world we are researching, and we cannot be completely objective about that, hence other people's perspectives are equally as valid as our own, and the task of research is to uncover this." For this reason they favour the term understanding to describe the meaning that researchers give to data and inferences they make on the basis of the data that need to conform to the rigorous requirements of validity and reliability. The researcher and participants' perspectives on the phenomenon have to be reflected, preferably supported by evidence from data, to ensure triangulation.

Triangulation, a pivotal research concept mentioned earlier in this chapter, is defined by Cohen et al (2011:195) as "the use of two or more methods of data collection in the study of some aspect of human behaviour". It is, in other words, the process of strengthening the findings obtained from a qualitative inquiry by cross-checking information that helps in analysing results and judging the quality of the study. In this study triangulation through observation, interviews and document analysis aimed to control bias and establish valid propositions. It served to bring together different sources of information to develop a credible interpretation.

4.8 Data analysis process

The nature of qualitative research implies that the collection of data and the analysis of the data build on one another. "The researcher is guided by initial concepts and developing understandings that she shifts or modifies as she collects or analyses the data" (Marshall and Rossman, 2011: 208). The researcher also needs to make certain choices regarding an approach to data analysis before embarking on the research process. In this regard Ensor and Hoadley (2004:81) in a discussion of different methodologies concerning the use of classroom observation as a data collection tool, state: "[T]he ways in which we generate and analyse classroom data has implications for the kinds of claims we can make about pedagogy." They point to the application of either a deductive or an inductive approach where the former involves the development of closed schedules of categories and sub-categories beforehand on the basis of a particular theoretical framework. The latter involves a more open system where instruments like field notes and video recordings are studied to reach conclusions on the acquired observations. The deductive method has, according to these authors, been found to be most beneficial in large-scale studies with, for instance, the assessment of wider educational trends.

As the current study involved a small scale investigation of teaching practices, an inductive approach to data analysis was found to be more suitable. It was steered broadly along the seven phases suggested.by Marshall and Rossman (2011). These are: (1) organising the data (2) immersion in the data (3) generating categories and themes (4) coding the data (5) offering interpretations through analytic memos (6) searching for alternative understandings, and (7) writing the report or other format for presenting the study. In each instance data was collected, reduced and interpreted.

As part of the data analysis process I investigated the field notes, semi-structured interviews, and the school and classroom observations to look for possible recurring themes and patterns in the contextual background and teachers' practices regarding lesson structure, language interaction and teaching strategies. Through a coding of these themes I strived to gain a better understanding of the data.

4.9 Ethical considerations

In my process of data gathering I took into account the ethical nature of my position as a researcher with a particular background entering various schools, each with its own particular social background. I remained mindful of my responsibility to respect and protect the rights of the respondents. At the outset, I acquired written permission from the Department of Education for the study as part of the broader Consortium study. I also acquired oral permission from all the participating principals and participating teachers. The schools received a letter from me stipulating the goals, objectives and potential benefits of the study as well as the procedure that would be followed (see Appendix A).

The principal and teacher of each school received assurance that their privacy and the privacy of the learners would be upheld and protected through the measures of confidentiality instilled in the research process. Confidentiality of information supplied by participants as well as the anonymity of respondents was upheld and respected. For this reason each participating school, teacher and learners (in the lesson transcripts) was given a pseudonym. It was also brought to the attention of the respondents that their participation was voluntary and that they retained the choice to withdraw at any stage. Care was taken to ensure that data were stored safely and that they would be used for the purposes of this research only. Care was also taken to avoid comparison of the three teachers' teaching practices, as such a comparison would be inappropriate and unscientific if the unique context of each is not taken into consideration.

4.10 Research positionality

In qualitative research the identity and background of the researcher is acknowledged more openly than in quantitative research. According to Denscombe (2007:313) "[t]he research is 'self-aware'. This means that the findings are necessarily more cautious and tentative, because it operates on the basic assumption that the findings are a creation of the researcher rather than a discovery of fact". It was therefore necessary for me to recognise the fact that my position as Afrikaans-speaking had an influence on the research process. As I have indicated above, the fact that I was able to conduct the interviews with the participants in Afrikaans, and was able to understand the LoLT used in the classrooms where I conducted my observations, acted as a distinct advantage. I am of the opinion that it allowed me to form the kind of relationship with the participating teachers that would encourage them to share their perceptions with me knowing that I had an understanding of the complexities of the cultural and, more importantly, linguistic contexts of their teaching practices. My position as a female researcher interacting with female teacher could possibly have had a similarly advantageous effect on the research process. My positionality as outlined above, it must be said, carries the possible danger of interfering with the maintenance of an objective approach to the research. Throughout the data collection period I remained aware of the need to maintain a professional distance and to avoid the possibility of allowing my position to diminish the quality of the data.

4.11 Limitations of the study

A small-scale research study like this one has certain limitations. One such limitation is the fact that it involved three case studies in the contexts of three schools in the Grahamstown region of the Eastern Cape. The study focused on three Afrikaans-speaking Grade 3 teachers' mathematics teaching practices teaching isiXhosa-speaking learners through the medium of Afrikaans. Because no other schools or teachers were included in the study the findings can therefore not be generalised to other subject areas or other contexts. The patterns that emerged cannot be generalised to all second language teaching practices in the whole country. However, the results are important and may provide insight into aspects of teaching through a second language such as, for instance, factors that enhance or constrain learning.

A further limitation concerns the documentation of data regarding teaching practices. Any attempt to describe classroom events and teaching practices is problematic, and runs the risk of presenting a less than accurate version of events. The fact that the teachers and learners are aware of being observed also affects the data that the researcher encounters in the sense that it does not necessarily perfectly reflect the real everyday practice To reconstruct the lesson exhaustively is not possible, but by providing the full transcripts of three maths lessons per teacher I attempted to present the school and classroom contexts of the teachers' practices as faithfully as possible so that the reader can at least get a sense of what these practices involved. The photographs, direct quotations from interviews and examples of translated lesson transcriptions aimed to provide an enriched representation of classroom life.

A further limitation of the study concerning the presentation of the videoed classroom observation data lies in the fact that the Afrikaans transcriptions have, for the sake of accessibility, been translated into English. Transcribing interactional contexts such as classroom discourse is an integral part of qualitative research and requires an accurate account in the form of detailed verbatim transcripts. According to Nikander (2008), "[d]iscussion on transcription practice is all the more important given that qualitative research sees transcripts as a central means of securing the validity and guaranteeing the publicly verifiable, transparent and cumulative nature of its claims and findings". In instances where the transcripts are translated, the challenge to produce reliable data is all the greater, especially in a study such as this that focuses on the language used by teachers and learners in a mathematics class. The fact that the translations of transcripts in this study were done by a researcher with good bilingual skills who handled the data with an awareness of the complexities involved in the terminology that formed a central part of the study, it can be argued, strengthened that level of reliability of the process.

As with any translating process, an inherent drawback lies in the fact that some subtleties in meaning will be lost in the final presentation of classroom data.

For the purposes of this study, a final limitation of the research process involves the fact that the study investigated teachers' teaching practices and did not include learners' perspectives, their levels of home language and LoLT proficiency or their scholastic performance and progress. The time spent in the field was also limited. As a researcher I was aware of the fact that, although all three teachers were extremely open, accommodating, and supportive, the classroom observations did disrupt their teaching. I decided, therefore, to keep the class observations to a minimum.

4.12 Significance of the study

Despite the limitations of the study, the information collected can provide an enhanced understanding of the particular phenomenon of Afrikaans teachers teaching isiXosa-speaking learners mathematics through the medium of Afrikaans while they do not speak the home language of the learners.

The study further aims to contribute to classroom-based research into current teaching practices where learners are taught content subject, mathematics in particular, through the medium of a second language. Mercer (1995), for instance, argues two aims that will be served by in-depth classroom-based research:

- to help children use language effectively as a tool for thinking; and
- to facilitate classroom-based involvement in culturally-based ways of thinking in order to contribute to the development of individual children's intellectual ability

On a more specific level, this study aims to inform a better understanding of the local phenomenon of learners learning through a second language in classrooms where the teachers do not speak the home language of the learners in the class. In South Africa where approximately 90% of learners from Grade 4 onwards and a growing number of Foundation Phase learners learn through a second language, a deeper understanding of the current teaching practices within these contexts can contribute to improving the quality of teaching in such classrooms.

CHAPTER 5 INTRODUCING THE TEACHERS

5.1 Introduction

This chapter introduces the three Grade 3 teachers who participated in the study, their classrooms, and their perceptions regarding their teaching practices which are presented in full. While all the participating teachers were asked the same questions during the semi-structured interviews, Marlene's responses proved to be the most expansive, reflecting the more nuanced conditions within which she operated as a teacher. A description of each participating school as well as a profile of learners in the school and the Grade 3 class is provided as Appendix C. In addition, translated transcriptions of three mathematics lessons of each teacher are provided as Appendix D. In the abbreviated references to the lessons of each teacher, I make use of the following coding, e.g. Lesson 1:2 implying Lesson 1 line 2 or a shortened reference, e.g. (1:2) for the sake of concision.

What follows is pivotal contextual information that situates each teacher and provides a backdrop to understanding their mathematics practices. This information also provides insight into individual and professional aspects of their lives that mediate their practices. Importantly too, it shows how teachers shape and are shaped by the contexts in which they make sense of themselves as individuals and professionals. Therefore, this chapter serves as background to understanding the teachers' mathematics practices that are described in Chapter 6.

5.2 Introducing the teachers

The three Grade 3 teachers who were selected and who agreed to participate in the current study, provided the following information in the course of interviews that conducted during fieldwork visits.

5.2.1 Marlene (Winter Primary)

Marlene is 45 years old and grew up in Grahamstown. She was a learner at the primary school where she now teaches; a school that previously catered for only 'coloured' learners (see Appendix C1). She completed a BA degree at the University of the Western Cape in 1989, majoring in Afrikaans and History. Thereafter, she completed a Diploma in Higher Education, qualifying as a high school teacher. After a short period of teaching in a high school, Marlene decided to move to a post at her current primary school because she felt that she would prefer to work with younger children. She has taught at her present school for 23 years. She started off as a Grade 4 teacher but, following changes in internal staffing requirements, she began teaching a Grade 3 class. It is important to note that, at the time of the study, Marlene had been teaching in the Foundation Phase for four years, even though she had not had any formal training in teaching in this phase.

According to Marlene, she had over the years attended various departmental and other teacher development programmes that she had found to be helpful and informative. No mention was made, however, of courses focusing on teaching learners through a second language. Marlene indicated that she took part in the NICLE mathematics research programme[20] and found it beneficial as it provided her with new ideas for teaching of mathematics. She said that she had attended a number of workshops on CAPS, but made no reference to guidance she received during these workshops regarding practices particular to the Foundation Phase in general or teaching mathematics in particular. She spoke of helpful information she received in the workshops she attended in March and November 2012 but, on the whole, felt that the same teaching principles that she had gained through experience, still applied. She said,

> I have not been able to attend them all because of school commitments, but found the workshop on assessment in Life Skills, for instance, very helpful. On the whole, however, not much has changed with the introduction of the CAPS. I see it as going back to the old ways of teaching. For teachers like me who have taught for more than 20 years, some things have changed, but a lot has stayed the same.

Marlene regarded herself as a dedicated teacher. She said she did not want to ever be absent from school and wanted to ensure that, when the learners left her class at the end of the year, they were able to understand the work they had covered and were ready for the next grade. She said, “I always say when I put my foot past the school gate, I forget about my house.” As far as the way she viewed the learners in her class was concerned, she said, “I tell my class ‘you are my children’. You forget about everything else and you just want to do the best for your kids.” This statement suggested that she positioned herself as a 'mother' in her relationship with her learners.

[20] NICLE is one of the key development schemes of the South African Numeracy Chair (SANC) Projects. At Rhodes University NICLE involves a partnership between in-service teachers and staff in the Chair and key partners of the Chair. The participants meet regularly and work together to fulfil one of the objectives of the Chair, namely teacher development from a classroom practice based perspective.

Marlene also indicated that she regarded the maintenance of a good level of discipline and an assertive but loving approach in her class as important.

Marlene mentioned a number of factors that impacted on her teaching. First, the fact that the Grade 3 learners did not have a teacher for a considerable period of time in Grade 2 was a major challenge for her, as she had to try and catch up on the work that had not been covered before. She said, “I would say to parents, ‘I cannot now in Grade 3 teach your child the letters of the alphabet, because now they need to be taught the double sounds’.” Second, Marlene found the present class size of 37 learners, of whom 33 are isiXhosa-speaking, a challenge, because of the group’s mixed academic ability, varying levels of Afrikaans proficiency, and the learners’ inability to all work at a similar pace. She regarded the slow pace at which some learners worked as problematic and added that she was seldom able to keep the slower learners after school. She said, “The ones who need extra help are often the ones who make use of transport directly after school.”

In addition to these factors, Marlene said she found the regular arrival of the feeding scheme meals in the middle of a lesson disruptive. As the teacher in charge of overseeing and coordinating the feeding scheme meals, she was also often required to stop teaching to handle issues regarding this programme. Marlene felt that while she experienced positive staff collaboration, the fact that she was regularly called upon to supervise the classes of absent teachers in her classroom was a further challenge.

As far as Marlene’s perspectives on teaching isiXhosa-speaking learners were concerned, she described her biggest challenge their lack of understanding. She put it this way: “[I]t is very frustrating when they don’t understand you, when the language just does not get through to them.” Marlene said she found teaching complex, especially because it was often difficult for her to determine whether the lack of progress was caused by the language barrier, learning difficulties, or by a lack of motivation and discipline. She said,

> I have many strong learners, and then I have my group with whom I really battle. I try my best ... but it's not so much about understanding the language. It's more about 'we're slow, we're not yet at the level of Grade 3 because we still would like to play’. Today one in the slow group surprised me and sat and listened and actually answered my question. And I said to him if you listen to me like this every day, we would be able to

> work well together. So my first group I can't give extra work, because there is no time. I have to tell them to keep themselves busy while they wait.

While learner attitudes are not the focus of this study, the manner in which they perceive being taught through the medium of Afrikaans has relevance for the teacher's practices as it impacts on the teacher-learner relationship. In the interview, Marlene indicated that she was aware that a number of the learners in her class would prefer to be in an English medium class. The majority did not mind being in the Afrikaans class though, as long as they were able to achieve success. She said, "[W]hen they are proficient in Afrikaans, they seem quite happy to be in the Afrikaans class, because they then find it easy. It's not such a political thing."

Marlene stated that she was keenly aware of some learners' lack of confidence to speak and to read both aloud and silently. While the more proficient learners were able to speak with confidence and read independently, the majority was hesitant and spoke softly when asked to respond in Afrikaans. It was noted during the fieldwork (3 August to 22 November 2012) that Marlene regularly asked learners to speak louder when they gave answers. She stated that she never forced them to speak for extended periods of time in front of the whole class. This approach was confirmed during class observations as Marlene provided most of the oral input during lessons. According to Marlene, even the isiXhosa-speaking learners who were the most proficient in Afrikaans found writing in the language challenging. They struggled especially with extended writing. This was confirmed during class observation.

Apart from language proficiency, the learners' interest and confidence were also affected by their grasp of mathematics subject content knowledge. According to Marlene, learners did not have a proper grounding, for example, in mathematics and this affected their motivation. She found that they lost interest when they did not understand the work and that is when she encountered problems with motivation and behaviour.

During my class observations and pertaining to mathematics specifically, Marlene made the point that some learners had not reached more than a basic level of mathematical proficiency. The following excerpt from Lesson 2:67 in Appendix D1 shows an occasion, for example, where a learner displayed very low computing skills:

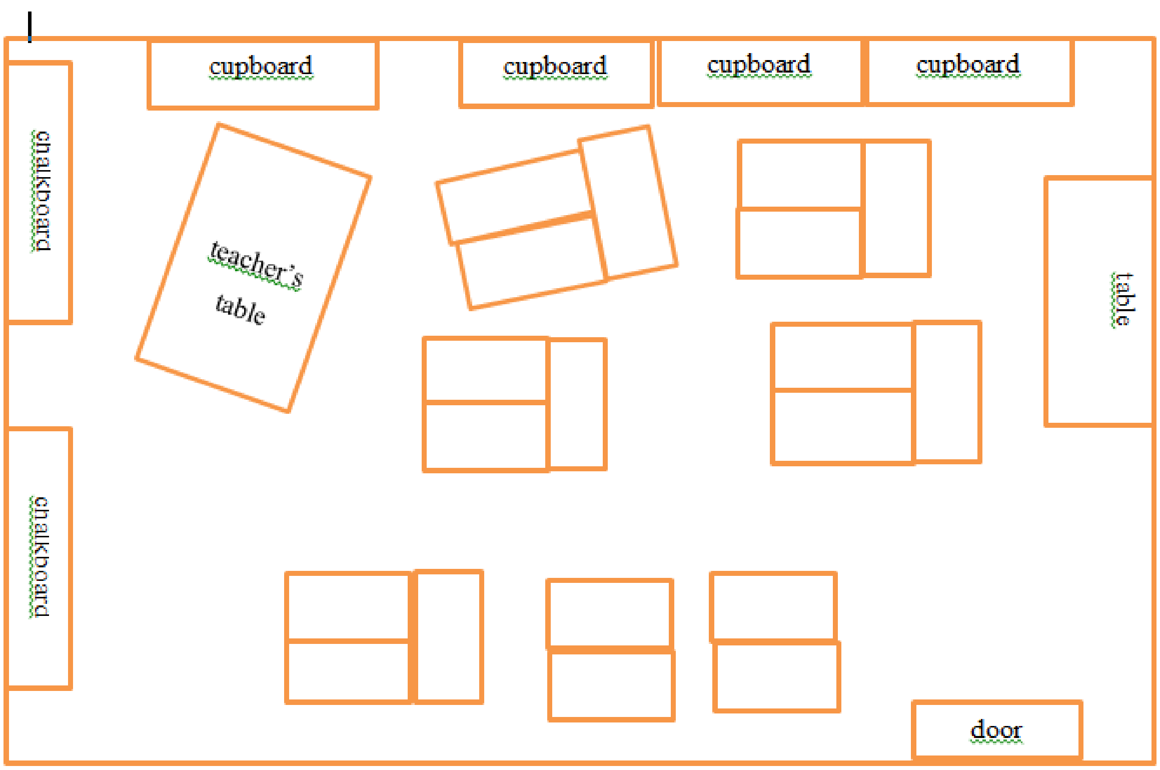
T Right. Zanatole, 5 times 1 ... (waits, then gestures, holding up one hand to stop gasping sound from the rest of the class) I have 5, just once, how many would that be? (waits) ... I do not say two times 5, I say 5 only once ... how much is it? Just how much is one 5? (waits) ... Right (to the rest of the class) Give Zanatole a chance ... Zanatole , 5 only once, only 5… is how much? (Teacher holds up her hand.) Look at me, look at me, Zanatole, look at me, Zanatole , how many do you see?
L5 (softly) 5

Marlene said that she found that the majority of learners battled to work with precision and confidence on their own and she ascribed this to a combination of low levels of language and mathematics proficiency. She said, "They halve when they should be doubling. They swop the two around. They know the difference between the two but they still swop them around because the concepts are not well-established for them. When I ask 'what needs to be done when we double?' only my few usual hands go up."

The classroom

As the floor plan in Figure 1 below indicates, the learners' desks were normally arranged in groups.

Figure 1: Floor plan of Marlene's classroom



It was observed that during assessment periods at the end of the term, the desks were placed in rows. The usual group arrangement pointed to a tension that I show later in Chapter 6, as Marlene placed the learners in groups but exclusively made use of whole class teaching. From the following explanation it appears that the motivation behind this arrangement was input from educational officers rather than the teacher's own understanding of Foundation Phase practices. She said,

> In the past the learners sat in rows, but the inspectors and subject advisors came and said it's preferable to put learners in groups, because it gives them a chance to talk about the work and the ones that are behind can learn from the others. And I find it works well, because it gives them a chance to discuss work and learn from one another. It also helps the weaker learners to learn from the stronger ones. It helps because I see how one will quickly explain to the other in isiXhosa what he's supposed to do.

As far as other basic teaching resources were concerned, it was noted that the classroom did not have a carpet, a characteristic feature of Foundation Phase classrooms. The implication of this was that there was no area available for mat work and for the type of differentiation required (and expected) in the Foundation Phase. The chalkboards were worn and needed to be wiped with a wet cloth before new information could be written. During the field work, I noted that this had an effect on the pace of lessons as wiping the chalkboard took time and often interrupted teaching. Marlene mentioned that the limited board space affected her differentiation because she needed to wait for everyone to finish the work on the board before she could continue. The faster learners often had to wait for slower learners to complete work off the board.

The well-lit classroom, as is clear from the photographs above, had a selection of colourful educational posters displayed on the walls. This helped to create a positive atmosphere that conjured a sense of learning and teaching taking place in this classroom. The condition of the classroom was good, with sufficient desks and chairs available to the learners. Learners' books were stacked in piles on a table in the back of the class, with some work books and other material stored on the floor and in cupboards. Marlene's reference books were stored in a cupboard next to her table in the front of the class. It was noted that no wall clock was displayed in this classroom – equipment that could serve as a useful time management device during lessons and also, as suggested by the CAPS, as a teaching tool to support learning of mathematics principles involving measurement and in particular, time.

Figure 2: Photographs of Marlene's classroom

As far as reading resources for language development were concerned, it was noted that no classroom or school library books were available for learners to read in class or at home. Marlene mentioned that in her experience not all the learners brought library books or classroom readers back after reading them at home. As a result, the learners were not allowed to take books home, but were provided with photocopies of their class readers for home reading.

In the past, Marlene explained, the school library had been used to support reading development. The system whereby teachers selected books from the library had not been in operation during the current year and the teacher expressed hope that the system would be reinstated in the future. Marlene mentioned that she was also not following the other methods of reading support that she had used in the past. She said, "In previous years, I would use the Grade 1, 2 and 3 reading books with my class. I did three grades in one and would go to the Grade 1s and ask them to give me one of their readers. Then I would read it with a group. But this year I did not have time because our year was just not the same as other years."

As far as mathematics teaching was concerned, Marlene indicated that she used a variety of new and older textbooks to find suitable exercises for the learners. However, no evidence of differentiated exercises, especially to challenge or extend more proficient learners, was observed. During the observed mathematics lessons, Marlene used a variety of mathematics support material such as counting cards, a clock and dice.

The learners appeared to be comfortable and relaxed and they responded quite readily to the teacher's directions. As the lesson transcripts in Appendix D1 indicate, Marlene did not often make use of explicit affirmations of learners' responses, but the way she mirrored their answers and related to them gave an indication of a supportive approach to the learners. Marlene indicated that, in her opinion, the learners did not display good self-discipline. She saw this as one of the reasons why she had to work slowly. She said, "In the morning they write the day and date. After break they still sit with day and date. I always say shouting doesn't help, because when you discipline them they write only one short sentence and when I turn around to work with another group, they just continue to talk to one another. I think that is what keeps us back the most: our children that are slow." The manner in which Marlene regulated learner behaviour will be discussed in greater detail in Chapter 6.

With regard to homework, Marlene indicated that it was difficult to monitor this aspect of schooling. She said, "The learners regularly received reading for homework, but there is no system in place for the completion of mathematics homework. I try with maths, but I have often said I feel I am wasting my time because, when I give maths homework, then the same eight or ten complete the homework and the rest just have an excuse."

5.2.2 Anine (Park High)

Anine is 29 years old and teaches at a former ex-model C school that caters for children from Grade R to matric (see Appendix C2). She has had five years of experience as a Foundation Phase teacher. While teaching in a neighbouring town, she studied part-time and completed a BEd degree in Foundation Phase in 2010. She started teaching as the Grade 3 teacher at Park High at the beginning of 2011. Anine regarded herself as a committed educator who wanted to provide the best possible learning opportunities for all her learners. She viewed reflection on her teaching as an important part of her practice. As a relatively new teacher, she found the CAPS training courses and the guidance she received from the Grade 1 and 2 teachers valuable. She said, "I have learnt a great deal from my senior colleagues about the basics of teaching and about which methods work best. We work closely together." No mention was made of courses focusing on teaching learners through a second language.

According to Anine, the tuition that the learners in her class had received in previous grades prepared them sufficiently to cope with the challenges of the Grade 3 curriculum. For the most part, she felt able to keep up with the pace required by the CAPS. According to Anine, the class size of 26 learners was manageable and the school system allowed her to teach uninterruptedly and with a solid administrative support structure in place.

Anine believed that the majority of isiXhosa-speaking learners in her class were able to keep up with the rest of the class and did not experience the LoLT to be a major stumbling block. She said, "[M]ost of the isiXhosa-speaking learners are able to speak Afrikaans for extended periods of time. Some are more confident speakers than others, but even the shy learners can explain their calculations to the whole class." This confidence was confirmed during my class observations (16 October to 20 November 2012) where calculations were explained on the chalkboard or spontaneous contributions were made during whole class teaching on the mat.

Like Marlene, Anine said she was not always able to determine whether isiXhosa-speaking learners' problems with language or mathematics were caused by language, learning barriers or attitude. She referred, for example, to one isiXhosa-speaking learner who had been at the school since Grade 1 and who was making very little academic progress. This learner came from a challenging home background as both her parents had passed away and she was being raised by her grandmother who was a cleaner at the school and who spoke very little Afrikaans. Anine said, "[S]he receives extra lessons, but her progress is very slow. I don't think her attitude towards her work is positive and this could play a role. She battles a lot with mathematics."

In other cases, however, Anine found the causes for language challenges to be more specific. In particular, she spoke of one isiXhosa-speaking learner whose reading ability was affected by a learning barrier rather than Afrikaans proficiency. She said, "He battles with reading and also seems to have visual learning problems. He would swop around numbers like 354 and write 345. He seemed to learn quite fast, but he definitely has a learning disability. I would not say it is because of his language, because his language is quite good. He came at the end of Grade 1."

On the whole, however, Anine found that the isiXhosa-speaking learners in her class were able to read independently and that they read with good understanding. In her experience, their comprehension skills, amongst others, depended on intellectual ability rather than primarily on second language proficiency. As far as proficiency in mathematics was concerned, she believed that ability played a bigger role in achievement as opposed to language barriers. She said,

> There are Afrikaans and isiXhosa-speaking learners who are just obviously good at maths. The learners who battle are often Afrikaans-speaking learners who come from other schools and who did not get a strong grounding in mathematics. I have a number of isiXhosa-speaking learners in the top group, but most are in the middle group. Only a few of the isiXhosa-speaking children battle with word sums.

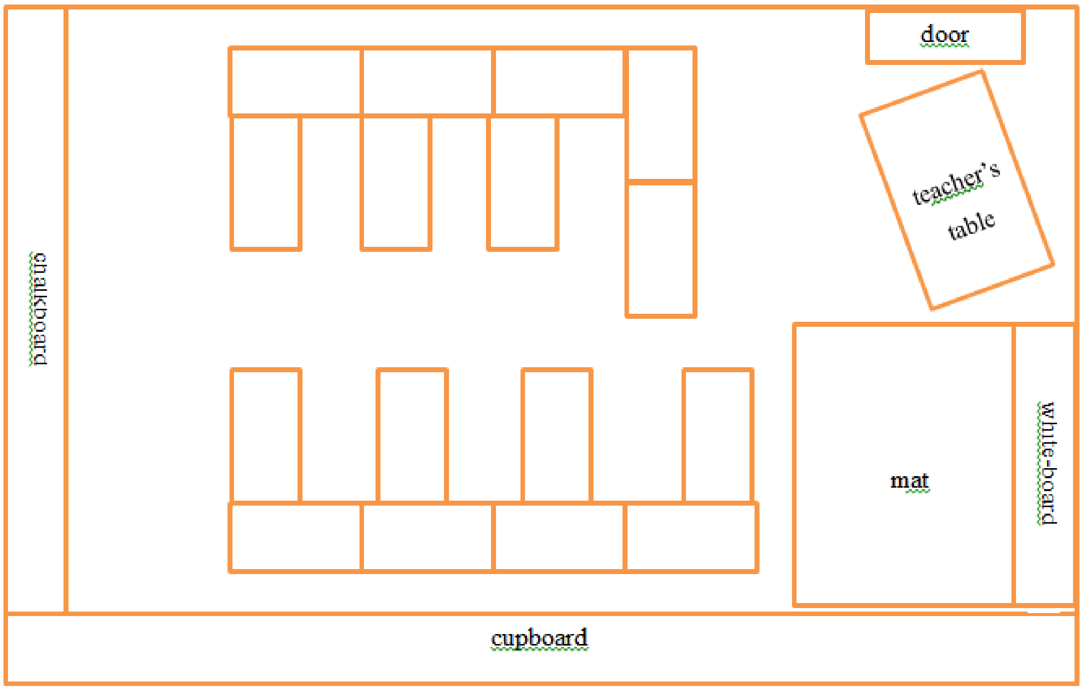
Anine said she had nine learners who battled with mathematics, some of whom were Afrikaans speaking. She found that all the learners in her class battled with the way mathematics questions were formulated and for this reason, she often focused on the formulation of questions to familiarise the learners with the way they are set. She said, “[T]hrough practice, learners get used to working out when to multiply and divide. They learn which words to look out for. They need to practice this repeatedly.”

As far as learner attitudes were concerned, Anine found that the isiXhosa-speaking learners displayed a positive attitude towards their work and towards learning through the medium of Afrikaans. On the whole she found them to be fully integrated and highly motivated. She said, “Their writing speaks of the pride they have in their work. The learners work really neatly, especially the girls. They are perfectionists.”

The classroom

As the floor plan below indicates, the learners’ desks were organised into short connecting rows facing the chalkboard.

Figure 3: Floor plan of Anine's classroom



Anine explained the reason for this formation as follows: "The learners like having a stable environment and a seat where they can quietly work on their own. They enjoy working together too and I sometimes shift them around to work in mixed ability groups." This was confirmed during the class observations as learners mostly completed desk work mostly on their own, but a number of instances were observed where learners completed a task in pairs. The teacher's desk was placed at the door at the back of the class. The classroom resources included a carpet at the back of the class and a whiteboard on the wall next to the carpet. The whiteboard was used to support teaching while the learners were gathered on the carpet for whole class or group work. The whiteboard provided a second teaching space that Anine used for groups on the mat while the rest of the learners completed tasks written on the chalkboard.

Figure 4: Photographs of Anine's classroom

As is clear from the photographs above, the well-lit classroom had a selection of colourful educational posters displayed on the walls. It created a positive learning environment. The classroom furniture and resources were in a good condition and all the classroom equipment was neatly organised. A wall clock was placed above the chalkboard in the front of the class and Anine regularly referred to the clock to remind the learners of the expected time frames within lessons. The classroom had a well-stocked class library with a wide variety of Afrikaans and English books.

As far as mathematics teaching resources were concerned, Anine used a combination of new and older textbooks for the preparation of lessons. The learners used the Via Afrika mathematics textbooks, but did not use departmental work books because Anine felt the books "jumped around too much". She preferred the learners using a classwork exercise book, saying, "[T]hey do everything in one book so that I only have one book to mark." She also found it best to write the work on the board, because the learners were accustomed to the format. Anine mentioned however, that she liked bringing variation into the classroom programme with different activities and writing tasks. In this regard she said, "[Y]ou can't just let them work from the board because it must not all be the same. If you give them a worksheet now and then, it helps." During the observed mathematics lessons, Anine used a variety of mathematics support material such as counting charts, sets of flard cards[21], a clock and dice. It was also noted that photocopies of extra exercises from the aforementioned textbooks were made available to the learners for enrichment following completion of class work.

It was noted during all five lessons observed that the organisation of the classroom space and adherence to familiar routines and procedures created an atmosphere of structure and predictability. One example of structure established by Anine was the uniform format used to present activities. Tasks were, for instance, always written on the board in a consistent manner. Anine described this system as follows:

> The work on the board always looks the same. It creates a calm atmosphere. They recognize it and know what to do. As soon as I give them a different worksheet every day and tell them to continue with it while I am working on the mat, it becomes difficult for me. And they do not get as much writing practice as when they write in their exercise books.

According to Anine, the learners had, over time, grown accustomed to these specific formats. It was also necessary, she believed, to have recognisable moments in the learning programme, such as a routine for explaining, discussing and then applying individually what had been learnt. She said, “While I try to bring variation into every day’s programme, I find that the learners like having the same routines for the different subjects”.

Anine had a structured daily programme. The day started with a joint Foundation Phase religious programme in the area where the learners lined up before each group went to their respective classes. The Grade 3s started with a life skills lesson and then had mathematics from 8:30 until break time at10:00. While Anine did not always follow a fixed routine during the mathematics lessons, the subject material was usually presented in a predictable format with whole class mat work followed by individual deskwork and group work on the mat. She favoured a variation of activities because spending long periods of time on the mat was physically taxing for the learners. She gave the following example: “I sometimes start the lesson with a whole class activity at the desks. I don’t start every maths lesson on the mat.”

[21] Flard cards are sets of cards that help learners to build up and break down numbers into their constituent thousands, hundred, ten and unit elements (http://educational-toys-online.co.za/product-category/maths-flard-cards/)

A further feature of classroom routine was the way in which homework tasks were managed. Learners received homework on a daily basis. It was noted during observations that Anine checked to see whether the homework had been completed at the beginning of every day. She indicated that she marked the homework every afternoon and it was observed that she revisited general mathematics errors that were picked up during the following day's mathematics lesson. She indicated that she recorded specific mathematical areas where learners needed help and addressed these either in group work on the mat or individually. She said, "I often use the time on the mat to discuss the mistakes that I found was made by a number the learners in the work that I marked on the previous day. I will then draw their attention to it and show them how to correct it so that they won't make the same mistake again".

As far as the classroom relationships and discipline were concerned, a positive group dynamic was observed. Learners actively took part in the management of the class by, for instance, handing out of books (1:35 and 2:38) or assisting one another (3:286) and they regularly worked in pairs during the mathematics classes (Lesson 1:85). Anine frequently gave affirmations ("You're doing well") and positive reinforcements in the form of praise and the mirroring of answers. She also mentioned that the learners had a positive influence on one another, saying, "[T]here are hard-working learners whose efforts have a positive influence on others and I am grateful about this. The others see her working hard. It helps when you have a few who want to work together."

As a result of the well-articulated routines, disciplining of learners during instructional phases was seldom necessary, even during whole class work. It was noted that Anine maintained control and motivated learners by using, for instance, concise directions before lesson transitions: "[O]kay, so it's an addition and subtraction sum… you do it every day in your workbook and you do it for homework… right, take out a book for me to keep your work closed." (Lesson 1:33) She indicated that, on the whole, the learners gave good cooperation. She said, "[T]hey know that I expect a lot from them and they try to set high standards for themselves." The fact that Anine worked with individual groups on the mat meant that she could regularly interact with them on an individual level. She indicated that this enabled her to keep a close formative assessment record of each learner's progress. As I illustrate in Chapter 7, during instruction learners' opinions were, on occasion, asked and taken into account. When a learner, for instance, expressed her hesitation about trying a challenging task, Anine reassured her that she would first do a number of examples with the class (Lesson 1:2-5). It was noted that when learners worked on their own at their desks, they did so on their own.

5.2.3 Lillian (Duiker Primary)

Lillian is 50 years old and teaches at a school that previously catered for only 'coloured' learners (see Appendix C3). She began her training as a teacher in 1985. She completed a Lower Primary Teacher Certificate, then specialised in Foundation Phase and eventually completed a Diploma in Education. At the time of this study she had 35 years of experience as a Foundation Phase teacher, had taught at the current school for more than 20 years, and held the position of Foundation Phase Head, overseeing a group of 6 teachers. Lillian indicated that she had, over the years, attended various professional development programmes, but that none of the courses specifically looked at teaching learners through a second language. She participated in the NICLE mathematics training programme and in the interview indicated that she found it beneficial as it provided her with useful guidelines and resources for mathematics teaching. In the past, she had attended numerous RNCS (National Curriculum Statement) and CAPS training courses, as well as various courses aimed at development in the teaching of mathematics in the Foundation Phase.

Lillian regarded teaching as a calling rather than a career. She stated "[M]y salary will not be blessed if I do not fulfil my calling." She also viewed her pastoral role as important, as some children in her class had difficult home circumstances and sometimes needed special care. She described her approach to teaching as follows, "[M]y aim is to treat all the learners equally in the knowledge that their academic needs differ. This is why differentiation in groups according to ability is important."

According to Lillian, the management structures of the school provide support for her teaching and the continuity in the tuition her learners received in previous grades enabled them to cope with the challenges of the Grade 3 curriculum in general and the mathematics curriculum in particular. This, she felt, made it possible for her to keep up with the pace required by the mathematics curriculum. The regular communication with the other Foundation Phase teachers also supported her teaching. She said, “[A]t the beginning of the year, for example, I can ask the Grade 2 teacher exactly how far did you get with counting, how far did you get with language, and then they can tell me precisely where they ended for the year. Then I know where I have to fetch the child. We are definitely a team.”

As far as her views regarding the teaching of isiXosa-speaking learners were concerned, Lillian said that most of the isiXhosa-speaking learners in her class who started their schooling at an early stage, coped well in Grade 3. She was also of the opinion that the evenly balanced ratio between isiXhosa-speaking learners and Afrikaans-speaking learners in the participating Grade 3 class allowed the isiXhosa-speaking learners to reach high levels of proficiency in Afrikaans. According to her, these factors supported their language and their academic development, because of the top ten learners in this particular class of 24 learners, five were isiXhosa-speaking.

As indicated above, Lillian found that the isiXhosa-speaking learners’ learning in general was not constrained by learning through the medium of Afrikaans. She found that the majority of learners spoke Afrikaans with confidence and that their written proficiency was equal to that of the Afrikaans-speaking learners in the class. What was critical, she felt, was that they receive a good grounding from an early age. In this regard, she said,

> Their language does not hold them back. Not in Grade 3. Perhaps in Grade R, 1 and 2, but not in Grade 3. Because they are taught through the medium of Afrikaans in Grade 1 and 2, their Afrikaans is well-developed when they reach Grade 3. All they then need is to extend their vocabulary. It is only with pronunciation, for instance, that they seem to battle. To support them in this regards, we often make use of breaking up words into syllables. It helps them with pronunciation and spelling.

As far as learner attitudes regarding learning through the medium of Afrikaans were concerned, Lillian was of the opinion that the isiXhosa-speaking learners felt at home in the Afrikaans class, confirmed by classroom observations (1 November to 14 November 2012). She described her perceptions on attitudes and integration into the classroom culture as follows:

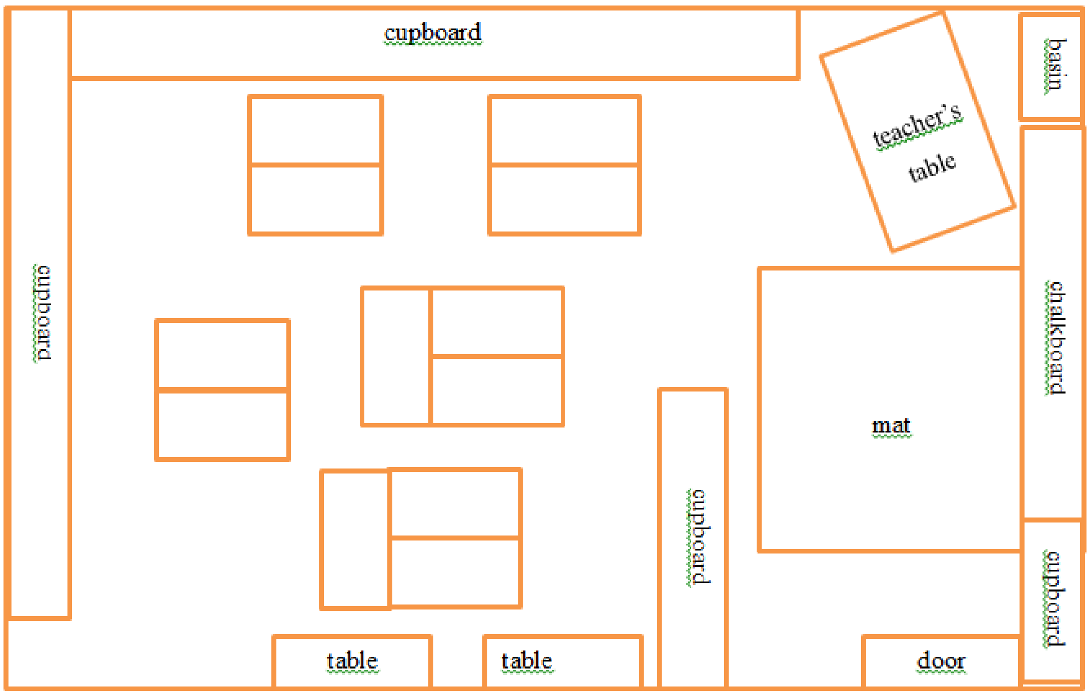
> I’ve never asked them about it, but you can see that they are happy. Sipho, for instance, is Xhosa-speaking and Mario, who is Afrikaans-speaking, is his best friend. I can see that the isiXhosa-speaking learners are completely integrated in this environment. It is their class and their school and they are as involved in the activities and culture of the school as any other child.

Concerning learning mathematics, Lillian did not experience language to be an obstacle. She felt that the mathematics tuition that the majority of the isiXhosa-speaking learners received from Grade 1 onwards, their participation in the Conquesta Maths Olympiad, and the preparation it involved, enabled them to perform on a par with, and in some cases, above the first language Afrikaans-speaking learners. In her experience the learners battled with mathematics for other cognitive reasons. She said, "I have eight learners in my top group for mathematics and four of them are isiXhosa-speaking. They cope with the work. In my third group I have four LSEN learners and only one of them is isiXhosa-speaking. So it is not the language itself."

According to her, isiXhosa-speaking learners with learning difficulties found learning through a second language to be a further barrier. She found that these learners were seldom able to grasp mathematics concepts such as multiplication. She observed, "[M]ost of the isiXhosa-speaking children can work independently, but the ELSEN child needs a lot of support. He battles to grasp the concepts."

The classroom

Figure 5: Floor plan of Lillian's classroom



The floor plan in Figure 5 above and photographs below give an indication of the classroom layout.

Figure 6: Photographs of Lillian's classroom

The learners' tables were arranged in group formations. Lillian used an ability group structure to assign seats. According to her, the purpose of the arrangement was that learners could have discussions and work together. She said, "[L]earners can learn from one another more easily when they are seated in (ability) groups. They can help one another." It was noted during my fieldwork, however, that very little group discussion in mathematics lessons happened during the periods in which the learners worked at their desks. The activities that learners completed whilst seated at their desks was of such a nature that it required them to work individually and independently rather than in groups.

As the classroom floor plan indicates, a carpet for whole class mat work and group activities was placed at the entrance in the front of the classroom with the teacher's table in the front next to the window. There was a chalkboard in the front of the classroom, close to the carpet, and a wall clock displayed on the side wall. The reading books, work books, and support material were stored on shelves and cupboards in an organised manner. The classroom was well-lit with colourful posters relating to language and mathematics displayed along all the walls.

Although no classroom library existed to enhance language development, it was noted that various sets of class readers were available to the learners. For mathematics support and enrichment, Lillian indicated that she used a wide variety of resources and textbooks. These included a combination of textbooks, previous years' Conquesta papers and Annual National Assessment (ANA) papers, NICLE worksheets and NICLE maths homework books. Lillian said, "[W]hen, for instance, I am looking for a nice activity about block diagrams, I will page through other books to see what their diagrams look like, or when I want to give the learners maths enrichment." No evidence of differentiated exercises for extension of more proficient learners was noted during the fieldwork.

For mathematics, the learners used Via Afrika mathematics workbooks, a classwork book, and a mat book for rough work. The mathematics support material that was used during the lessons I observed included counting wall charts, flard cards and a clock. Lillian explained, "I allow learners to use counting cards as support material during assessment activities, because it is similar to using calculators in higher grades. But I don't allow this where mental calculations need to be done."

According to Lillian, the learners were well-behaved and able to self-regulate. She said that she did not experience any major disciplinary problems, an observation confirmed during the fieldwork with no incident of misconduct was noted. The learners were seen to be familiar with the classroom routines. While they seemed capable of working independently in the fulfilling of tasks like the packing away books and cleaning the classroom, learners seemed more hesitant to speak during lesson episodes focussed on mathematics teaching or in discussions about their work. Instances where the learners volunteered to answer questions in an extended manner or shared insights regarding their work in either whole class situations or during group work on the mat were seldom noted. As far as peer support was concerned, the stronger learners were occasionally asked to help weaker learners and this they did quite readily.

The affective dimension that was observed during the fieldwork could be described as the majority of learners seeming relaxed and confident and sufficiently proficient in Afrikaans to take part in discussions that required short answers from them. Lillian observed that, "[t]hey are always excited about giving answers and I try to involve everyone by moving down the line. But to get them to speak in full sentences is quite a challenge. They just want to give one word answers".

5.3 Summary

The above profile situated the three participating teachers regarding their personal and professional background, classrooms and perceptions regarding teaching were discussed. The classroom environments were described with specific reference to the layout of the classroom, the general classroom atmosphere and the management of resources and routines. Their perceptions regarding teaching isiXhosa-speaking learners through a second language and teaching mathematics through a second language were explored. In summary, the following aspects are highlighted to provide a first level of insight into factors that shaped their teaching practices. It was observed that the teachers' qualifications and professional training had a defining influence on their response to how to teach in the Foundation Phase. While Anine and

Lillian had trained as Foundation Phase teachers, Marlene had qualified as a high school teacher. As a result of this Anine and Lillian's practices displayed the pedagogical approach to structuring and routines required for Foundation Phase teaching, while Marlene's approach did not in all ways conform to Foundation Phase requirements. Her background qualifications could, for example, explain why she made use of whole class teaching throughout the mathematics lessons that were observed.

Professional development was seen to provide beneficial input, but did not adequately offer training in teaching learners whose first language is not the LoLT. The teachers expressed a need for professional guidance about how to support learning a second language and learning through a second language. The two teachers who attended NICLE indicated that they had gained confidence in having developed strategies that helped them to teach mathematics.

Classroom structure was found to bear an influence on the way in which practices were shaped. The practical implication of the absence of a mat in the classroom was that whole class teaching was a more doable option than group teaching. It was found, however, that the presence of a mat or group formations did not always translate into group collaborations. One can conclude, therefore, that structure did not in all cases signal a particular teaching practice. Only Anine was explicit about the consistent use of mixed ability groups for collaboration, while for the other two teachers, it seemed a convenience rather than a pedagogical decision.

As far as perceptions about the ideal time to start learning through the second language were concerned, all three teachers felt strongly that, if learners were going to learn through a second language, they would benefit from starting to learn through the language of instruction as early as possible. This consistent view provides an enlightening perspective on the debate regarding the benefits of mother tongue instruction (Fleisch, 2008). Their view can be seen as an alternative to the opinion of Heugh (2003) and Alexander (2003) who support Cummins' position regarding the need for learners to first build proficiency in cognitive domains in the mother tongue before transferring it to a second language. The teachers' view seems to support the counter argument of Banda (2003) according to which second language learners in the current South African context could, under suitable circumstances, benefit from starting to learn through the second language from the outset of their school career.

While the data presented in this chapter provides one level of issues that impact the teacher's practices, the next chapter offers a further layer of influence that focuses mainly on mathematics teaching.

CHAPTER 6 TEACHERS' MATHEMATICS TEACHING PRACTICES

6.1 Introduction

The previous chapter provided information about the participating teachers, their respective classrooms and teaching conditions. This chapter reports in three separate sections, one on each teacher, on data gathered on the teachers' mathematics practices in classrooms where a significant number of learners speak a language that is not the medium of instruction and where the teacher cannot speak the primary language spoken by the learners. To adequately describe and analyse mathematics practices requires a discussion of how teachers structured their teaching and managed learners and learning. It is for this reason that, before I present the mathematics practices of each case study, I present data that provides yet another layer of influence on each teacher's practices in general and her mathematics practices in particular. Abstracted as a way to frame an understanding of what the teacher does in the mathematics lessons, these data were derived from the mathematics lesson observations as well as interviews with teachers. Five mathematics lessons of each teacher were observed and transcriptions of three of these lessons per teacher are provided as Appendix D. These serve to demonstrate consistency across the lessons observed as well as illustrate aspects of the practices as they unfolded in the classroom. With each case study, I begin with the conditions and thereafter present the teaching practices. I begin with Marlene from Winter Primary below.

6.2 Marlene (Winter Primary)

6.2.1 Conditions shaping mathematics teaching practices

The data gathered from the observations in Marlene's class during the period 14 August to 22 November 2012 and from interviews with her conducted on 3 August and 3 September 2012 provided insight into the conditions that shaped her teaching practice.

6.2.1.1 Managing the content and pedagogical process

This section includes a discussion on the planning for and structuring of lessons in terms of mathematical aims and outcomes, on the focus and logic as well as duration and transitions in lessons. In the final instance, the matters of sequencing and of signalling what to expect are discussed.

Planning for teaching

In one of the interviews referred to above Marlene revealed that her planning approach to mathematics teaching was influenced, on the one hand, by adherence to the CAPS and on the other hand, the learners' ability to concentrate and the pace at which they worked. She indicated that the policy provided important guidelines for her teaching. In this regard she said, "I find the direction the mathematics CAPS provide very useful, because it gives clear indications of the work that needs to be covered, examples of exercises and the assessment programme that I need to follow". Marlene made the point that adherence to the policy was often restricted by the pace at which learners were able to manage content.

She said, for instance, that she had not been able to cover all the mathematics sections required by the CAPS with her class and that she had set herself the goal of at least finishing as much as possible of the work needed for Grade 4. She described the limitations regarding pace as follows:

> I plan to do so much work during the lesson, but then I don't even get to half of it. And I can't say 'you go on on your own' because we have to wait for everybody to finish, especially when we do work on the board. I can't go on and write because I have to wait until they have finished writing down the work from the board.

The quote above points to a teaching practice, namely whole class teaching (elaborated upon later in this chapter) that characterised Marlene's approach to mathematics teaching. With regard to the learners' levels of concentration she said, "I am guided by the learners' attention. When I see that we are making progress, I would sometimes sit the whole day and battle with mathematics."

Marlene said that she planned on a daily basis and that in her planning, she relied on experience. The result was that she did not document her daily lesson planning, the consequences of which I elaborate on later. A tension was observed in Marlene's lesson presentation between the prescribed curriculum and what actually happened in the classroom as I show later on. She did not appear to follow a structured approach. While CAPS mediated the content, the approach to planning mathematics displayed a logic which was not always clear and the delivery of the lesson was not, as a rule, done in an explicitly structured manner. Importantly, there was not always a clear link in the sequencing of components in the lessons, nor were there links established within the content.

Goals and objectives

With regard to mathematics goals and objectives, Marlene indicated that she took guidance from the CAPS curriculum. The limitation of the definition of the terms 'goal' and 'objective' that appear in the CAPS document leads me to refer, for the purposes of this discussion, to the comprehensive descriptions found in the CAPS precursor namely the Revised National Curriculum Statement[22] (RNCS). According to this document, a teacher's goals, expectations and outcomes can be defined in terms of critical and developmental outcomes. These are achieved through learning outcomes of specific subject areas. The learning outcomes of mathematics involve developing learners' knowledge and skills regarding five main areas of mathematics content[23]. In line with these descriptors the term goal is used here to refer to the broad aim of strengthening mathematical proficiency in terms of the five areas of content. The term 'objective' is used here to refer to the more specific aims that are to be achieved within a lesson or a series of lessons.

While the goals of mathematics are overtly stipulated in the CAPS document, Marlene's approach to determining goals and lesson objectives did not display the same level of explicitness. Notwithstanding her reliance on the CAPS document, Marlene's approach to planning resulted in a situation where the mathematics lesson objectives were not made transparent and appeared to be left to chance. This was particularly the case because she did not have lesson plans that I was able to have access to during the fieldwork. As an observer, I was often left unsure of what the precise nature of the learning goals, core content and lesson objectives were. The consequence of this was that I was unable to gauge what lesson outcomes learners were expected to achieve either at the end of each lesson or at the end of a series of lessons.

[22] Revised National Curriculum Statement Grades R-9 (schools)
[23] The five main areas of content are (1) Number, operations and relations, (2) Patterns and functions, (3) Space and shape, (4) Measurement and (5) Data handling (CAPS, 2010).

Focus, logic and transitions in lessons

Marlene's structuring of lessons both in terms of their logic and focus was, for the most part, also left to intuition and as she stated, experience. 'Focus' in this instance refers to the specific content focus as it relates to the content areas stipulated in the CAPS document for mathematics in the Foundation Phase. 'Logic' refers to the way in which mathematical concepts and procedures are developed and how they related to one another in a logical and coherent manner within the various lesson episodes. The definition of the term 'episode' is based on Gibbons' (2006:95) description of an episode as a "unit which roughly correlates with a single teaching activity," The boundaries of such a unit are usually marked with particular frames and signal words, and the content is usually indicated by a particular participant structure, topic and purpose. Gibbons (2006:98) points out that "[a]ny attempt to name and describe classroom events and teaching processes is in itself problematic, and necessarily reflects a somewhat idealized version of events." While it was my experience that the lesson episodes of the transcribed lessons presented as part of this study were not always clearly definable, an attempt was made here to divide the lessons into particular teaching activities.

These lesson episodes have been coded by converting their content from black typography to sections of coloured typography to illustrate the transitions that were identified within the three lessons presented in Appendix D. This method is to be distinguished from the highlighted coding of teaching strategies presented in tabulated format in Chapter 6. I also provide the following overview of the episode sequences with a short summary of the content of each episode:

Lesson 1

Episode 1	Lines 1 - 59 Mental mathematics activity involving breaking up and building of numbers, doubling and halving and counting activity
Episode 2	Lines 60 – 106 Completion of written tasks with one written task involving breaking up of numbers, place values, doubling of numbers, number names and symbols and another written task involving number patterns and number names and symbols

Lesson 2

Episode 1	Lines 1 – 38a Counting activity and mental mathematics involving adding and subtracting, number sequences
Episode 2	Lines 38b – 62 Playing dice game involving multiplication
Episode 3	Lines 64 – 109 Mental mathematics involving multiplication
Episode 4	Lines 110 – 195 Completion of written exercise involving multiplication

Lesson 3

Episode 1	Lines 1 – 28 Reviewing time related concepts

Episode 2 Lines 29 – 179 Analogue time
Episode 3 Lines 180 – 218 Digital time
Episode 4 Lines 220 – 226 Group activity involving identification of analogue time

In the introductions to all five mathematics lessons that were observed it was noted that, in the absence of lesson plans, as I outlined earlier on, the focus regarding the mathematics concepts of the lesson as a whole seemed unclear. In the introduction to Lesson 1, for instance, it was noted that Marlene touched on a number of mathematical concepts and procedures involving the breaking up and building of numbers, doubling and halving before she moved on to a counting activity. She moved swiftly from one concept to the next; with little explanation or reference to each concept in a systematic or continuous manner that provided depth and clarity. The following lines from this episode (1:23b- 44) demonstrate how the move from one concept to another was conducted without a clear indication of logic and/or relation:

T What does 'halve' mean?
L (inaudible)
T Speak loudly, Henry, so that everyone can hear.
L Half of the number.
T What is half of 20?
Ls 10
Teacher addresses learners from the group she calls 'the slow group'.
T Who of you can tell me… if I put 2 with 68, what number will I get?
Ls (hesitate)
T If I put 2 with 68, what number will I get? If I put 2 with 68?
Ls (still hesitate)
T What did I say, what are we going to do? We are going to keep the number in our heads and do what?
L Count on. (softly)
T We are going to count on. So count on from 68. What will I get if I put 2 with 68?
Ls 70
***
T And if I count in 25s from 25? Which three numbers did I say should you remember?
L (Recite) 25 , 50 , 75
T Right, I'll ask again, what are the three numbers you need to remember?
L (Recite while looking at their counting chart) 25 , 50 , 75 ...
T Right, now count for me the multiples of 25.
L 25,50, 75, 100, 125…

A similar pattern with no explicit reference to a lesson focus was observed in the introduction to Lesson 2. Marlene started the lesson by saying: "Let's start by counting in 1's backwards from 163." She then proceeded to conduct a counting activity after which she focused on a variety of concepts, including more than, less than, number position, naming of numbers, adding and subtracting.

While no explicit focus was observed in the development of Lesson 1, the general focus of Lesson 2, namely multiplication, was gradually made clear. The reference to multiplication was, however, only made much later in the lesson. The same can be said regarding the more specific focus of Lesson 2, namely the interchangeable nature of multiplication calculations, for example 4x5 = 5x4. The focus was only referred to in the final lesson episode (2:110b-c): "You're going to do the multiplication sums for me… you now have an idea… when I say 6 times 5… you've made your row… I have 6 and I have 5 in each row, then you need to write your answer for me… so, we have two ways in which we are going to do the work…"

Of all five lessons observed, the focus of Lesson 3, namely time, was most easily identifiable. The fact that the learners had started preparing for this lesson on the previous day by making paper plate clocks gave indication of the preliminary lesson planning that Marlene had done. The learners' clock-making activity also provided information to them about the lesson content that could be expected and made it possible for them to understand the logic behind the introductory questions on days of the week and months of the year that followed. An explicit reference to the lesson focus was given at the start of the lesson, as the following excerpt from Lesson 3: 4c-7 indicates:

> T Right, let's look at time. We said that when we do analogue time... now before we get there, what day is it today?
> Ls Thursday
> T What comes after Thursday?
> Ls Friday

While Marlene's announcement of "Right, let's look at time" provided an explicit indication regarding the lesson focus, details regarding the envisaged content to be developed were not clearly stated.

As far as the transitions between lesson episodes in the observed lessons were concerned, it was noted that no clear indications regarding the link between the episodes and the rationale behind the shifts in content and procedure were given. The consequence in the lack of clarity was that learners were, to an extent, restricted in their engagement with the lesson content. The transitions between lesson episodes in Lessons 1 and 2 involved instructions regarding expected actions, but not information regarding content shifts. In Lesson 1:60, for instance, Marlene ended Episode 1 with the words “We can stop there. Right, we never got our work finished”. The way the transition was handled did not, it was noted, provide an opportunity for the learners to reflect on the relation between the content focus of the two episodes involved.

Similarly, the transition between Episodes 1 and 2 in Lesson 2:38 displayed no clear link with the preceding episode, prior knowledge or a clear reference to the envisaged lesson objective. A dice game was introduced, with no explicit reference to the objective of strengthening multiplication skills:

> T Right, pack away your cards. I’m going to hand out dice and we’re going to play a game. (Teacher hands out dice to learners.) Now the game works as follows… you are going to ... with your partner you are going to... just one rule ... you are going to take the dice (teacher first uses Afrikaans word for dice and then English word),you are going to throw it in front of you, you’re not going to throw it on the other table (emphasises and gestures) ... right?

The same lack of clear content focus and relation to the content that was covered in the preceding episodes was noted in the introduction of written tasks. In the following excerpt, from Lesson 1:59-62, Marlene ended the counting activity and immediately moved on to work that was written on the board and that had not been completed the day before. While she signalled closure to the episode, there was no clear link between the content in the previous episode and the next episode:

> T: Multiples of 10 ... go on ... 970 , 960 , 950 , 940 , 930 , 920 , 910 , 900 , 890 , 880 , 870 , 860 , 850 , 840, 830, 820 , 810 , 800 , 790 , 780 , 770 , 760 , 750 , 740 , 730 ...
> T: We can stop there. Right, we never got our work finished... we are now going to complete our activity ... yesterday you broke up the numbers ... you're going to open your book and then we are just going to continue with our activity ... Right, if you look on the board you will see...when you break up the number, what will you say, what is the answer?
> L1: 90 plus 5
> T a 90 and a 5 ... remember, we took the counting cards and then I said pack out...

Similarly, when the written exercise in Lesson 2: 110-120 was introduced at the beginning of Episode 4 with a reference to the interchangeable nature of multiplication calculations, the link between the activity and the preceding episode was not referred to explicitly:

> T 4 ... Right, we’re just going to do one revision exercise in our books... on the page ... right , Zandi and Michael and Sipho , we’re going to listen. You’re going to do the multiplication sums for me... you now have an idea ... when I say 6 times 5 ... you've made your row ... I have 6 and I have 5 in each row, then you need to write your answer for me ... so , we have two ways in which we are going to do the work ... I give you the sum Thuli ... I give you the sum and then I made you blocks for the two different ways in which you can count the sum… I will give you a page on which you can do rough work... so that you can draw your lines as we have just done it... the first sum says... 6 times 5... how many rows will I have ?
> L 6

T Right, before we shout out our answer we must make sure that we count correctly ... so now you are going to write the sum in two different ways ... the first one says 6 times 5 and the second one says 5 times 6.

Lesson duration and use of time

Regarding the way Marlene used the time she allocated to mathematics as well as the duration of lessons, no consistent pattern was observed. 'Duration' refers to the length of the daily mathematics lessons. Marlene indicated that she did not always adhere to the time assigned to mathematics on the daily timetable. As indicated above, Marlene said she was led by the learners' levels of concentration in her determination of the duration time of the lessons.

It can be said that the lack of explicitness in planning daily lessons resulted in the inconsistency in time allocated to mathematics. This inconsistency was evident in the differences in duration of all five observed lessons. Lesson 1, for instance, took 37 minutes, Lesson 2, 45 minutes and Lesson 3 was 93 minutes. Such variations in the time devoted to the daily mathematics lessons highlighted the way in which planning impacted on time management and, subsequently, on the irregular attention that was given to the structuring of lessons.

Sequencing the process and content

Sequencing refers to the processes and procedures by which content knowledge was built up within a lesson episode or in the sequence of lesson episodes that make up a lesson. From a constructivist pedagogical viewpoint careful sequencing of subject content and language building procedures are important scaffolding prerequisites (Gibbons, 2006). Sequencing links closely with Cummins' (1996) notion presented on page 37 of the interconnectedness of language and thinking involving a continuum of movement from context embedded tasks to context reduced tasks and the continuum of movement from cognitively undemanding to cognitively demanding tasks.

The structuring of learning was implicit in that, as was noted above, the lessons displayed a broad pattern of moving from whole class activities to individual activities involving the completion of written exercises. In the mathematics lessons observed there was, however, no clear adherence to a definable routine. As indicated above, Marlene seldom provided the learners with an explicit indication about the sequencing of the lesson content that she planned to cover.

Put differently, learners did not receive any signals about what they could expect and why, either before or during particular lessons. I refer here, for example, to the sequencing from Episode 1 to 2 in Lesson 1 as identified in lines 57 to 60:

57 T Right, when we count in decades, what do we count, multiples of...
58 L 10
59 T Multiples of 10 ... go on ... 970 , 960 , 950 , 940 , 930 , 920 , 910 , 900 , 890 , 880 , 870 , 860 , 850 , 840 , 830 , 820 , 810 , 800 , 790 , 780 , 770 , 760 , 750 , 740 , 730 ...
60 T We can stop there. Right, we never got our work finished... we are now going to complete our activity ... yesterday you broke up the numbers ... you're going to open your book and then we are just going to continue with our activity ... Right, if you look on the board you will see...when you break up the number, what will you say, what is the answer?

A similar lack of signalling was observed in the transition from Episode 1 to 2 in Lesson 2 as identified in line 38. As an observer, for instance, I did not get a clear idea of the exact moment when Marlene was introducing new content and when she was revising, consolidating, or assessing the content. These instances where clarity regarding the teacher's intentions and procedures was compromised show a lack of what Wells (1990) calls 'contingent responsiveness'. It means that a breakdown in communication occurs because the needs of the learners are not met and the construction of shared meaning is not successfully achieved.

Signalling what to expect

Signalling refers to explicit verbal and non-verbal indications given by the teacher about what actions or subject content the learners should expect to encounter during a specific lesson episode. The giving of signals is an important way in which a teacher ensures active learner participation in the process of knowledge construction. At the beginning of each of the lessons observed, Marlene tended to delve into the content immediately and very little signalling was provided to the learners about the mathematical concepts and procedures involved. In Lesson 1, for example, she started by giving directive signalling that had little to do with the content. She said, "[Y]our counting cards are on your desks… You must first pack those out." (1:2) As the following excerpt indicates, however, no signalling was given about subject content,

T Right. Build 24. Everybody build 24. What number do you read in front of you?
Ls 24
T What number do we read?
L 24
T Break up the number.
(Learners break up number.)
T What does 24 consist of?
Ls A 20 and a 4.

T A 20 plus a 4… a 20 plus a 4. Right, when we want to halve a 20. Tell me first, what are we going to do? What does 'halve' mean?

The same pattern emerged in the way Marlene signalled the start to Lesson 2. As the following excerpt (2:1-6) shows, the learners were required to follow the lesson procedures as indicated, but did not receive signalling regarding its nature, purpose or content,

The teacher instructs learners to each pack out their set of counting cards on their desks. The cards indicate counting in 1s, 100s, 200s, 300s etc.
T Let's start by counting in 1s backwards from 163.
Ls 163, 162, 161, 160…
T Don't use your finger… count faster… are you ready to fall asleep?
Ls (counting faster) …159, 158, 157,156,155,154,153…
T Right, let's stop there. Count backwards from 130.

Marlene then proceeded to introduce the second episode of Lesson 2 by signalling the start of the dice game, but without clearly indicating the purpose of the dice game or its link to the previous content. The function of the various multiplication activities were only mentioned at the start of the last lesson episode in line 110,

T You're going to do the multiplication sums for me... you now have an idea ... when I say 6 times 5 ... you've made your row ... I have 6 and I have 5 in each row, then you need to write your answer for me ... so, we have two ways in which we are going to do the work ... I give you the sum, Thuli ... I give you the sum and then I made you blocks for the two different ways in which you can count the sum…

The signalling pattern displayed at the beginning of Lesson 3 differed from that in Lessons 1 and 2. While the learners finished off their paper plate clocks, Marlene signalled what the mathematical focus of the lesson was going to be time. About 5 minutes into the lesson she said, "[R]ight, let's look at time. We said that we do analogue time… now before we get there, what day is it today?" From this question it was clear that the content of the lesson related to the concept of time.

The rationale behind transitions from one body of content to the next was seldom highlighted. As mentioned above, the transitions in Lessons 1 and 2 involved signalling about instructions, but this was not accompanied by references to content, "We can stop there. Right, we never got our work finished… we are now going to complete our work." (1:60a) Although the written task involved, amongst others, mathematical concepts such as breaking up, doubling and halving, and although reference was made to breaking up activities that were done the previous day ("…yesterday you broke up the numbers" in 1:60b), no explicit signalling was given of the way the written task linked with the content handled earlier in the lesson or the previous day. The signalling of transitions in Lesson 3, however, involved more explicit reference to subject content, for example: "[R]ight, now you know your hours and half hours..." (3:71b). A further example of this type of signalling was noted in the transition to the episode on digital time,

> T Right, do you remember I said you have analogue time in your houses? You have a clock in your home ... or your parents or you have a watch (teacher writes digital time on the board) and we call it digital time, right? (3:180)

Further instances of signalling regarding familiar procedures and concepts that had been covered before were noted in Lesson 3, for example,

> It's all to do with time ... but when we have to read time ...we know the first thing we said ... there are two arms… two legs ... we call it the hands (Afrikaans: wyser), not so? (3:29a-c)

> Right, now we are going to use the clock on the board. Right, this is work that we have done before…(Teacher colours in the right side of the clock drawn on the board) I just want to see if you can remember the part that I have lightly coloured in…it is the…? (3:47c-e)

> Right, we know hours… we have been doing hours for a long time now...when the big hand lies on the 6, then we say... (3:61)

> (B)ut remember we said when we draw the clock's symmetrical lines… Where are we going to draw it, when we draw one symmetrical line? (3:79)

As is evident from the excerpts quoted above, Lesson 3 provided more explicit information to the learners regarding the sequencing of subject content than Lessons 1 and 2. In Lesson 3 signalling involved a review of general concepts related to time, then a review of analogue time and, in the final instance, of digital time.

6.2.1.2 Managing learners

The following section offers a discussion of the way in which learners were managed in terms of differentiation and group work strategies and in which teacher talk served to direct learner actions, regulate learner behaviour and develop subject content. The discussion is concluded with an overview of the nature and extent of learner talk.

Differentiation and group work

A striking feature of Marlene's management of learners was the fact that, while the learners' desks were organised into groups and while they often completed tasks as groups, she made exclusive use of whole class teaching in the mathematics lessons that were observed. The learners were never divided into different groups in order to complete differentiated activities in which some learner focused on mat work activities while others were involved in desk work tasks, an expectation consistent with pedagogies in the Foundation Phase.

It was noted that the learners were placed in permanent groups who sat together with their desks arranged into clusters. Marlene indicated that she divided the learners loosely into ability groups but that the grouping was not done according to any specific criteria. Marlene described her approach to group structuring and differentiation as follows,

> The learners sit together in their reading groups. But I have not divided them into ability groups for mathematics. I tried, at a stage, but I found that it did not work. But while I was marking the other day I realised that I should start with my mathematics groups again because I can't give a strong child and a weak child the same work. But as I've said before, time is a problem. I tend to give more attention to the weaker learners… and the stronger ones just go on with their work. I am willing to struggle, but when I sit and mark I sometimes think, perhaps I should have asked the sum differently or maybe I should have given some of them different sums, because I provide the class with a chalkboard full of sums and then… it's one, two, three and then my stronger learners are done and then I sit the whole day and wait for the rest.

The quote above suggests that, while Marlene recognised the need for differentiation, her practice did not display strategies that addressed the individual needs and abilities of the learners in the class. In the interview, Marlene also alluded to the fact that she handled the class in terms of broadly two ability groups, namely the group of learners that she describes as the "slow learners" and the rest of the class. She mentioned that she spent more time assisting and guiding the group that she regarded as "slow learners" and this was confirmed during the fieldwork (Lesson 1:49-57). Although she moved around in the class and provided support to individual learners and groups, these periods of personal attention were not structured. As a consequence, it was noted, some learners ran the risk of being overlooked. Such a practice, it can be said, has serious implications for learner motivation, guided learning, and informal assessment.

It was further noted during the observation of the mathematics lessons that learners worked at varying paces. At the start of Lesson 1, for example, when the learners were required to pack out their flard cards, some finished much quicker than others and then sat waiting. The following excerpt from Lesson 1:12-13 provides evidence of this and shows Marlene's awareness of the situation as she tries to hurry the slower learners on:

> T (to learner) First pack out everything …I will come again … Pack out quickly, pack out quickly. Is it Phumzi and the others who are talking? ... Sipho and them?

> T (moves to front of class) Right, see how far you have packed them out? People are already waiting. Cherine, have a look. There is something lying on the ground ... what is it?

It was noted in all five mathematics lessons observed, however, that Marlene required of the learners to perform group activities together. They collaborated as a whole group and at times as pairs. While no group collaboration was observed in Lesson 1, both Lessons 2 and 3 displayed group work activities. In Lesson 2:38-59 pair collaboration was observed in the playing of the dice game and in Lesson 3:220 learners were required to identify the times indicated by group members on their paper plate clocks. More specific use of group activities was observed in lessons that have not been presented here, for instance collaborations involving multiplication calculations done with the help of counters, as the following photographs indicate. An important point here is that very little use of Afrikaans was observed during these activities. The communications that I noted were conducted mostly in isiXhosa.

Figure 7: Group activities in Marlene's classroom

Nature and extent of teacher talk

Apart from managing learners in groups, teachers use specific strategies to establish an explicit social order in the classroom (Christie 1995). The term 'social order' refers here to the type of behaviour the teacher expects from the learners during a lesson. The purpose of a particular social order in a mathematics class is to create an environment where learners can concentrate and are encouraged to participate in problem-solving activities.

In my observations of the mathematics lessons of all three participating teachers, I noted the use of directive and regulative registers to establish a particular social order, with the directive register referring to the actions of the learners before and during the lesson episodes devoted to subject content. The regulative register, on the other hand, refers specifically to the setting of behavioural boundaries and disciplining of learners. Both of these registers focus on providing information about the particular behaviour, skills and knowledge that form part of the mathematics classroom culture. Both registers also provide important opportunities for language development.

The prevailing social order that was noted in all five of Marlene's mathematics lessons observed involved a particular ruling about which languages were to be used in class as well as a particular approach to teacher talk. According to Marlene, she spoke mostly Afrikaans to the learners, and because they were not all fully proficient and she was unable to speak the learners' home language, she spoke slowly and often made use of repetition. While she indicated that she would, in some instances, ask isiXhosa-speaking learners to explain work to one another in their home language, this was not observed during the fieldwork. She said, "If I see that, after all my attempts, the learner still does not understand, I will ask an isiXhosa-speaking learner to explain what I meant."

There were three main ways in which Marlene used oral language in the classroom. Her communications involved providing directions regarding required actions, regulating learner behaviour and developing content knowledge.

- *Talking to direct actions*

Marlene used high levels of explicit language to direct the learners' actions. She used directions, for example, in the following way:

> T Write your names. We are now going to explain. We are just going to...You are just going to put it into your files, you are not going to stick it into your books. (To one group) Clean your table, your table looks untidy, put away everything that can be put away. (1:93)

> T You must also draw the diagram, yes, you need to draw the diagram in your book. Draw a line from the number to the name, Peter, a line goes from the number name to the number symbol ... your line goes from the number name to the symbol (the teacher points it out in learner's book, then moves on to the next learner at other table and shows him how to draw line, then moves to the next table). We do not want to sit all day with maths. (1:79)

What was striking was the amount of time spent in all the lessons observed on directing actions. In Lesson 1, for example, a word count revealed that approximately 1000 words were devoted to the directive register as opposed to 380 words used for mathematics teaching. In Lesson 2 as a further example, Marlene spent almost a third of the lesson time providing directions before and during the activity on how to play the dice game. The implication was, as the data suggests in Appendix D1 (2:38-59), that more time was spent on directing learners than was spent on teaching mathematics subject content.

It was further noted that Marlene seldom gave learners an opportunity to ask questions or tried to determine whether the learners understood the directions. She often made use of rhetorical questions such as “Right, now that’s easy to say, isn’t it?” (3:55, 3:168), “Is that clear?” and questions such as “Did we write it correctly?” to which the learners responded “Yes Ma’am” (1:69-70, 3:205-208). During the playing of the dice game (2:27), I noted that one of the learners drew the dots differently from the way indicated by the teacher. This seemed to suggest that not all the learners understood what they were meant to do and, because Marlene had not received feedback from learners and was only able to attend to some of the learners at any particular moment, such misunderstandings often went undetected. It was striking that in all three lessons presented in Appendix D1, only one instance of a learner seeking clarity about the directions given by the teacher was observed:

> L (points to the board and asks the teacher something softly)
> T You must also draw the diagram, yes, you need to draw the diagram in your book. (1:74-75)

- *Talking to regulate behaviour*

It was noted during the three lessons presented later on in the next section that, because Marlene made use of whole class teaching throughout, she regularly needed to provide disciplinary instructions. These regulating instructions were delivered in a firm tone of voice and involved information regarding learners’ required behaviour, their levels of attention and their mathematical predisposition, for example:

> We are not going to shout… we are going to play together (2:56f)
> I'll take your dice away… there are a few rules, and if you do not keep to these rules, then you are going to sit on the ground… (2:57k)
> Right, before we shout out our answer we must make sure that we count correctly … (2:120)

These regulating statements were not as prevalent as the use of the directive register, but what was noteworthy about both the directive and the regulative interjections, as quoted above, was the disruptive effect that it had on Marlene's own flow in her teaching as well as on her interactions with individual learners and groups. As with the count of words dedicated to mathematics teaching indicated above, the consequence of the interruptions was that little uninterrupted time was spent on content.

- *Talking to develop content knowledge*

When looking at teacher talk concerned with developing mathematics content knowledge, it is necessary to look at how and when content knowledge was constructed. As indicated above, the word count of teacher talk devoted to content knowledge in Lesson 1 was, compared to the use of other registers, noticeably low. This was the trend in most of the other lessons observed. While the amount of content knowledge covered in most of the lessons observed was limited, the level of mathematical discourse and level of subject content can be described as cognitively undemanding as far as mathematics thinking was concerned (Cummins, 1996). In terms of the distinction that Sfard et al (1998) makes between calculational and conceptual discourse (referred to on page 40) one can describe the majority of language used by Marlene as calculational as it focused on calculations and procedures without explicit reference to the underlying reasons for the calculation. In Lesson 1, for instance, basic tasks involving breaking up and building of numbers were covered while in Lesson 2 the mathematics teaching involved basic multiplication calculations. Lesson 3 was mostly concerned with the identification of analogue and digital time, as lines 64-78 indicate. The focus, it can be said, was thus more on physical and context-embedded tasks than on context-reduced task that require higher levels of reasoning.

In this regard Van Lier (1996) provides an enlightening insight when he points to the necessity of what he calls a process-oriented approach to teaching learners with restricted language and academic backgrounds. He argues for a careful fine tuning of teaching that would meet the learners on their level of language and cognitive functioning and offer appropriate teaching. He holds, "[I]n a system… in which there is a great diversity of cultures and languages, a process-oriented approach is needed to engage the students and "allow them to grow academically. A process-orientated approach must of necessity be conversational in character" (Van Lier, 1996:182). This view highlights the importance of language in mediation. And, one could add, it emphasises the use of language to stretch learners towards real academic growth in the way Vygotsky's notion of a ZPD process envisages. The use of metalinguistic talk is a critical factor. It involves what Mercer (1995) calls 'educational' and 'educated' talk; in other words use of everyday talk as well as talk that is language specific to the field of mathematics.

Examples of Marlene's 'educational' talk noted in the five lessons include everyday instructions and statements such as "Now listen… put down your paper plates… I want your attention with me…: (3:4) and "Right, now we are going to use the clock on the board. Right, this is work that we have done before…" (3:47c). 'Educated' language, on the other hand, was noted in communications involving academic language, for instance, "A full hour. Right from the 12, right around Nomsa, to the 12, then it's a full hour. Now who can tell me, if it moves right around, how many minutes?" In Lesson 1:21-28, as an example of 'educated' language where the halving of numbers was addressed, Marlene rephrased the learners' answer to an 'educated' phrase ("A 20 plus a 4"). She then drew their attention to the meaning of the term 'halving' by encouraging on of the learners to link it to everyday language:

T What does 24 consist of?
Ls A 20 and a 4.
T A 20 plus a 4… a 20 plus a 4. Right, when we want to halve a 20. Tell me first, what are we going to do? What does 'halve' mean?
L (inaudible)
T Speak loudly, Henry, so that everyone can hear.
L Halve of the number.
T What is half of 20?
Ls 10

In Lesson 2:104-109, a similar reference to the meaning of a multiplication calculation is described in words as follows:

T (turns and addresses the class) When we say 5 only once, then we say only one 5, 5 times 1 Deyi and Nomsa... 5 times 1 means I only have one 5... Sibulele, 3 times 1?
L6 3
T 3 Asanda Z, 6 times 1?
L7 Only one 6 .
T Just one 6... Zanetole ... if I say 'time 1' then I say that you count it once... Ziyanda, 4 times 1?
L8 4

It should be mentioned that, while this use of metalinguistic language was noted as a feature of Marlene's handling of mathematics concepts and procedures, the verification of the learners' understanding of the link between language and conceptual development was not found to be a focus in her teaching. Put differently, instances of Marlene's checking to establish whether the learners understood her explanations were limited. The level of learner uptake was not explored as part of the class observations as this did not form part of the focus of the study.

Extent and nature of learner talk

The learner participation patterns that were observed during the mathematics lessons consisted mostly of group chanting during counting activities (1:47-59), monosyllabic responses (2:43-53) and chorusing of responses (3:4-28). In the three lessons that are presented here, only one unsolicited question by a learner seeking information was observed (1:78).

In the isolated instances where learner talk was observed, the learners spoke softly and needed to be reminded by Marlene to speak louder. Her perception that the learners lacked confidence to speak Afrikaans in front of the whole class seemed to influence the manner in which Marlene facilitated learner talk. In the interview, Marlene intimated that she viewed their lack of confidence in a sympathetic way. She said,

> They find it difficult to explain how they got to an answer. It is perhaps because they are scared of speaking Afrikaans. Sometimes they pronounce the words incorrectly and then they giggle at one another. I try to stop that and say 'we don't laugh because we're all learning'. But some are simply too scared to speak. It's not easy for them to say a whole lot of sentences. At this stage they say only one sentence. And when I ask who wants to read, it is always the same hands that go up. There are a few who enjoy speaking and reading, but the others are dead quiet. They just try to disappear.

According to Marlene, the learners' lack of oral confidence was further affected by their lack in mathematical confidence. Both of these factors influenced the way she formulated questions and created opportunities for learner talk during the lessons. While questioning will be dealt with in more detail below, it is important to note that Marlene seldom insisted on anybody speaking in an extended way.

She said,

> I would say 'come on, we are going to do examples on the board. You are going to speak and I will write. It's not new work. We've done it over and over again and you should know all the steps'. I always say it's because they are not ready for Grade 3. The previous grades have not prepared them to be at the right place.

As indicated above, it was further noted that learners spoke mostly in isiXhosa to one another during group activities. It was observed that the learners spoke softly and, because Marlene discouraged the use of isiXhosa in the class, they stopped speaking when she approached the group.

In summary, Marlene's teaching conditions that shaped her mathematics teaching practices can be described as follows. Of all the valuable data offered by the classroom observations and interviews, I choose to highlight the following aspects as they provide insight into the dual focus of this study, namely the way in which the teaching practices described here support second language learning and the learning of content through a second language. As far as managing subject content is concerned, Marlene adhered to CAPS in her planning, but was restricted by the learners' language and academic ability and their ability to maintain an adequate pace and extended concentration. On the whole, the lack of explicit and documented planning resulted in a lack of consistent lesson structure as well as transparent interactive scaffolding of lesson content. Although she divided the learners into groups, she practiced whole class teaching almost all the time with minimal attention to differentiated, individual teaching.

A further striking feature of her teaching practice was the fact that far more time was spent on explicit directive and regulatory discourse than on discourse aimed at the development of mathematics content knowledge. Generally, Marlene's handling of mathematics content displayed low levels of cognitive demand as she tended to concentrate mostly on calculational processes and recall of information. Scrutiny of the underlying mathematical principles which are characteristic of conceptual processes received little attention.

In the light of the learners' low levels of language proficiency Marlene provided high levels of explicit comprehensible input, but her approach to the facilitation of learner talk resulted in minimal learner language production. It was further noted that, while the classroom interactions were conducted in Afrikaans for the most part, Marlene encouraged learners to explain concepts and procedures to one another in isiXhosa when necessary.

6.2.2 Mediation strategies in mathematics teaching practices

This section reports on the way in which subject content was mediated by means of various teaching strategies. The term 'mediation' as it is used here is informed by sociocultural theory. It refers to the task of the teacher to link the learner, through collaborative thinking and the use of various 'tools' such as language and concrete objects, to the role of an apprentice in the learning of mathematics (Lantolf, 2000). In classes such as the ones described in this study which investigates the teaching practices of teachers who teach learners through a second language, the use of mediation is critical because of the considerable linguistic and conceptual distance between the teacher and learners (Gibbons, 2006).

In Tables 3 and 4 below selected excerpts, one from each of Marlene's three transcribed lesson (Appendix D1) are presented. The excerpts were chosen as suitable demonstrations of the ways in which mediation strategies were used in Marlene's mathematics teaching practices. Because of the interrelatedness of the strategies it was often difficult to isolate them from content and procedural actions. I discuss the strategies below, concentrating on their prevalence and purpose during the episodes that involve the teaching of mathematical subject content. Instances of the various strategies are coded by means of highlighting and a key to the coding is provided at the top of each table. The numbering of the lines in the table correlates with the numbering of the lines in the lessons in Appendix D1.

The most prevalent and consistent strategies noted in Marlene's teaching included repetition, rephrasing and mirroring. Further strategies included the use of modified language in the form of simplifications, the use of resources, metaphorical language connected to everyday concepts and, finally, questioning strategies.

Table 3: Marlene (Exemplar 1)

Repetition Rephrasing Simplification Mirroring Use of resources Metaphors

Lesson 1: 64- 74

64 T I want the place values, place value (emphasises) of the 1 in this case ...what is the value of 1?

65 Ls 100

66 T (points to the question on the board) You are going to give me the place value of each underlined number ...the number under which I have drawn a little line, yes? Then you are going to double it for me... now yesterday I saw someone's work... What do we do when we double? (points to the question on the board)

67 Ls Add the same number to it.

68 T You are saying it to me so nicely… add the same number… but Chloe, when I look at your books then you halve. Listen, when we double, then we are going to add the same number... when we halve ... what do we do then?

69 L Take away... (some exclaim to show that they disagree)

70 T Take away? We've just used the counting cards to halve (emphasises) we ...

71 L We divide by 2 ...

72 T We divide by 2... we give half of it... halve means to divide by 2 or to take half of it. Is that clear?

73 L Yes, Ma'am

74 T Now quickly take out your books ... we'll just take 10 minutes to finish the activity... you started writing yesterday, now quickly finish it...

Lesson 2: 26 - 48

26 T Now look at this number. (writes 97 on the board) What number do we have here?

27 Some learners say 97, some say 79.

28 T It is a 9 and a 7… not a 7 and a 9… so it is…?

29 L 97

30 T Right, if I have 110 and I add a 100… (waits) I do not just want to see three hands.

31 Ls 210

32 T And if I take away 1?

33 Ls 209

34 T Now add 20…

35 Ls (give different answers)

36 T How many? I have 209 and I add 20.

37 Ls 229

38 T Right, pack away your cards. I'm going to hand out the dice and we're going to play a game. (Teacher hands out dice to learners.) Now the game works as follows… you are going to ... with your partner you are going to... just one rule ... you are going to take the dice (teacher first uses Afrikaans word for dice and then English word),you are going to throw it in front of you, you're not going to throw it on the other table (emphasises and gestures) ... right? We throw our dice and when it falls on the 2, right, if you throw it and it falls on 2, it says that we have to make two rows ... (Teacher moves to board and draws to support explanation) so we will have two rows ... we are going to throw twice ... and if I throw it again and it falls on 5 ... 4 ... then it says that we are going to have 4 dots in each row I will say it again, if we throw the dice and it falls on 6 ... the first time I throw it ... and it falls ...on what did it fall?

39 Ls 5

40 T Then it says we should have 5 rows ... and when I throw again... and it falls on 6 ... what does it say? We have to have 6 in each row. Can we see that?

41 Ls Yes Ma'am.

42 T Can we see? Each one ... now listen carefully ... Thandokazi go first ... We play with our partner, we play in groups of 2, then Amjoli gets a chance. But you are not only going to give me the rows... you are also going to give me the calculation... (points to the top picture) How many rows do we have?

43 Ls 4

44 T No no , how many rows , how many rows ... how many rows do you see?

45 Ls 2

46 T I see two rows (Teacher writes on board: 2 X .) How many are in each row ... 4 ... (Writes it on the board) so my answer is how much? Count for me.

47 Ls 2,4,6,8

48 T So my answer is 8 ... (points to the next picture)

Lesson 3: 29 - 47

29 T Right, now we know it all has to do with time, not so? Time passing. It's all to do with time ... but when we have to read time ...we know the first thing we said ... there are two arms… two legs ... we call it the hands (Afrikaans: wyser), not so? The short hand and long hand ... which one did we say works the hardest?

30 Ls The long one ... (Some learners say the short one.)

31 T The long one... he's big so he has to do the most work ... the long hand is the minute hand .. he must quickly run down the minutes ... the short hand is the hour hand , he shows us what hour it is ... Now if my hands, both my hands sit on 12 hours ... what time is it ?

32 Ls 12 o'clock

33 T Right...12 o'clock. Now the hand has to walk right around… he must walk right around (emphasises) And if he walks around, we say it runs a full what?

34 Ls A full hour.

35 T A full hour. Right from the 12, right around ,Nomsa, to the 12, then it's a full hour. Now who can tell me, if it moves right around , how many minutes?

36 L1 24

37 T 24 minutes?

38 L2 60

39 T 60 minutes? How many minutes? Are you sure?

40 L3 12

41 T 12 minutes? Right, I said we count when we walk from the 12 to the 1... how many minutes?

42 Ls 5 minutes

43 T 5 minutes ... so from the 12 to the 2 ... how many minutes will it be?

44 Ls 10

45 T So let's see, how many minutes are in 1 hour? (indicates on clock while learners count)

46 Ls 5,10,15,20,25,30,35,40,45,50,55,60

47 T (indicates end of counting) Right, we have 60 minutes when we go from the 12 to the 12 again ... when the hand moves so (indicates)... now when the big hand…when the big hand moves (indicates) then it's 5 minutes ... Right, now we are going to use the clock on the board.

Repetition, rephrasing and mirroring

As noted in the five lessons observed and demonstrated in the table above, the most significant feature that was noted regarding Marlene's practice was her use of what Wong-Fillmore (1985) describes as 'explicit language' in the form of repetition, rephrasing of own statements and mirroring of learners' answers. The term 'repetition' here refers to instances where the teacher repeats words and phrases in a single communication or in related communications. 'Rephrasing' refers to instances where the teacher paraphrases her words by using similar words or simpler words. Rephrasing differs from 'recasting', which, according to Gass and Mackey (2006) refers to instances where the teacher reshapes the language used by learners in their responses. 'Mirroring', on the other hand, refers to instances where the teacher repeats the answer given by one or a group of learners. While all of these terms are related, they differ in terms of their function in the discourse between teacher and learners.

In all three excerpts quoted in the Table 3 provided above and in the lessons observed, Marlene used repetition to achieve specific aims. For the most part, Marlene used repetition to direct learners' actions (1:79; 1:89; 1:96; 2:38) and regulate behaviour (2:56-57; 3:4). In the latter she repeatedly referred to the required behaviour and to the consequences that misbehaving learners could expect, for example, "[I]f I have to speak to you and your partner and say don't make such a noise, then you and your partner are out of the game ... so if you do not want to be out then you have to say to Sandla 'keep quiet because I don't want to be out'" (2:56c-e). This type of repetition can be regarded as a way in which Marlene provided the learners with comprehensible input and therefore supported language development. Because it was seldom established how much of the repeated language was understood by the learners by, for instance, getting them to repeat the essence of the teacher's communications in their own words, it was not clear to an observer how effective Marlene's repetition of words and sentences had been.

In the instances where Marlene focused on mathematics teaching, repetition was used in a number of different ways. First she used it for emphasis, for example, "I want the place value, place value of the 1 in this case… what is the value of 1?" (1:64). Marlene often supported the repetition by alerting learners to the fact that they needed to pay attention (1:68e) and by speaking slowly and putting emphasis on the key words such as 'place value'. This pattern was also noted in Lesson 2 where Marlene drew attention to the repetition of explanations: “I will say it again, if we throw the dice and it falls on 6…” Similarly, in Lesson 3:29 Marlene signalled the focus of the lesson and drew the learners’ attention to important concepts: “Right, now we know it all has to do with time, not so? Time passing... It’s all to do with time…”

It was noted that, while Marlene often repeated concepts and procedures (2:44-56; 2:59; 2:110; 3:99), the concepts and procedures were seldom further defined and clarified, nor the learners’ understanding verified. As a consequence, the repetition did not seem to be optimally effective for the building of conceptual knowledge, especially in the light of the following comment made by Marlene (1:68) about the learners’ confusion regarding halving and doubling, “You are saying it to me so nicely… add the number… but Cherine, when I look at your books then you halve.”

While the instances of rephrasing of sentences were not as common as instances of repetition, Marlene used rephrasing on a number of occasions to define or explain a concept or procedure in more than one way, for example, “You are going to give me the place value of each underlined number ...the number under which I have drawn a little line, yes?” (1:66-67). The paraphrasing often, as in the case quoted above, involved simplification and the use of everyday language in cases where Marlene had used more formal language such as the word “underlined”. Sometimes, rephrasing was used to provide instructions such as the case in point. Further examples where rephrasing was used to ensure clarity of instructions included the following, “We play with our partners. We play in groups of 2” (2:42c). At other times rephrasing served to elaborate a mathematical concept by providing the learners with an alternative description. For example, as indicated in Table 3 above, Marlene used rephrasing in discussing halving. She said, “[W]e give half of it... halve means to divide by 2 or to take half of it.” In this communication, Marlene paraphrased the mathematical term using two alternative descriptions to clarify its meaning.

As the colour coding in the table above indicates, Marlene regularly responded to learners’ answers by mirroring their answers (1:68; 3:35, 3:43, 3:71). In Lesson 1:68, for example, Marlene confirmed the learners’ explanation of the term doubling by mirroring it, “add the same number to it”. In the same set of interactions a further use of mirroring was noted. When Marlene proceeded to a next concept, namely the term halving, she signalled an incorrect answer by presenting the mirroring in the form of a question: “Take away?” The learners seemed familiar with her signal and one of the learners responded to the cue by offering an alternative answer which was then again confirmed through the use of mirroring. It was also noted, for example in Lesson 3:31, that Marlene’s mirroring of responses sometimes served to confirm that the correct answer had been given in a situation where learners felt uncertain. She also often expanded the learners’ answers to a fuller form, as the following interaction (1:16-22) indicates:

16 (T Right, let’s stop there. Right… I have 63… how much will 3 more than 63 be?
17 Ls (hesitate)
18 T What are we going to do?
19 L1 Take away.
20 T Are we going to take away?
21 L Add (Afrikaans: Sit by…)
22 T Yes, we’re going to add... So what is 3 more than 63?

Simplification

Simplification is a type of adjusted language that is not easily isolated, as it occurs in the way in which teachers fine tune their level of language to ensure that it will be accessible to their learners (Gibbons, 2006). In an interview, Marlene indicated that she was often aware of the need to break down language as well as mathematical content into more simplified, and therefore manageable, units. She said,

> In the maths class I read instructions, then I show an example of what I'm talking about. Like today we did ‘more than’ and ‘less than’. Then I’ll ask them, what other name is there for ‘more than’ and then they say ‘add to it’ and for ‘less than’ they will say ‘take away’. We need to simplify it into a language that will help them to understand plus and minus. This is basically what we are doing in maths.

Simplification occurred in a number of different ways. In Lesson 1:72, for instance, Marlene’s description of the process of halving includes the following simplified form: “…take half of it”. Marlene’s use of simplification involved short sentences and simple words supported by repetition, an emphatic way of speaking and writing on the board, as the following excerpt (2:56) demonstrates,

> T (writes) So my answer is 30 . So that's what we will be doing today. We are just going to practice ... you are going to give me the rows ... we're just going to try a few times ... I'll give you a piece of paper...for you and your partner ... the rules ... the rules are ... Peter ... if I have to speak to you and your partner and say don’t make such a noise , then you and your partner are out of the game ... so if you do not want to be out the you have to say to Sandla ' keep quiet because I don’t want to be out. We are not going to shout... we are going to play together... we are not going to throw our dice close

to Avile... or on the ground ... And when we're done , then each group 's dice must come back ... we are not going to put it in our pocket and think we will go home and play with it, right? I want it back.

Instances were noted where simplification was used to support thinking, as is shown in the following excerpt where Marlene guided a learner to work out the answer to a multiplication sum,

78 T 9 ... Lulama , 4 times 5 ... (waits) 4 times 5? (waits) Have you counted correctly?
79 L8 20
80 T Shhh, is your name Lulama? Is your name Lulama? 4 times 5, Lulama ? ... Count in 5s for me ... and you ... Subenathi (teacher gestures, counting on her fingers) 5s ... how many should I add? How many 5s can you count?
81 L9 Four 5s .
82 T Four 5s ... now count four 5s for me, you two... (waits) How many 5s can you count Lulama? Count for me… how many 5s? I can count four 5s... count for me, multiples of 5 ... 5 ...

While the simplified language in the example above served to mediate the learners’ calculational and procedural skills, it was found that, on the whole, the simplification seldom focused on making conceptual higher order thinking more accessible. Such simplification of language, it can further be said, served to provide learners with comprehensible input, but it did not facilitate the type of active learner participation and exploratory talk that, according to Mercer (1985), is necessary for further language and content development.

Use of resources

Consistently across all five mathematics lessons I observed, Marlene created context-embedded learning environments with concrete and semi-concrete resources supporting her teaching. As far as concrete support for counting activities was concerned, the learners were provided with flard cards, counting cards and counters. Marlene also used demonstrations by, for instance, writing or drawing on the board while explaining a concept. Regarding this practice Marlene explained that she often made use of pictures drawn on the board to support mathematical thinking,

> In situations where the learners battle with understanding the language, like in word problems, I would say, let’s draw the picture. I will read and then I will draw and ask them, if they tell us there are 6 trees with 11 oranges in each tree, how many trees should I draw and how many oranges on each tree? I need to break it down so that they can understand. I ask questions and they must come with the answers.

This practice was confirmed during class observations, as the following photographs of Marlene’s support for concept reinforcement in Lesson 3:45-47 illustrate.

Figure 8: Use of resources in Marlene's class

In Lesson 2, for instance, Marlene drew the rows of dots on the board while she explained the procedures required during the dice game. In Lesson 3, she used both the clock and the clock drawn on the board to support the discussion of analogue time. In a similar way Marlene used resources to provide support when learners were unsure of an answer. She reverted back to a concrete demonstration of a concept. For example, in Lesson 3:186, she guided the learners to count the minutes using the clock. In another example in Lesson 3:45-48, she proceeded to discuss the concept of 'half an hour to' and 'half past' by moving from the concrete clock to the semi-concrete clock drawn on the board. Further examples of semi-concrete support for an explanation include the explanation of multiplication steps in Lesson 2:16-19 and Lesson 2: 114-118.

It was noted, however, that this strategy was not consistently applied. Lesson 1:66, for example, where Marlene explained the term 'doubling', the only support she provided consisted of pointing at the questions written on the board. It could be said that, while the facilitation of a movement towards developing the learners' ability to perform context-reduce tasks of increasing levels of abstraction is, according to Cummins (1996), the goal of all teachers and in particular the teacher who teaches through a second language, this required a careful process of scaffolding and is a process not served by inconsistent handling of abstraction.

The use of metaphoric language

A further strategy which, although not widespread in the observed lessons, was of interest as a way of developing language and thinking was the use of metaphoric language. This manifested in the ways in which Marlene linked everyday language and everyday concepts with academic language and concepts. In Lesson 3:29c-33 in Table 3 presented above Marlene discussed the function of the two hands on the analogue clock, using the metaphor of a body with "two arms… two legs" that moves, walks and indicates time. She set up associations relating to differences in movement to support teaching of the movement of the long hand and the short hand. This metaphor was sustained throughout the lesson with references such as, "Right, I said we count when we walk from the 12 to the 1…" (3:41) and "…remember I said that the long hand tells us what we need to do ... we need to look at what the long hand does in order to tell us the time... if he is lying on the 3, what did we just say, what is it?" (3:99). Towards the end of the lesson Marlene developed the metaphor further by referring to an association with one of the learners in the class who is short and also moves slowly,

> T Half past 12... remember the short hand... as the long hand moves, so does the ... what did I say ... who's the short hand here in class? The short hand moves slowly… and he moves so slowly? We all know... so you must always remember the short hand moves slowly, the long one moves faster ...

It was noted that when Marlene, in the following instance, focused on the use of mathematical language, she linked the concrete, metaphoric example, with the mathematical terminology:

> T There are two arms… two legs ... we call it the hands (Afrikaans: wysers), not so? (3:29)

The way in which metaphorical language was used here provided the learners with language and thinking support in the way it linked everyday concepts and language with academic concepts and language. It has to be said, however, that learners were not encouraged to take an active part in the verbal exploration of the link between language and thinking.

Table 4: Marlene (Exemplar 2)

Questioning

Lesson 1: 64- 74

75 T I want the place values, place value (emphasises) of the 1 in this case ...what is the value of 1?

76 Ls 100

77 T (points to the question on the board) You are going to give me the place value of each underlined number ...the number under which I have drawn a little line, yes? Then you are going to double it for me... now yesterday I saw someone’s work... What do we do when we double? (points to the question on the board)

78 Ls Add the same number to it.

79 T You are saying it to me so nicely… add the same number… but Chloe, when I look at your books then you halve. Listen, when we double, then we are going to add the same number... when we halve ... what do we do then?

80 L Take away... (some exclaim to show that they disagree)

81 T Take away? We've just used the counting cards to halve (emphasises) we ...

82 L We divide by 2 ...

83 T We divide by 2... we give half of it... halve means to divide by 2 or to take half of it. Is that clear?

84 L Yes, Ma’am

85 T Now quickly take out your books ... we'll just take 10 minutes to finish the activity... you started writing yesterday, now quickly finish it...

Lesson 2: 26 - 48

49 T Now look at this number. (writes 97 on the board) What number do we have here?

50 Some learners say 97, some say 79.

51 T It is a 9 and a 7… not a 7 and a 9… so it is…?

52 L 97

53 T Right, if I have 110 and I add a 100… (waits) I do not just want to see three hands.

54 Ls 210

55 T And if I take away 1?

56 Ls 209

57 T Now add 20…

58 Ls (give different answers)

59 T How many? I have 209 and I add 20.

60 Ls 229

61 T Right, pack away your cards. I’m going to hand out the dice and we’re going to play a game. (Teacher hands out dice to learners.) Now the game works as follows… you are going to ... with your partner you are going to... just one rule ... you are going to take the dice (teacher first uses Afrikaans word for dice and then English word),you are going to throw it in front of you, you’re not going to throw it on the other table (emphasises and gestures) ... right? We throw our dice and when it falls on the 2, right, if you throw it and it falls on 2, it says that we have to make two rows ... (Teacher moves to board and draws to support explanation) so we will have two rows ... we are going to throw twice ... and if I throw it again and it falls on 5 ... 4 ... then it says that we are going to have 4 dots in each row I will say it again, if we throw the dice and it falls on 6 ... the first time I throw it ... and it falls ...on what did it fall?

62 Ls 5

63 T Then it says we should have 5 rows ... and when I throw again... and it falls on 6 ... what does it say? We have to have 6 in each row. Can we see that?

64 Ls Yes Ma’am.

65 T Can we see? Each one ... now listen carefully ... Thandokazi go first ... We play with our partner, we play in groups of 2, then Amjoli gets a chance. But you are not only going to give me the rows... you are also going to give me the calculation... (points to the top picture) How many rows do we have?

66 Ls 4

67 T No no , how many rows , how many rows ... how many rows do you see?

68 Ls 2

69 T I see two rows (Teacher writes on board: 2 X ...). How many are in each row ... 4 ... (Writes it on the board) so my answer is how much? Count for me.

70 Ls 2,4,6,8

71 T So my answer is 8 ... (points to the next picture)

Lesson 3: 29 - 47

29 T Right, now we know it all has to do with time, not so? Time passing. It's all to do with time ... but when we have to read time ...we know the first thing we said ... there are two arms… two legs ... we call it the hands (Afrikaans: wyser), not so? The short hand and long hand ... which one did we say works the hardest?

30 Ls The long one ... (Some learners say the short one.)

31 T The long one... he's big so he has to do the most work ... the long hand is the minute hand .. he must quickly run down the minutes ... the short hand is the hour hand , he shows us what hour it is ... Now if my hands, both my hands sit on 12 hours ... what time is it ?

32 Ls 12 o’clock

33 T Right...12 o’clock. Now the hand has to walk right around… he must walk right around (emphasises) And if he walks around, we say it runs a full what?

34 Ls A full hour.

35 T A full hour. Right from the 12, right around ,Nomsa, to the 12, then it's a full hour. Now who can tell me, if it moves right around , how many minutes?

36 L1 24

37 T 24 minutes?

38 L2 60

39 T 60 minutes? How many minutes? Are you sure?

40 L3 12

41 T 12 minutes? Right, I said we count when we walk from the 12 to the 1... how many minutes?

42 Ls 5 minutes

43 T 5 minutes ... so from the 12 to the 2 ... how many minutes will it be?

44 Ls 10

45 T So let's see, how many minutes are in 1 hour? (indicates on clock while learners count)

46 Ls 5,10,15,20,25,30,35,40,45,50,55,60

47 T (indicates end of counting) Right, we have 60 minutes when we go from the 12 to the 12 again ... when the hand moves so (indicates)... now when the big hand…when the big hand moves (indicates) then it's 5 minutes ... Right, now we are going to use the clock on the board.

Questioning

As a practical measure I present the high number of instances of questioning strategies in a separate copy (Table 4) of the exemplar used earlier as Table 3. In this section Marlene's use of questions in the mediation of mathematics is discussed. I refer to patterns noted in all five lessons observed, with special reference to the evidence highlighted in Table 4.

In the first instance, it would seem that Marlene used questions to regulate behaviour. She used, for example, rhetorical questions such as the following to direct and discipline learners: "Is it Phumzi and the others who are talking? Sipho and them? (1:12) and "Don't use your finger… count faster… are you ready to fall asleep?" (2:26) In cases where Marlene focused on mathematics, she also sometimes used rhetorical questions to, for instance, check whether the learners followed the line of thinking or understood her explanation. In Lesson 1:66:b, for example, she asked "…the number under which I drew a little line, yes?" and in Lesson 348, as quoted above, she asked, "[w]e call it the hands (Afrikaans: wyser), not so?" In a similar vein it was noted that Marlene used questions such as "Is that clear?" to which the learners merely responded "Yes Ma'am". Such questions yielded no real feedback regarding learner understanding and little opportunity for learner talk. It was noted that Marlene often did not wait for a response when she posed such questions.

In other interactions that involved content development, Marlene mostly made use of simple display questions such as "what is the value of 1?" (1:64) that required monosyllabic answers of a cognitively undemanding level. Most of the IRF display questions, as the following ones from Table 4 show, were used to check whether the learners understood what was written on the board ("How many rows do you see?") or of testing the learners' basic computing skills ("How many? I have 209 and I add 20"). One implication of the use of such display questions asked in quick succession was that learners were not provided with a 'quiet period' in which to think about the question and consider possible answers. Such a quiet period is also, according to Johnson (2001), an essential precondition in the process of learning a second language. Like children learning a first language, second language learners need a chance to internalise language after listening and before speaking.

A further pattern that was noted in all the lessons observed was the formulation of a question in the form of an answer with only the key information left out. The learners then provided the part to which Marlene added the words necessary to complete the sentence, for instance in Lesson 3:33-34:

T And if he walks around, we say it runs a full what?
Ls A full hour.

While such instances were aimed at supporting the learners' language use and guiding their thinking, it did not necessarily provide opportunities for extended language production. A similar use of questions that did not encourage learner talk and independent thinking was noted where Marlene posed a question and then provided the answer as well. In Lesson 3:81 she asked the learners what the term 'symmetrical' meant and then proceeded to give the answer as well:

T What does symmetrically mean again? The one side ... looks ...
Ls Exactly...
T Looks exactly like the other side.

Marlene's questioning, on the whole, required low levels of cognitive engagement, as the following example in Lesson 2:142-153 demonstrates:

T 6X5 times ... how many dots am I going to put in the first triangle?
L1 1
T 1?
L2 5
T I am going to put 5, because it says I must count 5 times 6 times... so I'm going to have 5 triangles... 5 dots in the first triangle. So that means I have to count in multiples of what?
L 5
T We count...
L 5,10,15,20,25,30.
T But my sum is still not finished. What should I do? What should I add?
Ls 10
T I should add another 10. So my answer is going to be ...
L 40

This practice can be linked to Marlene's perception (referred to earlier) that, apart from a lack of oral confidence, the learners also experienced a lack of mathematical confidence. The section on learner talk reported on the fact that Marlene found these levels to be low and therefore tried to support the learners' responses as much as she could. Marlene's use of mostly whole class teaching and the fact that the learners seemed to lack confidence to speak in front of the whole class, acted as further factors that affected the way in which questioning was handled in this class. It was noted that Marlene sometimes gave long explicit monologues to explain procedures (Lesson 2:38) without the use of questioning or other strategies to determine whether the learners understood her explanation.

This pattern of providing language and mathematical support and breaking down the processes into smaller units through questioning was noted in all five mathematics lessons observed. As the lessons progressed and as content of a higher cognitive level were used, the questions continued to fulfil a supportive function. In Lesson 3:130-143, for example, a set of connected questions were directed at the whole class to guide the learner's thinking regarding analogue time:

T Half past 3... so when the long hand lies on the 3, then we say what?
Ls Quarter ...
T Quarter what?
Ls Quarter ..(not sure)
T Ouarter to or quarter past?
Ls Quarter past
T Quarters past. So the time is now ... (showing quarter past 12)
Ls Quarter past... (learners all give different answers)
T Quarter past ... ?(not giving answer)
L Quarter past 3
T Quarters past 3? No, Cherine , now ... you're just guessing…Cherine, look at the clock and tell me what time is ... where is the little one ...
Ls On the 12
T On the 12... So we say it is ...
Ls Quarter past 12

With regard to the distribution of questions, it was noted during the lesson observations that most of the questions were addressed to the class as a whole rather than to individuals. The implication of this was that some learners were able to stray in and out of attention without being detected. If one were to judge the extent to which Marlene' questions supported language development and mathematical proficiency, one would have to conclude that, while they served to support and guide the learners, they were not focused on optimally developing language skills through interaction and a conceptual understanding of subject content.

In summary, Marlene's mediation strategies during mathematics lessons can be described as follows: Marlene used high levels of explicit language, but it was noted that the use of repetition was focused mainly on the directing of actions and regulating of behavior. Marlene's explicit use of language provided the learners with important comprehensible input, but the encouragement of learners' reflection on repetition that focused on mathematics teaching and language construction was not foregrounded by her. It was further noted that limited attention was given to verifying whether the message had been understood. Rephrasing of academic language also provided comprehensible language input and served as a key method of modelling the use of everyday and academic language and establishing a link between the two. Learners were, however, not explicitly alerted to the use and link between these registers and the function of each. Instances of overt recasting of learner language were found to be minimal. Mirroring provided confirmation to the learners regarding their responses.

Marlene expressed an awareness of a need for simplification of language and concepts for her class and she simplified her language by using short sentences and simple words. Simplification supporting thinking, however, remained on a low level of cognition and did not facilitate active learner participation.

Marlene made regular use of concrete and semi-concrete support for teaching and context-embedded support for language and thinking. Her use of metaphoric language was noted as a further method used to link everyday concepts with mathematical concepts, particularly relating to measurement and time.

As far as the use of questioning was concerned, Marlene used a high number of rhetorical questions which yielded no feedback about learner understanding and did not offer opportunities for language production. The majority of questions were simple display questions requiring short answers of a cognitively undemanding nature. On the whole it was found that Marlene's mediation strategies involved the offering of large amounts of extended language, but did not optimally facilitate the development of learner language construction.

6.3 Anine (Park High)

6.3.1 Conditions shaping mathematics teaching practices

The data gathered from the observations in Anine's class during the period 16 October to 13 November 2012 and from interviews with her conducted on16 November and 22 November 2012 provided insight into the conditions that shaped her teaching practice.

6.3.1.1 Managing the content and pedagogical process

This section includes a discussion on Anine's teaching with reference to her planning and structuring in terms of mathematical aims and outcomes, the focus and logic of lessons as well as the duration, sequencing and the level of signalling that was perceived in the lessons.

Planning for teaching

In an interview, Anine indicated that she closely followed the CAPS guidelines regarding the mathematics subject content, prescribed lesson format and time frame. She described her approach as follows:

> I plan and design maths lessons on a daily basis and the CAPS gives a clear indication of the concepts and skills that need to be covered and how they can be taught. But I do shift more challenging concepts like time to the end of the year so that the learners might understand it better. For the specific content of my lessons I use a variety of text books to get suitable activities.

I observed the documentation of Anine's yearly to daily planning during my field work and it was noted that she regularly referred to the planning schedule during lessons. The schedule seemed to allow for flexibility as, on occasion, it was noted that she changed and adapted details while teaching (2:138). Further evidence of Anine's planning of lesson content ahead of time was noted in the way she wrote work on the chalkboard and whiteboard before the start of Lessons 2 and 3.

Anine indicated that her daily planning was largely influenced by the feedback she received about the learners' progress when she marked their class work and homework. In this regard she explained that she found reflecting on previous lessons important. "I reflect a lot on my teaching but I don't document it formally. I just do it and it comes quite spontaneously when you see a strategy didn't work. If you see you don't get results, you try something different. I do that quite often in my planning." This approach was noted in, for instance, Lesson 3:218 when Anine said, "There are just a few things that I saw yesterday… you did strange things in your books." Anine furthermore indicated that she kept a formative assessment record of all the learners' progress and used it to inform her planning. For this purpose she made use of the Via Afrika assessment schemes which she photostated and pasted into her assessment book.

Goals and objectives

It was noted that, because the lessons I observed appeared to be planned, they displayed general outcome-orientated goals and specific lesson objectives. Apart from the usual goals such as developing computing skills and fluency, the main general goal, it was noted, was the development of conceptual discourse and the internalising of conceptual patterns and strategies. Anine regularly made reference to, for instance, strategies for doing division: first break up the given number into smaller numbers, find ways of simplifying the calculation, as the following quotes from Lessons 1 and 2 demonstrate:

> And what is the easy sum for half of 500? (1:69)
>
> 72 divided by 3... I'm going to use numbers that are easy for me to divide by 3. (1:108)
>
> Now when you do a division sum, then it is the easiest to take out that 30... you do know what is 30 divided by 3, right? (1:148)
>
> T So what's the easiest way - without thinking - to divide by 3? (2:4)
>
> T What is the secret to these sums? Can you take a number of which you do not know the answer? (2:12)

As far as the objectives of specific lessons were concerned, Anine described her approach as follows: "I indicate to myself what goals I want to achieve in a lesson. I will think of my aim, for example, that at the end of the lesson the learners must be able to understand division better." While Anine took pains to clarify these objectives in her own planning, it was noted in the mathematics lessons observed that the focus and logic were not always explicitly communicated to the learners during the lessons.

Focus, logic and transitions in lessons

Anine's structuring of lesson episodes in terms of focus and logic displayed a measure of coherence. As mentioned above, focus in this instance refers to the content focus as it relates to the content areas stipulated in the curriculum for mathematics. Logic, as indicated, refers to the way in which concepts and procedures relate to one another within the various lesson episodes. For the sake of clarity I have coded my division of episodes within the three lessons that are presented in Appendix D2 in different colours and I also provide the following overview of the episode sequences with a short summary of the content of each episode:

Lesson 1

Episode 1	Lines 1-44 Counting activity and then demonstration of adding and subtracting sums (whole class at desks)

Episode 2 Lines 45-162 Halving/division, multiplication, division (Group on mat)

Lesson 2

Episode 1 Lines 1-37 Reviewing division and then doing division sums (whole class and pairs at desks)

Episode 2 Lines 38-154 Adding and division using dice and then breaking up of numbers and then problem sum involving division (group, pairs and individuals on mat)

Lesson 3

Episode 1 Lines 1-116 Counting activity and then reviewing of concepts relating to time (whole class on the mat)

Episode 2 Lines 117-220 Analogue and digital time (whole class on the mat)

Episode 3 Lines 221-246 Speed exercise writing down digital times (whole class at desks)

Episode 4 Lines 248-328 Reviewing division and then problem sum involving division (group on mat)

It was noted in all five lessons observed that no explicit indication regarding the lesson focus was given to the learners, but there seemed to be a measure of implicit coherence between certain activities in the lesson episodes. In Lesson 1: 1-11, for example, the learners started with a mental maths activity and then were asked to proceed to a written exercise involving speed counting in multiples of 3. In the second episode (1:88-109), after concluding an activity involving adding and subtracting, Anine focused on the use of multiples of 3 again in the second episode in lines 88-109. The impression was created that, while the lesson procedures involved a number of different foci, for example adding, subtracting and division, a thread involving working with multiples of 3 in these calculations was noted in both Lessons 2 and 3, a strategy which ensured a measure of coherence.

In Lesson 3, where the focus was on matters relating to analogue and digital time, a similar thread involving the number 5 was noted. Anine gave particular attention to the rationale behind focusing on multiples of 5 when reading analogue time:

117 T (uses clock) It's a quarter past 11 ... When we count time, in which multiples do we always count... Think carefully… What pattern?
118 Ls In 5s
119 T We count in 5s... Why do we count in 5s?
120 L Because there are 5 lines between the numbers.
121 T Let's see if she is right ... 1,2,3,4,5 ... so that's why we count in 5s ...

During the lessons that were observed, a consistent pattern of transitions between lesson episodes was noted. The transitions all involved movement to or from the mat and while the learners seemed familiar with these transitions and with the roles that they needed to fulfil as participants, the relevance and the rationale regarding the shifts in content development were seldom explicitly stated. In Lesson 1:45-54, for instance, learners moved to the mat and received directions about what to write and which mathematics actions to perform without any initial reference to the reasons for these actions. During the introduction of written tasks in, for instance, Lesson 2:123, learners also did not always receive explicit explanations about the underlying motivation for these tasks.

Lesson duration and use of time

In the mathematics lessons that were observed approximated the guidelines provided by the class timetable. While the lesson times were not rigidly fixed, the lessons never started later than 08:45 and always ended at 10:00 with the start of break time. It was noted that Marlene adhered to the timetable division of 30 minutes whole class teaching followed by a group work/desk work phase of an hour.

Sequencing the process and content

As indicated above, sequencing refers to processes and procedures by which content knowledge is built up within a lesson episode or in the sequence of lesson episodes in a lesson. It was noted in all five lessons that while Anine seemed to have a clear idea of how lesson content was to be sequenced during a lesson, explicit explanations of the nature of and rationale behind the sequencing were limited. At the end of Episode 1 of Lesson 1, for example, Anine indicated that the episode had come to an end and she then briefly gave instructions about what actions and movements the next episode would require. Anine then began the group work session with an activity that involved the breaking up and halving of a number (1:45), but with little explanation about how its content related to that of the previous episode. A similar pattern was noted in the transition to the next episode in Lesson 2:38-42 and Lesson 3:117 and Lesson 3:221.

Signalling what to expect

As indicated above, while the learners received signalling regarding the required actions, explicit signalling was not always provided regarding the subject content learners would encounter in a specific lesson episode. In Lesson 2:2, the focus of the lesson was signalled in the following manner: “Now we have in the last while been practising our division sums…” After explaining to the learners that they were going to work in pairs to solve division sum, Anine reminded them of the procedural strategies that needed to be followed, namely to focus on principles such as “what’s the easiest way” or “what is the secret to these sums?” While no explicit signalling was made at the start of Lesson 3 regarding the lesson focus, the display of digital times on the whiteboard and the introductory counting exercise involving time served as implicit indicators about what the lesson content that learners could expect.

The work that Anine wrote on the board before the start of the lesson could also be regarded as implicit signalling about what the learners could expect in a specific lesson or lesson episode. As the transition from one body of content to the next usually involved movement from or to the mat, this provided information about the type of content that can be expected, but it was noted that Anine did not explicitly indicate what the specific subject content of the next episode would be.

6.3.1.2 Managing learners

A striking feature of Anine’s classroom management during the mathematics lessons that I observed involved a consistent adherence to routine and structure. The structure consisted of a system according to which whole class teaching switched to small group teaching and desk work. The organisation was done in such a way that group teaching and desk work activities could take place simultaneously without a major interference from either. The learners were familiar with the routines of the system and followed them closely. The result was that very little time in the lesson was taken up by overt management of learners. The routines that were observed did, however, also display a measure of variation. Anine explained it as follows,

> I try to bring variation into each lessons, otherwise they get bored. I regularly use mat work for the different subject, but I try to vary it, because the time on the mat sometimes gets too long for the children. If I see it’s something that I do not have to do on the mat, we go to the tables. I also do not want the learners to move around too much. It all depends on what the day looks like. With maths I usually start on the mat because the

> whole class needs to be on the mat for 5-10 minutes to count and for other things that I need to do with the whole class.

Variations were noted regarding the sequencing of routines and the positioning of learners. In Lessons 1 and 2, for instance, Anine started the mathematics lesson with a whole class activity at the desks. After this, a group of about eight learners was selected to work with her on the mat while the rest remained at their desks to complete a written task in their classwork books. Lesson 3, on the other hand, started with a whole class counting and mental maths session on the mat focusing on concepts of time. She then sent the whole class to their desks to do a related exercise involving the speed writing of digital times. After concluding this activity, Anine wrote a set of exercises on the board. She discussed the exercises with the learners and then selected a group to work with her on the mat.

Differentiation and group work

As far as the grouping of learners was concerned, Anine indicated that the class had been loosely divided into ability groups for reading and mathematics group work on the mat, but that the learners at the desks were not organised according to ability. She also indicated that she did not make use of fixed groups with specific names, but selected a group of learners for mat work based on her regular assessment of their performance in written and oral tasks. She said,

> In activities where everyone is not on the same level, I select groups for a specific purpose. I will, for example, put learners together on the mat who made similar mistakes in the work I marked on the previous day. Then I will draw their attention to the mistakes so that they won't make them again. Then we'll go to the desks for a further whole class activity.

As the quote above suggests, Anine often made use of mixed ability groups, especially where pair work was concerned. She found this strategy to beneficial for weaker learners with challenging work such as division. She said,

> I put a stronger learner next to a weaker learner and then, before they write, they both need to be sure about what they have to write. I have found, after such a session, that when the learners have to work on their own, there are definitely fewer learners who battle with that work.

It was noted in a number of lessons observed that pairs at the desk and on the mat were required to collaborate and discuss their solutions with one another. In Lesson 2:27 Anine gave the following instruction, "You are going with your friend... you are going to discuss... to explain what you are going to write… and then you write together what you have spoken about. You are going to work out this division sum together for me.” Learners then proceeded to work in pairs. It was noted that the isiXhosa-speaking learners who worked together in pairs, were proficient enough to speak mostly Afrikaans to one another during these activities.

As mentioned above, a prominent feature of Anine’s group management was the use of pair work. This was a strategy used during whole class teaching as well as group work on the mat. The use of pair work was partly dictated by the layout of the classroom. The rows of desks did not provide an ideal arrangement for working in bigger groups, but the fact that pair work was also used as a strategy on the mat as well indicated that this was a method Anine preferred. Reiterating her approach, she explained:

> I often put weaker learners with a stronger learner so that they can learn from one another and before they write, both must know what they’re going to write. I have found after such a session they don’t battle as much.

In one of the observed lessons in which this strategy was used, the pairs were asked to explain on the board what calculation they had decided upon. According to Anine, the learners responded positively to joint activities, “They enjoy it. It is something that allows them to become actively involved. They don’t just have to sit and stare at the board. Otherwise they quickly get bored.”

Nature and extent of teacher talk

As indicated above, the establishment of a social order in a classroom involves the type of behaviour the teacher expects from the learners during a lesson. As far as the expected behaviour regarding which languages are to be used in the classroom, it was noted that Anine spoke only Afrikaans during lessons and she encouraged learners to do the same. She explained, “When I hear the learners speak Xhosa in class, I will tell them that they get enough practice speaking Xhosa at home and that I want them to improve their Afrikaans. That is what I do and it works.” While this practice was not witnessed during my class observations, Anine indicated that she often asked learners to provide the isiXhosa version of a term. She said, “Yes, I do it quite often. I would ask them what the word is in Xhosa. That is what I do when I see that some of the learners do not understand.”

Because Anine regarded the Afrikaans proficiency of the majority of isiXhosa-speaking learners as adequate, she spoke to the class without much attention to explanations of language. It was also noted that, while teacher talk formed a dominant part in classroom discourse, regular instances of turn taking took place, as is demonstrated in the following excerpt from Lesson 2:128-137,

> T Six. How many bags will he need for all those oranges? (draws on the whiteboard) Imagine this is a pile of oranges… How many bags is he going to need for the 153 oranges? How many fit into a bag?
> Ls Six
> T So, it is going to be a multiplication sum?
> L1 6 times 153
> T Okay so you want to tell me you are going to multiply 153 oranges by 6?
> L2 No, it's a division sum, Ma'am.
> T It's a division sum ... but what kind of a division sum? What is it going to look like?
> L3 153 divided by 6
> T Yes, Ilona is right, because I want to know how many 6s... how many piles of 6s I can take out of 153... (writes and uses gestures) Didi you hear that? We want to know how many bags of 6 we can take out of this pile... so what is my sum going to look like?
> Ls 153 divided by 6

No serious language barriers were observed on the part of the learners during my lesson observation and, as a result, the focus was on teaching mathematics rather than on teaching language. The use of strategies such as repetition and rephrasing were aimed at strengthening maths proficiency rather than language proficiency and these strategies will be discussed in greater detail below.

- *Talking to direct actions*

It was noted during my class observations that much less time was spent on the directing of actions than on subject concept development. Because the routines were familiar and predictable to the learners, they performed actions with minimal prompts from their teacher. Rather than control general actions about what to write and how to do it, the majority of Anine's directions were aimed at guiding learners' actions relating to mathematics. She provided concise directions before the lesson transitions, for instance: "Okay, so it's an addition and subtraction sum… you do it every day in your workbook and you do it for homework… right, take out a book for me to keep your work closed." (Lesson 1:33). Only a few instances of extended directions were observed, of which the following at the beginning of Lesson 1:7 was the longest:

> Now we are going to do another exercise. You're going to have to think carefully. Write the date and draw a line and then you stop talking. You write the date. 17 October. Good, are you ready? You are going to count in 3s for me… again… and write it as fast as you can… and today we're going to start at 3… You are going to see how fast

and how far you can count… but today I'm going to give you two minutes. You're going to see if you've made any mistakes and we're going to see counts the furthest. Write down 3 for me and fold your arms. (Looks at the wall clock) On your marks, set, begin!

- *Talking to regulate behaviour*

It was noted during the observed lessons that disciplining of learners during instructional phases seldom occurred, even during whole class work. This could also be attributed to the highly structured organisation of proceedings. The learners displayed high levels of self-regulation during both whole class and group teaching. It was noted that while Anine worked with groups on the mat, the rest of the learners completed individual desk work in an unsupervised manner. The only times Anine moved from the mat to the learners at the desks were, for example, in Lesson 1:46-48 when they requested help with mathematics or, for example, in Lesson 1:46-48, with emotional matters:

> T (checks to see whether learners got the correct answer) Good…now I want to do multiplication and division that I am sure you…
> L (from the desks) Ma'am, Rene is crying…
> T (walks over to the learner who is crying and addresses learners on mat) The children on the mat, write down for me as many as possible multiplications by 3 sum and their answers…as many as you can…you don't need to use your ruler…

The disciplining methods that Anine applied included a firm tone of voice, a loud sh-sound and sometimes a pause as she waited for silence before continuing. She gave regular and concise reminders regarding expected behaviour, such as "don't shout out" and "put up your hand" when learners were bidding to answer. She also reminded learners, especially at the start of the instructional phases, what the required behaviour was: "Xoli, sit up straight for me... with your feet together and your hands at your book" (Lesson 1:40). As the learners seemed familiar with the class rules and adhered to them quite readily, the regulating of behaviour did not appear to interrupt Anine's teaching.

- *Talking to develop content knowledge*

As noted above, the majority of time in the lessons that I observed was spent on developing content knowledge. Anine's communications were focused on teaching mathematics. In the three lessons displayed in Appendix D2, it was noted that Anine concentrated on calculational and procedural discourse, but also on conceptual discourse in which the underlying reasoning in calculations and procedures was explored. Her approach involved, for example, regular reminders to use strategies to simplify calculations. One example pertaining to division, for instance, was the constant reminder in Lesson 2:2c-12 to break down bigger numbers into simpler numbers:

2 And there are different ways in which we can break up 135 to divide it by…? (checking whether they are concentrating)
3 Ls 3
4 T So what's the easiest way - without thinking - to divide by 3?
5 L1 100 ... (some say 30)
6 T 100 divided by 3?
7 L1 Maybe 30, ma'am?
8 T Okay, so we have 30 that we can divide by 3. Or you can... 60
9 L2 90
10 T Okay. Or 90
11 L3 Or 120
12 T Or 120. Fine, but you have to think what will be the easiest... so you can ... there are going to be different ways in which to do this sum... some of you are going to use 30, 30, 30, 30 and what is left you will divide by 3… or you are going to say 60, 60, 60... shoot straight to 60 ... because you already know ... but ... what is the secret to these sums? Can you take a number of which you do not know the answer?

Further strategies involved repeating instructions, alerting learners to pay attention and to listen carefully to what was being asked. Discipline regarding focus was referred to quite regularly, as in Lesson 1:52-54, for example:

52 T 1335 ... now you break it up for me ... no, I have just said break it up, I did not say halve or double ... (walks around to check learners' writing ...) just break it up, only break it up ... did I say halve or double?
53 Ls No
54 T No, so you just break it up ... (waits) ...then below that you halve it ... so under the hundreds ... (stands up to shows one learner) ... so under the hundreds ...look here ... each little number you are going to halve below it... write the half of each little number ... that's right ... (waits)

Various instances of scaffolded progression were observed during the lessons. Anine moved through the steps in a structured manner, referring to prior knowledge of how to go about it. In Lesson 1, for instance, Anine guided the learners from doing addition to the more challenging subtraction by involving learners' use of prior knowledge, using her fingers as support material and by recording the steps on the board:

28 L2 Ma'am, I struggle with these sums ...
29 T Then you look closely ... you've all have had a turn ... umm , Ntombi ... what are we going to do first?
30 Ls (all answer together)
31 T Don't all shout together ... we minus 752 from 300 equals 452 ... now we count in 10s ... 452 ... 442 ... (holds up hand and counts down on her fingers)
32 Ls (join in) 432, 422, 412, 402, 492, 382 ...
33 T (writes answer) 382

The mathematics discourse was supported with sayings such as "And what is the easy sum for half of 500?", "So what is the easiest way – without thinking – to divide by 3" (Lesson 2:4) and

“What is the secret to these sums? Can you take a number of which you do not know the answer?” (Lesson 2:12)

Extent and nature of learner talk

While the majority of the learner talk I observed involved group chanting during counting activities and chorusing of responses, it was noted that the most of learners, including the isiXhosa-speaking learners, were confident enough to offer unsolicited communications. The learners regularly expressed their opinions, asked for clarity and were able to speculate about possible answers. In Lesson 3:202-217, for instance, many learners were willing to explain in extended communication what patterns they noticed in the digital times that were written on the whiteboard:

> T Well let's see if you can see any patterns…
> L Ma’am, you count in 2s as 1,3,5,7,9 ...
> T Okay , there’s a pattern ...
> L And 2,4,6,8,10,12 ...
> T Wow, beautiful, you 're right ...
> L2 And ma’am. If you take 9 for example, you just add 15... 15 plus 15 is 30 plus 15 is 40…
> T You're quite right, so we counted in multiples of ….?
> L2 15
> T 15, yes... (points to next learner)
> L3 Ma’am, I see a pattern… on the one side are odd numbers and on the other hand, even numbers ...
> T You 're right, here are the odd numbers, and here I move over to even numbers... Wow, that’s great.

A number of occasions were observed where Anine directed learner to learner collaborations. In Lesson 1:27-35, for instance, Anine gave explicit indications of how she wanted the learners to discuss their calculations:

> T Okay, so these are the easy ones, so don’t shoot to 120 if you do not know ... Right, you are going, with your friend ... You are going with your friend... you are going to discuss... to explain what you are going to write… and then you write together what you have spoken about. You are going to work out this division sum together for me…
>
> T Uh... Sibu, you may not write before you and Lwazi have spoken about it... what is it that he doesn’t know?... (Almost inaudible) You are going to show him your sum ... and then he is going to shows you how he does it ...

It was noted that Anine also facilitated pair discussion on the mat. In Lesson 1:85-89, for example, she reminded learners to work together and negotiate the answers:

> T (to learner's partner) You must wait for your partner... you've got to work on the same sums.
> L Ma’am, I have two of the same. (inaudible)
> T Whose sum is this?
> L1 Mine.

> T (to learner's partner) She must answer, not you, right? You must see whether she is correct. Let me see what you have done.

Learners were also, on occasion, asked to explain an answer, but in Lesson 1:113-121 with the guidance of the teacher:

> T (looks at learner's work) Okay, 5 divided by 3 ... Mbuyi ... they are sitting at the same sum at which you are sitting... quickly explain to them how many 3s in 5.
> L If you say 3, 6, 9 ... (battles to explain)
> T Let's count ... 3,6 ... okay there, we are already past 5 ... so it's a 3 and what is left ?
> L 1 rest 2
> T Yes, you have taken away 3... what is left?
> L 2
> T Okay, so your answer is 1 ... ?
> L Rest 2.
> T Good! Thanks Mbuyi , they are right.

To summarise, the distinguishing features of Anine's teaching conditions that shaped her mathematics teaching practices follow. In her planning Anine adhered to the CAPS guidelines. It was noted that she made use of documented planning and adapted details before and during lessons based on the feedback she received from learners' oral and written assessments. While Anine provided clarity about the lesson objectives in her planning schedules and achieved coherence between the calculational and conceptual handling of subject content, it was noted that these objectives were seldom explicitly communicated to the learners. A similar lack of overt signaling and sequencing of lesson processes and procedures regarding content knowledge was observed.

As a result of Anine's planning approach the classroom management displayed adherence to routines and structures that were familiar to the learners. Anine was able, therefore, to spend less time on overt management of learners by means of directive and regulative language and could focus more on mathematics teaching and subject content development. As far as mathematics teaching was concerned, it was noted that, while most attention was given to calculational and procedural processes, the strategies and reasoning associated with conceptual knowledge and strategies were also explored.

Anine made use of mostly mixed ability groups and learners were encouraged to collaborate with explicit directions from Anine. Because of the high levels language proficiency they displayed, the learners responded with confidence. The most prevalent group formation for these collaborations was found to be pair discussions. Learners spoke Afrikaans for the most part, but were encouraged to explain concepts and procedures to one another in isiXhosa when necessary.

6.3.2 Mediation strategies in mathematics teaching practices

The following section reports on the way in which mathematical content knowledge was presented in the lessons and on the way in which Anine mediated learning through various strategies. With a focus on possible ways in which mathematics content knowledge was developed, I examine the use of explicit language in the form of repetition, rephrasing and mirroring. My investigation focuses further on the simplification of language, the use of resources and metaphorical language and, finally, questioning strategies.

The three excerpts presented below were selected from the lesson presented in the study as suitable demonstrations of the way in which these strategies were used in Anine's mathematics teaching practices. The excerpts from Lesson 1 and 2 below are taken from lesson episodes involving group activities on the mat. Anine's questions in these quotes are addressed to small groups or individual learners. The excerpt from Lesson 3 is taken from a whole class activity on the mat and involved questions addressed to the class as a whole. The numbering of the lines in the Table 5 correlates with the numbering of the lines in the lessons in Appendix D1.

Table 5: Anine (Exemplar 1)

Repetition Rephrasing Mirroring Simplification Use of resources Metaphors

Lesson 1: 107- 141

107 T Okay, right, I'm going to give you a calculation and the calculation looks like this ... (Writes on whiteboard) 72 divided by 3 ... I'm going to use numbers that are easy for me to divide by 3 ...

108 L 12 divided by 3 or 3 divided by 3 ...

109 T Like 3 divided by 3 ... yes, you're quite right. Well, let's take a 30 out of 72 ... what is 30 divided by 3?

110 Ls 10

111 T 10 ... well, what is left?

112 L 2

113 T No ... what was left of the 72?

114 L 22 (corrects her own response) ... 42

115 T 42 (confirms learner's answer and then recaps process)...What is 40 plus 30?

116 Ls 70

117 T And the 2 that is left over?

118 Ls 72

119 T So there is a 42 left... can I take out another 30?

120 Ls Yes

121 T So, I have another 30 ... and it's easy, you don't even have to think ... I go and fetch another 30 ... what's my answer?

122 Ls 10

123 T 10 ... so how much have I now taken out of 72 altogether?

124 Ls 60

125 T 60 ... what 's left? Think carefully...

126 Ls 10

127 T There's only 10 left?

128 Ls (shout different answers)

129 L 20

130 T Shhh ... you said 20 ... what is 6 plus 2? What is 6 plus 2?

131 L 8

132 T What's 60 plus 20?

133 L 80

134 T Where did we get to? 72... So we have a 30 and 30... what is left?

135 Ls 12

136 T (Writes it on the board) 12 ... and do you know what 12 divided by 3 is?

137 Ls Yes... 4

138 T (writes it on the board)

139 L It's 20 plus 4 ... that's 24

140 T So what is 72 divided by 3?

141 L 72 divided by 3 is… 24

Lesson 2: 126- 154

126 T Good, now we have one more thing to do (draws on the whiteboard)... a man works in a fruit shop... he packs oranges in bags ... he has 153 oranges... only six oranges can fit into bag.

127 L How many?

128 T Six. How many bags will he need for all those oranges? (draws on the whiteboard) Imagine this is a pile of oranges… How many bags is he going to need for the 153 oranges? How many fit into a bag?

129 Ls Six

130 T So, it is going to be a multiplication sum?

131 L1 6 times 153

132 T Okay so you want to tell me you are going to multiply 153 oranges by 6?

133 L2 No, it's a division sum, Ma'am.

134 T It's a division sum ... but what kind of a division sum? What is it going to look like?

135 L3 153 divided by 6

136 T Yes, Ilona is right, because I want to know how many 6s... how many piles of 6s can I take out of 153... (writes and uses gestures) Did you hear that? We want to know how many bags of 6 we can take out of this pile... so what is my sum going to look like?

137 Ls 153 divided by 6

138 T Oh dear, look carefully. I'm going to change this sum a little. I'm going a make it a little easier, because this one is a little too hard. Let's put three oranges in a bag ... so now it's bags of?

139 Ls 3

140 T So what is my division sum going to look like? I can't hear you.

141 Ls 153 divided by 3

142 T Good… we have done quite a lot of division, so try ... I've taught this to you often… what is the easiest number to take out of that big number?

143 L1 30

144 L2 60

145 L3 90

146 T Yes. Wow, I almost gave you a really wild sum... (Learners start working)

147 L Ma'am, can I take out another 30?

148 T Yes. Can you take out another 30?

149 L Yes

150 T Good, you do it, you can do whatever you want… How many have you taken out?

151 L 60

152 T Fine. Can you take out another 30?

153 L Yes

154 T Good… (moves on to next learner) Good, some of you have moved past 30… you are working with bigger numbers.

Lesson 3: 117- 145

117 T (uses clock) It's a quarter past 11 ... when we count time, in which multiples do we always count... think carefully… What pattern?

118 Ls In 5s

119 T We count in 5s... why do we count in 5s?

120 L Because there are 5 lines between the numbers.

121 T Let's see if she is right ... (counts on the clock) 1,2,3,4,5 ... so that's why we count in 5s ... now when I break up the clock into parts, when I cut it into parts... (draws with koki on the clock) ... I'm going from the 12 ...

122 L Into quarters, ma'am?

123 T Yes, quarters ... I'm going to cut it from the 12 into halves... okay... luckily one can wipe off the koki... How many minutes are on that side? (points)

124 Ls 30

125 T How many minutes are on this side?

126 Ls 30

127 T How many minutes are there altogether?

128 Ls 60

129 T Okay , I'm going to cut it again ...

130 Ls Quarters

131 T Now how many minutes are in that quarter ... and in that quarter ...

132 Ls 15 ... 15

133 T Yes

134 L I know why it is 15 ... because 15 plus 15 is 30.

135 T Yes ... and how many 15 minutes can we get out of 60?

136 Ls 4

137 T Yes ... (points at clock) ... so there is 15 plus 15 plus 15 plus 15 ... well ... how many minutes are in that half?

138 Ls 30

139 T Plus this quarter?

140 Ls 35

141 T (raises eyebrows)

142 Ls 45

143 T So 30 plus 10 plus 5 ...

144 Ls 45

145 T So half an hour plus a quarter of an hour is 45 minutes ... so it's the easiest ... we then add quarters ... and that's what we're going to do on the board today... we are going to count in 15s... and we're going to count in quarters ... quarters of the clock ... quarters of an hour...

Repetition, mirroring and rephrasing

It was noted in the five lessons observed and highlighted in the excerpts in Table 5 that the explicit language used by Anine was aimed at supporting mathematics teaching rather than directing learners' actions or regulating their behaviour. This confirms the view she expressed regarding the learners' language proficiency. She contended that the isiXhosa-speaking learners in her class understood Afrikaans moderately well and that she did not find it necessary to adapt her language much to ensure better understanding. While the mirroring of answers that is highlighted above served to encourage learners by confirming correct answers ("It's a division sum") and question incorrect answers ("There's only 10 left?"), repetition and rephrasing was used to draw attention to the formal mathematical discourse, the specific content of the questions and tasks being posed or to establish patterns in learner thinking. In Lesson 3:125-132 in Table 5 repetition served to establish a procedural pattern that supported learner thinking:

T How many minutes are on that side? (points)
Ls 30
T How many minutes are on this side?
Ls 30
T How many minutes are there altogether?
Ls 60
T Okay , I'm going to cut it again ...
Ls Quarters
T Now how many minutes are in that quarter ... and in that quarter ...
Ls 15 ... 15

The following quote from Lesson 3:145 provides an example of how clarity regarding the focus of the mathematics task is provided through the use of rephrasing: "And we're going to count in quarters ... quarters of the clock ... quarters of an hour." The adjustments in the description of analogue time aimed, in this case, to clarify and strengthen the idea of dividing the physical surface of an analogue clock into fractions. In Lesson 2:136 Anine rephrased the earlier question with the words "[H]ow many piles of 6s can I take out of 153?" is a similar bid to clarify the question and focus the learners' attention on the content of the question. One could say, therefore, that Anine used repetition, rephrasing and mirroring to focus on mathematics and strengthen the learners' understanding of calculational and procedural processes. Although the classroom interactions highlighted above were to a large extent directed by Anine, instances were noted where Anine focused on facilitating exploratory talk and attempted to assess learner understanding, for example in Lesson 2:130-136:

T So, it is going to be a multiplication sum?
L1 6 times 153
T Okay so you want to tell me you are going to multiply 153 oranges by 6?
L2 No, it's a division sum, Ma'am.
T It's a division sum ... but what kind of a division sum? What is it going to look like?
L3 153 divided by 6
T Yes, Ilona is right, because I want to know how many 6s

Simplification

Simplification of language is at the best of times a difficult strategy to isolate as it often overlaps with other strategies. The explicit language referred to in the section above can, for instance, be regarded as examples of language simplification. Simplification of language was linked here to simplification of thinking processes, as Lesson 1:107-118 in Table 6 demonstrates. Anine used short sentences and simple words to keep the focus on how to perform the calculational sequence when 70 is divided by 3: "What is left?" and "Where did we get to?" It was noted that Anine did not feel the need to adjust the language for the sake of comprehension as such because the learners had, it seemed, reached a sufficient level of proficiency. The simplification that was noted in Lesson 2:138, as a further example, involved the modification of a calculation rather than the modification of language: "I'm going to change this sum a little. I'm going a make it a little easier, because this one is a little too hard." The modification was focused, in other words, on the support of learners' thinking rather than on the development of informal language.

Use of resources

It was noted that, in the same way as with the simplification of language, Anine used concrete and semi-concrete resources to support learner thinking rather than language development. She used, for instance, concrete support such as counting on the fingers (1:31, 2:58-66 and 3:66), counting on the clock (2:121 and 2:137) and semi-concrete means such as writing on the board while explaining (1:107d and 3:121). While it was noted that when Anine required learners to attempt more 'cognitively demanding' abstract thinking in tasks where language became more 'context reduced', she continued to provide a measure of support with resources. In Lesson 3:302, for example, she writes the problem on the board while describing it and later encourages learners to count the time on their fingers:

> Louis goes to tennis practice ... and we have a long lesson on a Wednesday afternoon... Louis comes at 4 o'clock and he stays there until half past 5. Now go and work it out and write down the answer for me ... he arrived at 4 o'clock to half past 5 ... (Writing on the board while she speaks) Half past 5… have you got an answer?

Use of metaphoric language

In Lesson 3 Anine provided support through the use of metaphoric language. The fact that metaphoric language was observed only in the lesson where the measurement of time was concerned seemed to indicate that its use was determined by the subject matter. The need for context embedded language connecting concrete images and language with abstract concepts formed an important part of Anine's practice. She related the mediation of content through a movement from concrete thinking to abstract thinking as follows:

> When I do word sums, especially at the beginning of the year, I will provide the learners with the concrete objects like, for instance, egg boxes when we count eggs. Later I use blocks to depict oranges. I always try to start with the concrete and move towards the abstract.

Questioning

In the following section Anine's use of questioning as a strategy to mediate mathematics is explored. I refer to patterns noted in all five lessons observed, with special reference to the evidence provided in the selected excerpts in Table 6.

Table 6: Anine (Exemplar 2)

Questioning

Lesson 1: 107- 141

107 T Okay, right, I'm going to give you a calculation and the calculation looks like this ... (Writes on whiteboard) 72 divided by 3 ... I'm going to use numbers that are easy for me to divide by 3 ...

108 L 12 divided by 3 or 3 divided by 3 ...

109 T Like 3 divided by 3 ... yes, you're quite right. Well, let's take a 30 out of 72... What is 30 divided by 3?

110 Ls 10

111 T 10... Well, what is left?

112 L 2

113 T No... What was left of the 72?

114 L 22 (corrects her own response)... 42

115 T 42 (confirms learner’s answer and then recaps process)...What is 40 plus 30?

116 Ls 70

117 T And the 2 that is left over?

118 Ls 72

119 T So there is a 42 left... Can I take out another 30?

120 Ls Yes

121 T So, I have another 30 ... and it's easy, you don’t even have to think ... I go and fetch another 30 ... What’s my answer?

122 Ls 10

123 T 10 ... So how many have I now taken out of 72 altogether?

124 Ls 60

125 T 60 ... What 's left? Think carefully...

126 Ls 10

127 T There’s only 10 left?

128 Ls (shout different answers)

129 L 20

130 T Shhh ... you said 20 ... What is 6 plus 2? What is 6 plus 2?

131 L 8

132 T What's 60 plus 20?

133 L 80

134 T Where did we get to? 72... So we have a 30 and 30... What is left?

135 Ls 12

136 T (Writes it on the board) 12 ... And do you know what 12 divided by 3 is?

137 Ls Yes... 4

138 T (writes it on the board)

139 L It’s 20 plus 4 ... that’s 24

140 T So what is 72 divided by 3?

141 L 72 divided by 3 is… 24

Lesson 2: 126- 154

126 T Good, now we have one more thing to do (draws on the whiteboard)... A man works in a fruit shop... he packs oranges in bags ... he has 153 oranges... only six oranges can fit into bag.

127 L How many?

128 T Six. How many bags will he need for all those oranges? (draws on the whiteboard) Imagine this is a pile of oranges… How many bags is he going to need for the 153 oranges? How many fit into a bag?

129 Ls Six

130 T So, it is going to be a multiplication sum?

131 L1 6 times 153

132 T Okay so you want to tell me you are going to multiply 153 oranges by 6?

133 L2 No, it's a division sum, Ma’am.

134 T It's a division sum ... but what kind of a division sum? What is it going to look like?

135 L3 153 divided by 6

136 T Yes, Ilona is right, because I want to know how many 6s... How many piles of 6s I can take out of 153? (writes and uses gestures) Did you hear that? We want to know how many bags of 6 we can take out of this pile... So what is my sum going to look like?

137 Ls 153 divided by 6

138 T Oh dear, look carefully. I’m going to change this sum a little. I'm going a make it a little easier, because this one is a little too hard. Let's put three oranges in a bag ... So now it's bags of?

139 Ls 3

140 T So what is my division sum going to look like? I can’t hear you.

141 Ls 153 divided by 3

142 T Good… we have done quite a lot of division, so try ... I've taught this to you often… What is the easiest number to take out of that big number?

143 L1 30

144 L2 60

145 L3 90

146 T Yes. Wow, I almost gave you a really wild sum... (Learners start working)

147 (Learners start working)

148 L Ma’am, can I take out another 30?

149 T Yes. Can you take out another 30?

150 L Yes

151 T Good, you do it, you can do whatever you want… How many have you taken out?

152 L 60

153 T Fine. Can you take out another 30?

154 L Yes

155 T Good… (moves on to next learner) Good, some of you have moved past 30… you are working with bigger numbers.

Lesson 3: 117- 145

117 T (uses clock) It's a quarter past 11 ... When we count time, in which multiples do we always count... What pattern?

118 Ls In 5s

119 T We count in 5s... Why do we count in 5s?

120 L Because there are 5 lines between the numbers.

121 T Let's see if she is right ... (counts on the clock) 1,2,3,4,5 ... so that's why we count in 5s ... Now when I break up the clock into parts, when I cut it into parts... (draws with koki on the clock) ... I'm going from the 12 ...

122 L Into quarters, ma’am?

123 T Yes, quarters ... I'm going to cut it from the 12 into halves... okay... luckily one can wipe off the koki... How many minutes are on that side? (points)

124 Ls 30

125 T How many minutes are on this side?

126 Ls 30

127 T How many minutes are there altogether?

128 Ls 60

129 T Okay , I'm going to cut it again ...

130 Ls Quarters

131 T Now how many minutes are in that quarter? ... And in that quarter?...

132 Ls 15 ... 15

133 T Yes

134 L I know why it is 15 ... because 15 plus 15 is 30.

135 T Yes ... and how many 15 minutes can we get out of 60?

136 Ls 4

137 T Yes ... (points at clock) ... so there is 15 plus 15 plus 15 plus 15 ... well ... How many minutes are in that half?

138 Ls 30

139 T Plus this quarter?

140 Ls 35

141 T (raises eyebrows)

142 Ls 45

143 T So 30 plus 10 plus 5 ...

144 Ls 45

145 T So half an hour plus a quarter of an hour is 45 minutes ... so it's the easiest ... we then add quarters ... and that's what we’re going to do on the board today... we are going to count in 15s... and we're going to count in quarters ... quarters of the clock ... quarters of an hour...

In all five lessons observed Anine used mainly short display questions that required monosyllabic answers. The questions highlighted in Table 6 served, for example, to gain feedback about the learners' ability to do basic calculations, for instance: "How many piles of 6s can I take out of 153?" or "What is 30 divided by 3? What's my answer?" The majority of display questions, it was noted, was aimed at exploring mathematical thinking in a procedurally connected manner. In Lesson 2:142b, for instance, Anine started a line of questioning by linking the reasoning to the learners' prior knowledge: "I've taught this to you often… what is the easiest number to take out of that big number?" Anine then guided the learners' thinking by using a set of related questions as she checked whether the learners were keeping up with procedural process, for example: "Where did we get to? 72... So we have a 30 and 30... What is left?" She responded to their answers in a way that incorporated their understanding.

A further consistent feature of her questioning involved the use of open ended referential questions that focused more on conceptual knowledge and required learners to offer explanations and explorations of meaning, as the following quote demonstrates: "[Y]ou have to think what will be the easiest... so you can ... there are going to be different ways in which to do this sum... some of you are going to use 30, 30, 30, 30 and what is left you will divide by 3… or you are going to say 60, 60, 60... shoot straight to 60 ... because you already know ... but ... What is the secret to these sums? Can you take a number of which you do not know the answer?" This explanation confirms the following description that Anine offered regarding her approach to questioning, "[I] also challenge learners to think through a problem. I will never just give them an answer. I will ask questions to lead them so that they must think. I find if I give them too many clues it's as if they get lazy to think. They expect you to give them the answer".

In a further example in Table 6, Anine enquired about motivations for the learners' thinking: "We count in 5s... why do we count in 5s?" (1:119) In Lesson 3:170-179 Anine used open-ended questions with part of the sentence provided in the questions, to guide the learners' thinking and elicit extended learner talk:

T Good, Ilona , why do we not say 3:45 for a quarter to 3?
L Because it's not yet 3o'clock ...
T It's not even 3 o'clock ... and what does the 45 stand for, Keisha?
L For a quarter to...

T And what else does it stand for?
L 45 minutes past 2
T Okay ... and then it's before the…?
Ls Before 3
T Before 3 ... how many minutes before 3?
L 15 minutes to 3
Ls A quarter to 3
T A quarter to 3... how many minutes?
Ls 15 minutes before 3
T And then it is…? (points to time on the board)
Ls 3 o'clock

Her tactics for encouraging learners to develop and express their conceptual skills were demonstrated in the way, for instance, she questioned learners about possible patterns that could be identified in the representations of digital time on the whiteboard. As mentioned before, Anine emphasised the fact that different paths or possibilities existed. She explained: "I set up activities where learners are required to see mathematical patterns. And each one can see his own pattern. They do not have to all use the same specific way." The following excerpt from Lesson 3:202-212 referenced above to illustrate aspects of learner talk, also demonstrates this pattern,

T Well let's see if you can see any patterns…
L Ma'am, you count in 2s as 1,3,5,7,9 ...
T Okay , there's a pattern ...
L And 2,4,6,8,10,12 ...
T Wow, beautiful, you 're right ...
L2 And ma'am. If you take 9 for example, you just add 15... 15 plus 15 is 30 plus 15 is 40…
T You're quite right, so we counted in multiples of ….?
L2 15
T 15, yes... (points to next learner)
L3 Ma'am, I see a pattern… on the one side are odd numbers and on the other hand, even numbers ...
T You 're right, here are the odd numbers, and here I move over to even numbers... Wow, that's great.

As mentioned earlier, the learners in this class displayed a confidence and willingness to venture explanations and this seemed to suggest that they were familiar with these types of dialogic patterns. As far as the distribution of questions was concerned, it was noted that the learners were comfortable to participate and respond to the questions that were randomly posed. Language barriers did not seem to inhibit any of the learners and, on the whole, it was noted that the learners received equal opportunities to respond as questions were not only directed at the most language or mathematically proficient ones.

In summary, Anine's mediation strategies during mathematics lessons can be described as follows: For the most part, Anine used repetition and rephrasing of her language and mirroring to draw the learners' attention to the formal mathematics discourse and patterns of thinking.

Because of the learners' high levels of language proficiency, language support for the sake of comprehension was not viewed as a priority. The simplification of language and use of resources that were noted, focused mainly on providing access to calculational and procedural knowledge and the strengthening of abstract thinking. In the same way, metaphorical language was used to support the movement from concrete thinking to abstract thinking.

While Anine's questioning strategies involved mostly short display questions, it was noted that she also made use of more open-ended referential questions in which the learners were encouraged to describe their thinking processes in a more extended manner.

6.4 Lillian (Duiker Primary)

6.4.1 Conditions shaping mathematics teaching practices

The data gathered from the observations in Lillian's class during the period 1 November to 14 November 2012 and from interviews with her conducted on 14 November and 30 November 2012 provided insight into the conditions that shaped her teaching practice.

6.4.1.1 Managing the content and pedagogical process

Planning for teaching

In this section I discuss Lillian's teaching in terms of her planning of mathematics lessons and its influence on the structuring of the various lessons. Lillian expressed her approach to planning as follows:

> My year planning and term planning is guided by CAPS. I find the maths CAPS guidelines useful because it says exactly what should be taught when. It also gives tips about how to teach different concepts. I work according to the topic to make sure nothing gets left out. I shift some concepts like time to later in the year with the hope that learners will be more ready to understand it.

Lillian provided me with evidence of her planning in the form of a record file in which she documented the envisaged lesson content and procedures. As far as her approach to specific lessons was concerned, she explained that she first determined what she wanted to achieve and then planned accordingly. She explained her views on the planning of particular lessons as follows:

> Planning is essential. I plan my lessons daily so that I can see which lessons need to be repeated and when I can continue to a next section. I keep careful record of my planning and I make notes about what I want to achieve in my lessons. I will note aims, e.g. at the end of the lesson the learner must be able to identify 'less than' and 'more than' symbols, or be able to count to 1000. I use a variety of books to find suitable activities.

The quotes above suggest that Lillian's approach to planning was informed by the mathematics CAPS guidelines as well as the development of learner skills. It was noted during my class observations that, while she planned in detail, her envisaged procedures were not always made explicit to the learners.

Goals and objectives

Lillian expressed her approach to the setting of goals in the mathematics lessons as follows:

> My goal is to cover the various skills in the prescribed manner. Counting, mental maths and everything. I try to bring variation and fluency. I start with the whole class adding and subtracting, doubling and halving. If I've counted in 1s, 2s, 3s and 4s today, tomorrow I'll want to count in 5s, 10s. The day after tomorrow I'll want to count in 50s and 100s. If I've counted on today, I'll try to count back tomorrow. That is as far as counting is concerned. CAPS tells you exactly which mental maths to do. Then I go on to group work. I write in my planning schedule which groups I will be working with. I work according to a pattern.

While Lillian expressed a detailed understanding of the goals required by the mathematics curriculum and the lesson observations confirmed an awareness of and attempt to address these goals, the lesson objectives were, at times, less clearly defined. In Lesson 1, for instance, a variety of concepts and procedures were covered, ranging from breaking up of numbers, doubling, halving, adding, multiplication and the use of the 'bigger than' and 'smaller than' symbols. The objective that this particular lesson aimed to achieve, however, was not clearly obvious to me as an observer. In Lesson 2, on the other hand, the objective of reading and indicating analogue and digital time was clear, as was the aim of Lesson 3, namely to apply the principles of identifying analogue and digital time in a written exercise. The different structures and approaches to lesson objectives described above seemed to suggest that Lillian adhered to a measure of structure regarding the objectives of lessons, but that they displayed varying degrees of clarity and, it needs to be said, the details regarding lesson objectives were not found to be explicitly shared with learners.

Focus, logic and transitions in lessons

While Lillian's structuring of lesson episodes in terms of focus and logic displayed a measure of coherence, this coherence was not always found to be consistent. As mentioned earlier, 'focus' in this instance refers to the content focus as it relates to the content areas stipulated in the curriculum for mathematics. 'Logic', as indicated, refers to the way in which concepts and procedures relate to one another within the various lesson episodes. For the sake of clarity I have coded my division of episodes within Lillian's three lessons that are presented in Appendix D3 in different colours and I also provide the following overview of the episode sequences with a short summary of the content of each episode:

Lesson 1

Episode 1	Lines 1-92 Counting activity and then breaking up, doubling and division (whole class on mat)
Episode 2	Lines 94-145 Mental mathematics involving adding and subtracting and the breaking up of numbers (group on mat while rest complete desk work activity)
Episode 3	Lines 147-180 Symbols for adding, multiplication, bigger than and smaller than, complete activity on board involving the use of bigger than and smaller than symbols (next group on mat while rest complete desk work activity)

Lesson 2

Episode 1	Lines 1-46 Counting activity, activity involving the use of 'bigger than' and 'smaller than' symbols, then breaking up of numbers (whole class on mat)
Episode 2	Lines 48-106 Identifying of analogue and digital time (group on the mat while rest complete desk work activity)
Episode 3	Lines 109-137 Identifying of analogue and digital time (next group on the mat while rest complete desk work activity)

Lesson 3

Episode 1	Line 1 Counting activity (whole class on mat)
Episode 2	Lines 2-28 Review of analogue and digital time in preparation for work book activity (whole class at desks)
Episode 3	Lines 30-62 Learners work individually to complete work book activity, then take books to teacher at desk for marking (whole class at desks)

In all five lessons observed it was found that lesson episodes were not introduced with a reference to the focus or underlying principles involved in the episode or the lesson as a whole. In Lesson 1, for instance, the class started with a counting activity, then directly moved on to mental mathematics and then to doubling and division calculations on the chalkboard. It was noted that lesson episodes in Lessons 2 and 3 were conducted in the same manner, with a direct move to the handling of content and no explicit reference to the focus of the lesson at the start of the lesson and during lesson transitions. The signalling regarding focus and logic will be discussed in more detail below.

As far as alerting learners to the focus of written tasks was concerned, it was noted in a number of instances that Lillian provided clear guidance about the required procedures. In the first episode in Lesson 1:68-78, for example, one of the learners performed the calculation on the board and the rest of the class then copied it in their mat books.

T Now break it up then. Look. Draw your block first. Put your thousands.
Double 880

800	80
1600	160
	1760

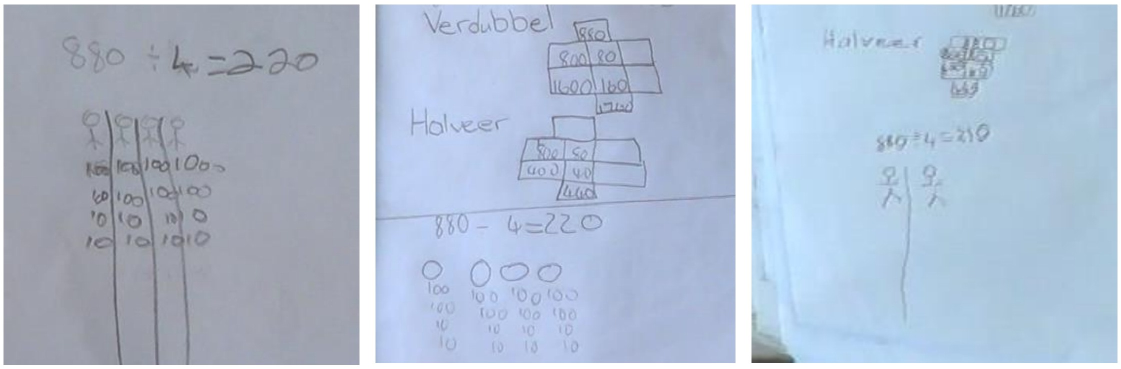
T Very nice. I think she deserves a hand. (learners clap) So softly? Very nice. Can you tell us what you did, Phumeza? Tell us what you did. Just speak loudly.
L Broke up. (Speaks softly)
T You first broke it up.
L And then I doubled it ...
T And then?
L I added them together.
T Yes, then you add them together.
(Learners start writing it down.)
T You may write it down.

For the next calculation (1:87-91), Lillian first gave a demonstration on the board about how she wanted division to be done:

T Divide it by. Now let's see, how do you divide 880 by 4?
L Do we need to show places?
T Only these, dear ... I want to see a number sentence. You need to tell me what you are doing here… and I want an answer as well.
T (Looks at a learner’s work) Is this correct?
L Ma’am, here 's my answer.
T Who has already written an answer? Let me see.

While the written example had provided procedural knowledge, the implicit underlying conceptual knowledge had not been grasped by all the learners, as the response on the right in the following set of photographs indicates.

Figure 9: Examples of written work done by learners in Lillian's class



Lesson duration and use of time

While the mathematics lessons, according to Lillian's timetable, did not take place at the same time every day, it was noted that she followed the programme closely and that an equal amount of time was spent on mathematics every day. Lillian motivated her adherence to the timetable as follows: "CAPS allocates 7 hours per week for mathematics contact time: 4 hours for numbers, operations and relationships, 40 minutes for patterns, functions and algebra. I try to stick to the guidelines, but sometimes I find that the LSEN learners need more time than the rest." This account confirmed that while Lillian was guided by the CAPS regarding time allocations, she remained flexible in her response to the needs of the learners. The flexibility and variation that was noted during the lessons I observed. While most lessons displayed a regular pattern of whole class counting followed by simultaneous group work and desk work activities, a measure of variation in content and structure was observed. In Lesson 3, for instance, the lesson was not conducted according to the usual routine, but involved the completion of a written task on subject content that was covered in the previous lesson.

Sequencing the process and content

It was noted that while Lillian indicated that she planned the sequencing of content before the start of the lessons, the underlying reasoning for the sequencing of lesson episodes was not made explicit to the learners. The transitions between lesson episodes involved, in most cases, changes in physical location. The fact that the learners appeared to be familiar with these routines provides a possible reason for this lack of explicitness. As the following excerpt from Lesson 1:141-150 demonstrates, while implicit signals such as “Everybody must come closer” provided some clues about sequencing of action, very little indication was given about the sequencing of content:

T Okay, does everybody have it? Let's all read it.
L (Read Alone) 381
T Again.
Ls 381.
T Put away the tins.
***
The next group comes to the mat.
T Everybody must come closer. We call this one… What do we call it?
Ls Plus
T Plus. If we sound it, we call it plus.

Signalling what to expect

As far as verbal and non-verbal signals about the content and procedures are concerned, little indication was given to the learners about what they could expect in a lesson or lesson episode. Lillian started Lesson 1, for example, with a counting activity and provided directive information about the required actions, but gave no explicit signalling about the content. She said, “Let’s go. Sit up straight. We count in 10s, we count in 10s. We begin at 810. Everyone has to look here… Chester… let’s begin.” A similar pattern emerged in the way Lillian introduced the episode in Lesson 1:148. She started the session with a new group on the mat with the following words: “Everybody must come closer. We call this one… What do we call it?” In Lesson 2:2 and Lesson 3:2 is was noted that Lillian gave similar information about actions and behaviour with limited signalling regarding the content and procedures that they could expect in the lessons. The implications of the lack of overt signalling, as with clear sequencing, is that learner engagement in the process of knowledge development was restricted.

6.4.1.2 Managing learners

Group work and differentiation

A prominent feature of Lillian’s management of learners that was noted during all five lessons observed was the use of a system involving alternating episodes of whole class teaching and group work/desk work teaching. As indicated above, the latter was structured in a way that allowed the activities to take place simultaneously without a major interference of either. The learners appeared to be familiar with this system of alternating phases. Lillian described her approach as follows:

> I start the lesson with whole class teaching on the mat. I also work with the groups on the mat because then it is easier to help them. The learners do their individual work at their tables and I help them where I can. I sometimes help them at my table, especially with remedial work and when I assess their work.

As far as group work strategies were concerned, Lillian indicated that she divided the class into three general ability groups at the beginning of the year, based on initial base line tests and discussions with their Grade 2 teacher. The group division applied for all the subjects. She explained that she assessed and adjusted the divisions regularly on a general basis, based on the performance of the learners. According to her, she reviewed the groups later in the year when she saw that some learners were developing faster, or others were battling and needed to go back to a lower group. Lillian explained her use of groups as follows:

> I have a specific system for the rotation of groups and, as far as possible I take each group for 20 minutes. On a particular day I would take groups 1 and then 3 or 2 and then 3. I work with the third group every day because they need the most attention and the other two groups receive a turn every second day.

This approach to group work suggests a strong emphasis on teacher-learner interactions in which the teacher acts as the ‘primary knower’ (Gibbons 2006:114) and in which learner to learner collaboration is not foregrounded. During all five mathematics lessons this arrangement was confirmed to be the dominant interaction pattern between Lillian and groups or individuals. Instances of interaction focusing on problem solving among learners were seldom observed during lessons. The group patterns that were observed in all the lessons involved a whole class activity after which the class divided into groups, with one group selected to work with Lillian on the mat while the rest completed individual desk work. This feature will be discussed in more detail below.

Regarding differentiation Lillian indicated that she viewed the distinction between learners of varying ability as an important strategy as it provided her with an opportunity to adjust the pace and level of teaching to the needs of the learners. As an example of the difference in skills and needs she indicated that Group 1, for instance, counted further than 1000 while Group 3 battles to count to 600.

> I go on with the first group, the second group is sort of on standard and then I continually try to get Group 3 to catch up. They are going to battle to count to a 1000. It is now November already, but I battle to help them keep up. It is not only about counting, but also about working with the numbers. So some learners would have been disadvantaged if one were to work with only one group.

She found that Group 1 worked faster than Groups 2 and 3 and she indicated that she provided the early finishers with extending activities such as mathematical games. A further method of addressing different skills and needs that was described by Lillian and then observed in Lesson 3 was the interaction with individual learners regarding their written work. Lillian indicated that when the group activities were concluded and when time allowed, the completed tasks were brought to her at her desk to be discussed and assessed individually (see Lesson 3:30-62).

Nature and extent of teacher talk

As indicated above, the establishment of a social order in the classroom involves the type of behaviour the teacher expects from the learners during a lesson. As far as the expected behaviour regarding which languages are to be used in the classroom, it was noted that while Lillian on the odd occasion used English words to explain terms relating to analogue and digital time, she spoke mostly Afrikaans during lessons and she encouraged learners to do the same. According to Lillian, she regarded the listening skills of the learners in her class to be of an adequate level for her to speak Afrikaans. She said, “I find that I am able to speak only Afrikaans in class, because even the isiXhosa-speaking learners’ vocabulary is fairly well-developed. Most have been taught in Afrikaans since Grade R.”

- *Talking to direct actions*

It was noted in all five lessons observed that, in comparison to registers related to mathematics teaching, Lillian made use of a limited number of directives. As the learners displayed a familiarity with the lesson routines, it was observed that only minimal prompts were necessary to direct learners’ actions. At the start of Lesson 1, for instance, Lillian indicated to the learners what actions needed to be performed before teaching could begin: they all needed to sit on the mat, each with their mat book, ready to first count and then later do written calculations. The learners were then instructed to start paying attention as she said, “Let's go. Sit up straight. We count in 10s, we count in 10s. We begin at 810. Everyone has to look here…” (1:2) The directions given in Lesson 2:2 were similarly concise as Lillian moved swiftly to the counting activity: “Look, how are you going to work in your book if you pack your cards on your book? No, my dear, it doesn’t work like that. Everybody packs their cards on the mat. Let's begin, let's begin. You need to sit up straight, thanks, sit up straight. Tabiso. Asanda. We count in 1s. We begin with 880.”

The directive statements quoted above seem to suggest that Lillian was careful not to spend unnecessary time on directions and to start focusing on mathematics as quickly as possible. Considerations of pace were also made a priority in the way in which Lillian regulated learner behaviour, which is discussed in the next section.

- *Talking to regulate behaviour*

Lillian indicated that she regarded the regulating of behaviour and disciplining as a vital part of mathematics teaching. She explained, “This year’s class is quite well behaved, and that helps a lot. I need the learners to concentrate and focus when we do maths. They can’t be all over the place.” It was noted that Lillian regularly referred to expectations regarding behaviour and pacing, but because this was done in a concise manner, it did not seem to interrupt the flow of her teaching. The rhetorical question in the following excerpt (2:46) indicates how Lillian expressed the consideration of pacing: “There are many different ways to break up 900. We are just doing three. (Waits for learners to write down from board) Are you done? Are you asleep? Don’t spend time drawing lines. You're wasting time.” It was also noted that Lillian interjected misbehaving learners’ names without interrupting her instructional communications, for example: “We write it as 880 and its number name is, Asanda, eight hundred and eighty” (1:10) and “Take 910 out for me. Look at the ones at the back. They’re sleeping at the back… 910… Asanda has it, Asanda has it… Let’s read the number” (2: 37). In this last instance it was noted that Lillian directed the question to the inattentive learner to facilitate participation.

- *Talking to develop content knowledge*

In all five mathematics lessons that I observed the majority of time was spent on developing content knowledge. The routine featured a predictable and pattern that the learners were familiar with: first counting and mental maths on the mat and then simultaneous instances of desk work and group work. Lillian motivated the focus on developing mental fluency within this routine as follows:

> I feel counting is important. If you do counting often, the child will be able to do tables later. I start with the whole class with about 15 minutes of counting. Everything about counting. If I choose 900, you have to know the order where he sits, what is before it, make it 10 more, make it 10 less, double it, halve it. If we have counted on today, I will try to count backwards tomorrow. That is as far as counting is concerned. Mental maths takes about five minutes.

Attention was also given to exploring the link between concepts and its expression in language. In this regard, it was noted that Lillian's handling of concepts often involved the use of metalinguistic talk. As the following excerpt from Lesson 1:148-168 indicates, she created an awareness of the link between oral and written language, linking everyday language, mathematical language and symbolic language:

> T Everybody must come closer. We call this one… What do we call it?
> Ls Plus
> T Plus. If we sound it, we call it plus.
> T This sign we call...
> L Less than…
> T (writes multiplication symbol on the board and waits for answer)
> Ls Multiply
> T Its long name. Who can give me its long name? Chester? What is its long name? (Gesture to imitate the fact it is a long name) Beginning with 'ver' (Afrikaans)
> L Verdubbel (double)
> T No, this is something else. Who knows its long name? Does one of the monkeys know its name?
> L Multiplication
> T Yes, its looong name is multiplication, and we just say it's 'times' because it means 'so many times'.
> T The symbol?
> Ls Divided by
> T (Nods) Divided by. They all have names.

It was further noted that attention was given to calculational and procedural registers as well as, to a lesser extent, conceptual registers focusing on underlying reasoning and strategies. Learners were, for instance, required to work out doubling and halving strategies. As the following excerpt from Lesson 2:87-98 demonstrates, Lillian provided support for concept development where she moved from analogue time to the more complicated matter of calculating digital time from analogue time:

> Teacher draws 2:25 on the clock on the board. She draws a rectangular block under clock in which learners are required to fill in the digital time.
> T 25 past 2. Now listen very carefully to me ... 25 past 2 ... you need to give me the digital time ... (first in Afrikaans and then in English) Give the ' digital ' time, right? The digital time is early in the night ... early… before the afternoon... so you need to write the digital time in there... (The teacher explains this while handing out a whiteboard marker to each learner.) ... you should press down hard down... you have to write it down there ... digital time (in English), digital time (in Afrikaans).

T (assists one of the learners) Have a look here. Let me help you. This side we have the hours. So many hours ... how many hours are there? On your clock? Yes, say how many hours.

She drew a rectangular block to differentiate digital from the round analogue clock drawn on the board. She then alerted the learners that they had to “listen carefully”, providing an explicit message through repetition, rephrasing and further explanation. She said, “The digital time is early in the night… early… before the afternoon”. This displayed instances of guided thinking as the teacher moved from simpler to more advanced tasks. Lillian first asked learners to identify and read the analogue times she indicated on the clock. They were then asked to display specific analogue time and, after that, to identify and write down specific digital times. She moved from digital times in the morning to more complex afternoon times. She also moved from saying the times to writing the times. Throughout this activity Lillian supported the learners’ thinking by using concrete resources like analogue clocks as well as strategies such as reverting back to counting the minutes in 5s to establish what the time is. During the next lesson phase the learners moved on to more independent thinking as they individually completed work book tasks at their desks.

Extent and nature of learner talk

According to Lillian, she regarded it important to facilitate learner talk. She explained: “I try to involve everybody, but sometimes they get so excited and then they shout out the answer. Sometimes, especially with mental maths, I move down the row to accommodate everybody.” As the following excerpt from Lesson 2:69-82 indicates, Lillian encouraged and supported the learners’ attempts at more extended sentences, even though most of the responses consisted of single words:

T Half past 1. Why do you say that?
(Learners hesistate. Teacher prompts.)
L2 Because the…
T Because the... Say it, Chester.
L2 Because the long arm is at the 6 and ...
T And?
L2 And the short arm is at ...
T Is going to the... The short one is going to the…
L2 2
T The short one is going to the 2.
(Teacher moves hands to indicate 1:45)
T The time is here ... you 're right ... come Tabiso…No, look here.
Ls A quarter to 2. (One of Xhosa-speaking learners mouths the answer with others, but does not seem sure of the answer.)

Most of the learner talk that was observed, however, consisted of monosyllabic responses to the teacher's cues. The responses can be divided into two types: talk during the whole class episodes and the group work episodes. The learner talk that was observed during whole class episodes included chorusing in counting activities as well as group responses to Lillian's questions, with very few examples of unsolicited talk observed. The individual responses during whole class and small group teaching consisted mostly of mono-syllabic responses, while the more extended talk was carefully supported by Lillian. It was noted that some of the learners (in most cases the more proficient learners from the top group) were selected during whole class teaching to perform calculations on the board. In these instances it was noted that they were able to explain their thinking in very basic words with Lillian supporting their language by extending their sentences. They spoke softly, even in smaller groups, and with little confidence, and Lillian regularly requested that they speak loudly, for example: "Can you tell us what you did, Phumeza? Tell us what you did. Just speak loudly" (1:80).

Lillian had indicated in an interview that she felt learners should be encouraged to give their opinions and ask questions. However, apart from a few isolated instances where learners asked for clarification, for example, "Do we need to show places?" (Lesson 1:88) and "Where do I need to stop, ma'am?' (Lesson 3:32) instances where learners reflected on the understanding of mathematical principles or expressed views on their own learning processes, were rarely observed. Although the learners seemed to feel more comfortable asking Lillian questions during individual interactions, this did not happen often, especially not in the case of the less proficient learners. The desk work, it was noted, was organised in such a way that learners were discouraged to talk to one another and very few instances of group discussion involving mathematics were observed. Learners were sometimes observed discussing matters in Afrikaans in their groups, but these involved personal conversations rather than discussions of mathematics.

Although Lillian encouraged learners to help one another, few opportunities were created for exploratory exchanges between them and very little extended interaction was observed. In an instance observed, an isiXhosa-speaking learner was asked by Lillian to help a class mate who struggled with the exercise. The learner first communicated quietly in Afrikaans with the classmate about the question, but then decided to just write in the answer. When teacher came over and helped her with what was being asked, she was able to continue her basic explanation. After a second visit from Lillian, she pointed to the sum and said the answer, but without actually addressing her class mate.

In summary, the conditions that shaped Lillian's teaching of mathematics can be described as follows: She regularly documented her planning for lessons and her planning was informed by the development of the learners' mathematics skills. As a result of Lillian's planning approach her classroom management displayed adherence to routines and structures that were familiar to the learners. Although she designed lessons in detail, it was noted that her envisaged lesson procedures were not always made explicit to the learners. Little reference was made to the focus and logic within and between lesson episodes and the underlying rationale of transitions was not clearly communicated on a regular basis.

Lillian made, for the most part, use of ability groups and for the putting together of these groups she differentiated on the mathematical ability. It was noted that, in the majority of teaching situations, she made use of a teacher-directed approach in which learner collaboration was not foregrounded. Desk work was not designed and presented in a way that encouraged exploratory exchanges between learners and very little discussions of maths was observed.

During whole class teaching as well as group work activities, learners were encouraged to describe their mathematical calculations and procedures to the class. Their attempts at more extended sentences were carefully and consciously supported by Lillian. Learners spoke Afrikaans for the most part, but were encouraged to explain concepts and procedures to one another in isiXhosa when necessary.

6.4.2 Mediation strategies in mathematics teaching practices

This section reports on the way in which mathematical content knowledge was presented in Lillian's lessons and on the way in which Lillian mediated learning through various strategies. In Table 7 a breakdown of different strategies in passages from the three lessons presented as

Appendix D3 is given. The strategies involve the use of language and other methods to communicate what was being taught in the lesson. While I have attempted to isolate examples of the strategies, it is necessary to note that this type of analysis is not fool proof as no ultimate distinction can be drawn between them. I will discuss the strategies below, commenting on their prevalence and purpose during the episodes that involve the teaching of mathematical subject content.

The excerpts displayed below were selected from each of the three lessons transcribed that best demonstrated the common features of Lillian's mathematics teaching practices. Lessons 1 and 2 were taken from lesson episodes involving small group activities on the mat while the excerpt from Lesson 3 was taken from a whole group activity at the desks. The numbering of the lines in Table 7 correlates with the numbering of the lines in the lessons in Appendix D3.

Table 7: Lillian (Exemplar 1)

Repetition Rephrasing Mirroring Simplification Use of resources Metaphors

Lesson 1: 148- 179

148 T We call this one, what do we call it? (writes 'plus' symbol on the board)
149 Ls Plus
150 T Plus. If we sound it, we call it plus. This sign we call... (writes smaller than symbol on the board)
151 L Less than…
152 T (writes multiplication symbol on the board and waits for answer)
153 Ls Multiply
154 T Its long name? Who can give me its long name? Fernando? What is its long name? (Gestures to imitate the fact it is a long name) Beginning with 'ver' (Afrikaans)
155 L Double (Afrikaans: verdubbel)
156 T No, this is something else. Who knows its long name? Does one of the Monkeys know its name?
157 L Multiplication
158 T Yes, its long name is multiplication, and we just say it's 'times' because it means 'so many times'. (Afrikaans: 'maal') And this symbol? (writes divided by symbol on the board)
159 Ls Divided by
160 T (Nods) Divided by. They all have names.
161 T (wipes off symbols) When I want to say one number is bigger than... Sandi? When I want to say a number is bigger than another number, I do not write everything in words. I have 9, Jayden, and I have 4. Is 9 more or less than 4?
162 Ls More
163 T 9 is more than 4 ... now I do not write ... 9 is more than 4 (emphasises words) ... so many words. I'll just write a symbol (writes symbol) and it says 9 is more than 4.
164 Ls 9 is more than 4 (say words with teacher)
165 T So the sign says?
166 Ls (with teacher) Is more than...
167 T (writes on board 306 and 300) First read the number.
168 Ls 306
169 T And this number?
170 Ls 300
171 T Is 306 more or less than 300?
172 Ls More
173 T (hands chalk to learner who comes to board and adds ' more than' symbol. She asks the class what learner had written.)
174 T It says 306 is more than 300.
175 Ls (as teacher points at board) 306 is more than 300
176 T There is another symbol. (writes 14 and 41 on the board) The number is? Butlebelo? Sibulele?
177 T (first points at numbers and then asks learners to read numbers)
178 T Is 14 more or less than 41?
179 Ls Less than ...

Lesson 2: 64- 83

64 L2 Half past 1.
65 T Half past 1. Why do you say that?
66 (Learners hesitate)
67 L2 Because the…
68 T Because the... Say it, Fernando.
69 L2 Because the long arm is at the 6 and ...
70 T And?
71 L2 And the short arm is at ...
72 T Is going to the... The short one is going to the…
73 L2 2
74 T The short one is going to the 2.
75 (Teacher moves hands to indicate 1:45)
76 T The time is here ... you 're right ... come Tabiso…No, look here.
77 Ls A quarter to 2. (One of X-speaking learners mouths the answer with others, but does not seem confident of the answer.)
78 T A quarter to 2. And then he walks and he walks and he walks... Chantelle, sit up straight, girl. Put your clock at 25 past 2. (Teacher checks individually whether the learners are getting it right.)
79 L Here, ma'am.
80 (Teacher nods, looks at others learners' clocks. She goes and stands next to X-speaking learner at the back and helps him adjust the arms on his clock.)
81 T Count in 5s, count in 5s, 5... Count again in 5s… 5, 10, 15, 20... look at the long arm... the clock does not walk that way round... 25... (nods ... helps learner move arms)... hold onto the long one... move the short one... 25 past two ... past 2, past 2, good... (walks over to check others' clocks) There's a mistake, Titia ... here's the long ... (Learner on mat starts singing song with next door's class.) Fernando, I can hear you, are you in that teacher's class? Good… (to next learner) Does everybody have 25 past 2? (keeps checking)
82 Teacher draws 2:25 on the clock on the board. She draws a rectangular block under clock in which learners are required to fill in the digital time.
83 T 25 past 2. Now listen very carefully to me ... 25 past 2 ... you need to give me the digital time ... (first in Afrikaans and then in English) Give the ' digital ' time, right? The digital time is early in the night ... early… before the afternoon... so you need to write the digital time in there... (points to the space at the bottom of learners' educational cardboard clocks.

Lesson 3: 1 - 21

1 As preparation for a CAPS workbook exercise, Lillian uses the educational clock and revisits the times (on the hour) after 12 o'clock.
2 T Now the 12 o'clock is in the afternoon. So it is 12 o'clock, right? 1 o'clock in the afternoon is what time?
3 L1 (isiXhosa-speaking learner in Group 1 is the only one who gives an answer) 13:00 (The majority of learners do not join in.)
4 T And 2 o'clock will be?
5 L1 14:00
6 T And 3 o'clock?
7 Ls (give different answers)
8 T And then you go on like that. 12 o'clock midnight… in the middle of the night… what is the time going to be?
9 Ls (unsure)
10 T Chensil, count…
11 L2 12:00
12 T In the middle of the night?
13 L 3 60 minutes
14 T Hours, dear… where is my clock? Let's look on the clock. Let's see... (holding up the educational clock) 1 o'clock is…
15 Ls 13:00
16 T 2 o'clock is…
17 L 14:00 (only a few of the learners join in to answer the questions and the teacher seems unaware of this)
18 T (moves to each hour and when she gets to 5 o'clock, more learners join the counting) I'm not going to turn the whole time. 12 o'clock?
19 L4 24:00
20 T Thanks, my child. 12 o'clock at night is…?
21 L (with teacher) 24:00…

Repetition, rephrasing and mirroring

In the five lessons observed and particularly in the excerpts quoted in Table 7 only limited instances of repetition, rephrasing and mirroring were noted. It was noted that Lillian used repetition to focus learners' attention and emphasise the use of particular language. In Lesson 2:81, for instance, repetition was used to focus the learners' attention on the instruction: "Count in 5s, count in 5s, 5... Count again in 5s…" In Lesson 2:83 Lillian used repetition to draw the learners' attention to a more challenging calculation: "25 past 2. Now listen very carefully to me ... 25 past 2 ... you need to give me the digital time ... (first in Afrikaans and then in English) Give the ' digital ' time, right?" The repetition of the question in Lesson 1:156 served to alert the learners to the use of a particular term for multiplication and in Lesson 1:161 it served to emphasise the meaning of the symbol for 'bigger than' and also emphasise the link between the language and mathematical content. In most of the instances referred to above the learners' subsequent responses and application could be regarded as means through which Lillian assessed whether the learners understood her message. It was, however, not always possible to establish how effective her strategy of repetition was for all the learners involved.

In the excerpts quoted in Table 7 Lillian's mirroring of the learners' responses involved the recasting of their answers into more complete sentences. In Lesson 1:163, for instance, Lillian provided a more complete answer, "9 is more than 4", which then served as an example for their next answer, "is more than". A further instance where Lillian expanded the learners' single word response into a full sentence occurred in Lesson 1:158. In Lesson 2:72 a recast improved the accuracy of the learners' response. It would appear that Lillian used recasting to develop the learners' grasp of the language needed to understand and use mathematical concepts and procedures. The effectiveness of these strategies as far as learner uptake and understanding was concerned, was not established as it lay beyond the scope of this study.

Simplification

While the use of simplified language was not easy to isolate in Lillian's teaching, the examples of repetition, rephrasing and mirroring referred to above all involve a measure of simplification. They involve the use of short sentences and simple words to help strengthen the learners' grasp on mathematical language. She fine-tuned her communication to a level that would make the language and mathematical procedure accessible to the majority of the learners. The modification involved the use of repetition, Afrikaans and English prompts and simplification: “25 past 2. Now listen very carefully to me ... 25 past 2 ... you need to give me the digital time ... (first in Afrikaans and then in English) Give the ' digital ' time, right? The digital time is early in the night ... early… before the afternoon... so you need to write the digital time in there...” In Lesson 2:83b, simplification of language was used to assist learners in understanding the concept of digital time. These instances of simplification served as further examples of strategies that aimed to strengthen that learners’ grasp of the language needed to understand and use mathematical concepts and procedures.

Use of resources

The excerpts quoted above display a high level of concrete and semi-concrete support for meaning. Examples used in the excerpts quoted above include concrete support in the form of a clock used by the teacher and individual small versions used by the learners. The semi-concrete support provided by Lillian included writing and drawing on the board.

Use of metaphoric language

While only one instance of the use of metaphoric language to support the learners’ mathematical thinking was noted in the excerpts provided above, it provides an important example of scaffolding involving everyday language. The movement of the hands on an analogue clock is equated with the movement of a walking person. In this excerpt the physical action of tracking the movement from 1:45 to 2:25 was further supported by Lillian’s use of metaphoric language as she describes the movement of the clock in terms of the movement of a person using everyday context embedded language as opposed to abstract language: “And then he walks and he walks and he walks...”

Table 8: Lillian (Exemplar 2)

Questioning

Lesson 1: 148- 179

148 T We call this one, what do we call it? (writes plus symbol on the board)Ls Plus
149 T Plus. If we sound it, we call it plus. This sign we call... (writes smaller than symbol on the board)
150 L Less than…
151 T (writes multiplication symbol on the board and waits for answer)
152 Ls Multiply
153 T Its long name? Who can give me its long name? Fernando? What is its long name? (Gestures to imitate the fact it is a long name) Beginning with ‘ver’ (Afrikaans)
154 L Double (Afrikaans: verdubbel)
155 T No, this is something else. Who knows its long name? Does one of the Monkeys know its name?
156 L Multiplication
157 T Yes, its long name is multiplication, and we just say it's ‘times’ because it means ‘so many times’. And this symbol? (writes divided by symbol on the board)
158 Ls Divided by
159 T (Nods) Divided by. They all have names.
160 T (wipes off symbols) When I want to say one number is bigger than... Sandi? When I want to say a number is bigger than another number, I do not write everything in words. I have 9, Jayden, and I have 4. Is 9 more or less than 4?
161 Ls More
162 T 9 is more than 4 ... now I do not write ... 9 is more than 4 (emphasises words) ... so many words. I'll just write a symbol (writes symbol) and it says 9 is more than 4.
163 Ls 9 is more than 4 (say words with teacher)
164 T So the sign says?
165 Ls (with teacher) Is more than...
166 T (writes on board 306 and 300) First read the number.
167 Ls 306
168 T And this number?
169 Ls 300
170 T Is 306 more or less than 300?
171 Ls More
172 T (hands chalk to learner who comes to board and adds ' more than' symbol. She asks the class what learner had written.)
173 T It says 306 is more than 300.
174 Ls (as teacher points at board) 306 is more than 300
175 T There is another symbol. (writes 14 and 41 on the board) The number is? Butlebelo? Sibulele?
176 T (first points at numbers and then asks learners to read numbers)
177 T Is 14 more or less than 41?
178 Ls Less than ...

Lesson 2: 68- 74

68 L2 Half past 1.
69 T Half past 1. Why do you say that?
70 (Learners hesitate)
71 L2 Because the…
72 T Because the... Say it, Fernando.
73 L2 Because the long arm is at the 6 and ...
74 T And?
75 L2 And the short arm is at ...
76 T Is going to the... The short one is going to the…
77 L2 2
78 T The short one is going to the 2.
79 (Teacher moves hands to indicate 1:45)
80 T The time is here ... you 're right ... come Tabiso…No, look here.
81 Ls A quarter to 2. (One of X-speaking learners mouths the answer with others, but does not seem confident of the answer.)
82 T A quarter to 2. And then he walks and he walks and he walks... Chantelle, sit up straight, girl. Put your clock at 25 past 2. (Teacher checks individually whether the learners are getting it right.)
83 L Here, ma’am.
84 (Teacher nods, looks at others learners' clocks. She goes and stands next to X-speaking learner at the back and helps him adjust the arms on his clock.)
85 T Count in 5s, count in 5s, 5... Count again in 5s… 5, 10, 15, 20... look at the long arm... the clock does not walk that way round... 25... (nods ... helps learner move arms) ... hold onto the long one... move the short one ... 25 past two ... past 2, past 2, good... (walks over to check others ' clocks) ..There’s a mistake, Titia ... here's the long ... (Learner on mat starts singing song with next door’s class.) Fernando, I can hear you, are you in that teacher’s class? Good… (to next learner) Does everybody have 25 past 2? (keeps checking)
86 Teacher draws 2:25 on the clock on the board. She draws a rectangular block under clock in which learners are required to fill in the digital time.
87 T 25 past 2. Now listen very carefully to me ... 25 past 2 ... you need to give me the digital time ... (first in Afrikaans and then in English) Give the ' digital ' time, right? The digital time is early in the night ... early… before the afternoon... so you need to write the digital time in there... (points to the space at the bottom of learners’ educational cardboard clocks.

Lesson 3: 1 - 21

1 As preparation for a CAPS workbook exercise, Lillian uses the educational clock and revisits the times (on the hour) after 12 o’clock.
2 T Now the 12 o’clock is in the afternoon. So it is 12 o’clock, right? 1 o’clock in the afternoon is what time?
3 L1 (isiXhosa-speaking learner in Group 1 is the only one who gives an answer) 13:00 (The majority of learners do not join in.)
4 T And 2 o’clock will be?
5 L1 14:00
6 T And 3 o’clock?
7 Ls (give different answers)
8 T And then you go on like that. 12 o’clock midnight… in the middle of the night… what is the time going to be?
9 Ls (unsure)
10 T Chensil, count…
11 L2 12:00
12 T In the middle of the night?
13 L 3 60 minutes
14 T Hours, dear… where is my clock? Let’s look on the clock. Let’s see... (holding up the educational clock) 1 o’clock is…
15 Ls 13:00
16 T 2 o’clock is…
17 L 14:00 (only a few of the learners join in to answer the questions and the teacher seems unaware of this)
18 T (moves to each hour and when she gets to 5 o’clock, more learners join the counting) I’m not going to turn the whole time. 12 o’clock?
19 L4 24:00
20 T Thanks, my child. 12 o’clock at night is…?
21 L (with teacher) 24:00…

Questioning

In an interview, Lillian described her approach to questioning as follows, "I try to use a variety of question types, for example direct questions, higher order thinking and open-ended questions." She said she found, however, that while she tried to facilitate learner talk through the use of open-ended questions, the learners' lack of oral confidence influenced the manner and the frequency in which she elicited learner talk: "To speak for a long time is a challenge. The children would rather just give a short answer." It was noted during all five lessons observed that Lillian made use of mostly display questions requiring one word or short phrases as answers.

Apart from the rhetorical questions used to regulate learners' behaviour, such as, "Chester, I can hear you, are you in that teacher's class? (Lesson 2:85), Lillian's questioning focused on mathematics teaching. As mentioned above, the simple IRF display questions about subject content involved mostly the recall of facts and required a low level of cognitive engagement. While these types of questions served to facilitate participation by all the learners, it was found to provide support for only basic levels of language and basic levels of thinking. In Lesson 1:146-171 in Table 7, for example, Lillian's display questions focused on the recall of concepts and terminology and on basic applications of the concepts, for example the 'bigger than' and 'smaller than' symbols. In Lesson 3 the questioning, it was noted, served to set up patterns of sequenced thinking regarding the transition from analogue to digital time. What is of interest in the excerpt from Lesson 2 in Table 7, however, is the limited use of questions. A similar pattern was observed in another extended small group interaction in Lesson 3:108-135. These instances seem to suggest that Lillian made use of alternative patterns of communication in small group interactions involving dialogues or conversations rather than an IRF discourse patterns.

A further striking feature of Lillian's questioning strategies was the way in which they supported individual learner's language and mathematics development during whole class activities. In Lesson 1:31, for instance, Lillian asked for alternative routes of thinking: "Are there other ways you can break it up?" She then supported the learner's response by, in the following instance, providing the necessary words for their responses,

1 T Uh ... Natalie.
2 L 400 + 400 + 40 +40
3 T Well, Natalie says... (writes on board) 400 +400 +?

4 L 40 + 40
5 T Equals?
6 L 880 (Some learners write this down.)

The following excerpt from a whole class activity on the mat in Lesson 1:70-79 further demonstrates the way Lillian supported language use and thinking by providing a question or statement in which certain information was omitted as well as mirroring and recasting the learner's answer. The responses were supported by further questions as the learner explained to the class the procedure she followed to reach the answer she had written on the board,

T Can you tell us what you did, Phumeza? Tell us what you did. Just speak loudly.
L Broke up. (Speaks softly.)
T You first broke it up.
L And then I doubled it ...
T And then?
L I added them together.
T Yes, then you added them together.

I provide the following example of how the limited number of open-ended higher order questions requiring more extended answers was handled. Lillian made use of very basic referential questions in which she asked learners to explain their thinking, as the following excerpt (2:69-78) demonstrates:

L2 Half past 1.
T Half past 1. Why do you say that?
(Learners hesistate)
L2 Because the…
T Because the... Say it, Chester.
L2 Because the long arm is at the 6 and ...
T And?
L2 And the short arm is at ...
T Is going to the... The short one is going to the…
L2 2
T The short one is going to the 2.

Lillian asked the learner to explain the reason for his answer and then supported him by helping to complete the sentence. These interactions provided a chance for learners to express thoughts and use language in a supported and guided manner. To mediate mathematics and language she gave cues (propositional content) and then elicited single word responses.

The following was noted regarding the distribution of questions: at the beginning of the instructional lesson stages, the questions were aimed at the whole class and later at individual learners. As the questions were directed at the group, it was observed, they provided only a superficial impression of the group's understanding or consolidation of concepts. It was further noted that the majority of questions were addressed to the more proficient learners. It was further noted that, when Lillian worked with groups on the mat, she used dialogues or conversations to monitor the learners' progress on an individual level.

The interactions quoted above show how Lillian used questions in combination with other strategies to support and direct learners' language use in order to support their thinking. In the few instances where questions elicited more extended use of basic oral language and the use mathematical language, Lillian guided the learners' language by extending it and by using recasts.

In summary, Lillian's mediation strategies during mathematics can be described as follows: She used repetition to focus the attention on particular concepts and procedures, especially more challenging ones. Lillian's mirroring of learners' responses involved implicit recasting of their answers into more complete and accurate versions. She used simple language and concrete and semi-concrete resources to make the concepts and procedures more accessible. She also made use of metaphoric language to link everyday concepts and language with academic language and abstract concepts.

Lillian's questioning strategies focused on mathematics teaching. The most prevalent questioning pattern consisted of simple IRF display question requiring basic recall of facts. Lillian also made use of sets of display questions to guide the learners' thinking. The use of questions was found to be less prevalent in small group interactions where dialogues or conversations rather than IRP discourse patterns were employed. Lillian also used questions and cues to guide and support individual learners' explanations and thinking during whole class activities, especially in instances where learners were required to demonstrate higher order thinking in slightly more extended language than usual.

6.5 Summary

In this chapter I have presented data to about how the participating teachers structured their teaching and managed learners and learning. To gain an in-depth understanding of the teachers' mathematics practices, I then described trends and patterns that emerged regarding each teacher's mathematics practices. For this purpose the conditions that shaped their mathematics teaching and the strategies they used for the mediation of mathematics were explored. The analysis and discussion of the data are presented in the next chapter.

CHAPTER 7 ANALYSIS AND DISCUSSION OF DATA

7.1 Introduction

In this chapter, data presented in Chapters 5 and 6 and Appendix D is firstly analysed and discussed in relation to the conceptual and theoretical framework and related studies discussed in Chapters 2 and 3. It is done with special reference to the sociocultural theory of learning (Vygotsky, 1986) and the interactive model of second language learning (Long, 1996). Secondly, the analysis is conducted with reference to the research questions of the study. The main research question sought to gain an understanding of the nature of the teaching practices in classes where isiXhosa-speaking learners are learning mathematics through the medium of Afrikaans. The supporting questions focused on the teachers' views about teaching learners who are learning through a second language, their views regarding teaching mathematics to these learners as well as the strategies and forms of mediation the teachers employed in teaching mathematics to the learners.

Data for the study was collected in a variety of ways. This necessitated a presentation in various formats. The interviews with the principals, HOD and interviews with the teachers regarding views about teaching practices in terms of the school context was presented in the form of a contextual background report for each school and is included as Appendices C1 to C3. The content analysis of classroom observations, teacher interviews and document inspections w3ere presented thematically in Chapter 5. The contextual data that situated the mathematics teaching practices and the strategies used by the teachers to mediate mathematics learning was presented in Chapter 6.

As far as the analysis and foregrounding of findings regarding teacher perceptions and contextual background of the teaching practices under discussion are concerned, a synopsis of the main points was provided and discussed in terms of the reflexive-dialectical scheme offered by Kemmis (2011) at the end of Chapter 5. This chapter concentrates on the way in which the teachers' mathematics teaching practices were shaped by individual and extra-individual conditions (Kemmis, 2011) and by the mediation strategies that were used to teach mathematics. While I acknowledge that there is a complex iterative relationship between the teaching conditions and teaching strategies, they are, for the purposes of this analysis, delinked and treated separately. The following section discusses the broader conditions that shaped the teachers' mathematics practices in a way that brings together the main preconditions that were identified and the findings regarding the teaching practices. It focuses on the teaching conditions in terms of the extra-individual conditions of the different school contexts and the individual conditions involving the classroom contexts.

7.2 Teaching conditions that shaped mathematics teaching

7.2.1 Conditions related to the school contexts

In this section the contextual background of each school, included as Appendices C1 to C3, is discussed to highlight the salient features of the extra-individual conditions that shaped the mathematics teaching practices of each teacher.

The three schools varied in terms of history and financial status. While Park High was a Quintile[24] 5 ex-Model C school, the other two were Quintile 3 schools previously classified as schools for 'coloured' learners. Winter Primary was the only dual medium school and, according to the participating teacher, this fact added a further layer of complexity regarding the staff and learners' perceptions about the language status of Afrikaans as opposed to English. The majority of staff in all three schools was Afrikaans-speaking.

The schools varied in terms of size and language ratio. While Park High had 391 learners from Grade R to 12 and 20% isiXhosa-speaking learners, Duiker Primary had 388 learners from Grade R to 7 and 48% isiXhosa-speaking learners. Winter Primary had the highest number of learners, namely 797 from Grade R to 7 and the highest percentage with 79% isiXhosa-speaking learners. The language profiles of the participating Grade 3 classes mirrored, to a large extent, that of the schools, with 39% isiXhosa-speaking learners in Park High's class, 46% in Duiker Primary's class and 89% in Winter Primary.

All three schools displayed a clearly defined academic programme as well as management and organisational structures. Enrichment programmes for learners were organised in all three

[24] See footnote 29.

schools, but not all these programmes were found to be available to all the learners. Teachers attended departmental and other in-service programmes, but none specifically aimed at supporting teaching through the medium of a second language. All three participating teaching emphasised the importance of staff collaboration and team work to incrementally build learners' language and academic skills across the grades in the Foundation Phase and further. This was considered to be a crucial factor in the achievement of sufficient levels of Afrikaans proficiency in, for example, Grade 3.

On the whole, the parents of isiXhosa-speaking learners were, according to the staff, satisfied to have their children in Afrikaans classes, provided they received good teaching in a well-functioning school. The parents' involvement in their children's academic progress was found to be generally low and, as a result, impacted the academic progress of the learners. The majority of parents of isiXhosa-speaking learners were found to be unable to offer sufficient assistance with homework tasks because of a language barrier. Each school's language policy was determined by the SGB (see footnote 32) and the general opinion expressed by the principals and teachers was that the policy should be supported as their schools, according to them, served Afrikaans-speaking communities.

7.2.2 Conditions related to the classrooms

The classroom data presented in Chapters 5 and 6 covered multiple aspects of the classroom conditions observed. Ultimately, however, the salient features are encompassed within a discussion of four main themes, namely structure, interaction, language and strategies to mediate mathematics. While these themes are distinguished as separate aspects for the sake of this discussion, it is important to notice that they overlap. The first theme involves looking at the way in which teaching, learning and learners were structured. For the theme of interaction, the prevalence of structures and patterns of classroom interaction are investigated. The theme of language focuses on the nature of language use and the way it supported the learners' movement from everyday language to academic language as well as their movement from everyday thinking to academic thinking. It also looks at the extent to which teacher talk served to provide comprehensible language input and to facilitate learners' use of negotiated language output. The theme of mediation strategies in mathematics teaching involves looking at ways in which the teacher assisted the learners to develop their thinking and to enable them to master tasks independently.

7.2.2.1 Structure

Chapters 2 and 3 reported on work that investigated the structuring of teaching and learning as an important precondition in effective teaching practices. Christie (1995) speaks of the necessity for a conducive 'social order' in a classroom and Wong-Fillmore's (1985) research found that structure and routine in a classroom played a central role in effective second language learning. She highlighted aspects such as the organisation and structure of lesson procedures and the careful design of learner participation according to their individual levels of proficiency.

A further precondition for effective teaching, as argued from a sociocultural perspective, involves active learner involvement. In order for classroom and learner structures to facilitate learning, they need to be balanced with learner involvement in the learning process. Active involvement implies that learners participate and interact in different ways in the learning process. Such interaction, for the most part, takes place through language, as a tool for thinking (Vygotsky, 1986). Such interactions, viewed in terms of the interactive model of SLA, provide an important means for learning a second language. Active learner involvement further implies that learners share an understanding of the underlying teaching structures and procedures and the content that they serve to convey.

Only when these preconditions are met can learners increasingly be included in what Lave and Wenger (1991) call the joint enterprise of a community of practice aimed at closing the gap between the teacher and learners' knowledge and creating of a shared repertoire. The implications of such a process are that the learners gradually need to develop an internal understanding that enables them to apply the shared repertoire in an independent manner.

Structuring of teaching and learning

The ways in which the participating teachers in this study structured teaching and learning displayed a number of variations. In Marlene's practice, for example, the absence of explicit lesson planning impacted the structure of lessons and the clarity regarding lesson aims and outcomes. It also resulted in inconsistencies regarding the time spent on mathematics teaching in the various lessons observed and, on the whole, compromised active learner involvement in the process of learning. While Anine and Lillian made use of more explicit planning and consistent routines, their awareness of an underlying logic and rationale was not consistently shared with the learners. Anine and Lillian both indicated that their planning was based on reflection on feedback they received in the form of learners' oral and written performance. It was noted, however, that their practices did not in all instances foreground clear communication to the learners regarding focus, envisaged content development and the underlying principles at play in the lessons and lesson episodes.

To iterate, sharing an awareness of the links between lessons and lesson episodes was not a priority in the practices of the three participating teachers. The result was that the learners did not necessarily develop a clear understanding of the process of knowledge construction during the lessons. It can be argued that, in terms of the sociocultural notion of the teacher and learners' co-construction of knowledge through the development of language and thinking skills, all three teachers worked from a positivist approach in which the transferring knowledge was foregrounded.

Structuring learners

The structuring of learners in a mathematics class involves initiating the learners into specific ways of doing and being (Lave and Wenger, 1991; Christie, 1995; Mercer, 1996). This involves the establishment of an environment that will support and develop learners' understanding of and participation in the process of learning. While the extent to which learning of mathematics took place was not the focus of this study, it was necessary to consider it as a factor in the investigation of the mathematics teaching practices. The main aspects of learner structuring that are discussed here, include the teachers' use of group work and their use of language to direct the learners' actions, regulate behaviour and develop subject content in general and as it relates to mathematics.

- *Group work*

Research on group work reported on in Chapter 5 described group work as an effective means for mediating learning because it provides a positive environment and an opportunity for collaboration to develop problem-solving skills through exploratory talk (Gibbons, 2006). This is however, as Dawes and Sams (2004) argue, only possible in favourable conditions, namely in conditions where participants understand the purpose of collaboration and possess the ability to engage in productive discussions. And as Adler (1997) highlighted, favourable conditions regarding language use often do not exist in classes where learners with low levels of proficiency are required to interact but do not have the language ability to do so. This was confirmed in Marlene's class where learners with low Afrikaans proficiency discussed the tasks in isiXhosa.

Anine's learners, on the other hand, were proficient enough to perform problem-solving tasks in an independent and spontaneous manner. A feature of Anine's management of group discussions which offers a solution to the matter of enabling second language learners to use exploratory talk, was the explicit way in which she directed the learners' discussion, giving specific instructions about how they needed to speak to one another and what they needed to report on. This practice links with what Adler (1997) recommends as a solution for developing language skills for group interactions. She suggests that teachers need to consistently and consciously develop second language learners' ability to use the types of everyday and academic language needed for group discussions. As mentioned earlier, Dawes and Sams (2004) offer further practical suggestions regarding the explicit development of strategies and communication skills necessary for successful collaboration. These include teaching 'talk lessons' and ground rules for talk as well as modelling exploratory talk.

A further relevant aspect regarding group work is the way in which groups are compiled and arranged to facilitate optimal interaction. Marlene, for the most part, put learners together in ability groups. Her whole class teaching style, however, did not allow much opportunity for verbal interaction. This practice was complicated by the fact that the majority of learners displayed low levels of proficiency and a lack of knowledge regarding the use of exploratory talk. Lillian made use of mixed-ability groups, but the interaction in these groups, it was noted, involved mostly teacher-to-learner communication. Anine's use of mixed-ability pair groupings, it was noted, provided opportunities for the development of exploratory talk, especially in a conducive context of high levels of proficiency and self-regulation, as well as a familiarity with interactional patterns used in the learners' induction into mathematics.

- *Directing, regulating and developing content*

As far as the teachers' use of language in directing actions, regulating behaviour and developing mathematics subject content was concerned, it was noted that the established patterns and routines in Anine and Lillian's classes enabled them to spend less time on directing and regulating of learners and more time on the development of content. Marlene, in the absence of clear and familiar routines, spent the majority of lesson time concentrating on the directing and regulating of learners rather ` than on mathematics teaching.

Interactional patterns

Interactional patterns can, according to Gibbons (2006) be classified in terms of participation in different types of actions, participant roles and cultural rules. The focus here is, however, on how these patterns and classroom discourse in particular enabled both language learning and content learning in the participating teachers' practices. Drawing on the sociocultural notion of co-construction of meaning (Vygotsky, 1986), the study examines the role played by the teachers in facilitating classroom interaction and to what an extent learners' participation was orchestrated by the teacher or, alternatively, was allowed to develop spontaneously. The investigation further poses the question whether the learners acted as participants in the classroom, first in receiving language and content input and then producing negotiated output.

In all three classes the interaction patterns were found to be strongly determined by the teachers. It can be said that, in essence, the teachers' practices displayed a teacher-directed approach as the learners' language use and thinking was guided in a way that did not always allow for free learner discovery and input. In the words of Gibbons (2006) the teachers acted, for the most part as 'primary knowers' who directed language use and thinking processes. Creating opportunities for learners to express their own thinking and then internalise their thinking processes was not, for the most part, observed to be the focus of the teachers' practice. Keeping the curriculum transparent and checking on learners' interpretation and understanding of concepts and procedures was found to be subordinate to the priority of knowledge transmission.

The discourse patterns were established through the way in which questioning strategies were used to facilitate participation and mediate learning. The most prevalent questioning pattern observed in all the teachers' practices involved the use of basic IRF display questions requiring short responses and low cognitive demand. While such questions ensure, as Wong-Fillmore (1985) argues, participation through the regular eliciting of monosyllabic answers, the development of more extended participation was found to be minimal. This was especially noticeable in Marlene's use of questioning patterns. In addition, the high prevalence of rhetorical questions pointed to a pattern that yielded minimal language interaction and feedback about learner understanding. Lillian, it was noted, more consciously guided and supported learners' answers by making use of recasts of answers. Anine, on the other hand, was able to facilitate more spontaneous dialogic exchanges. Participatory exchanges (Gibbons, 2006; Van Lier, 1996), where talk is genuinely co-constructed, were not foregrounded as part of Marlene and Lillian's practices and only to a limited degree present in Anine's interaction practices.

One can therefore say that the teacher-learner collaborative discourse that Vygotsky deems critical for learning to take place was limited in all three teachers' practices and that the low proficiency levels had a direct impact on the degree of exploratory talk. Learner-learner collaboration was even less prevalent. While participation in Marlene's class involved 'doing' mathematics in relative silence, the added benefit of 'speaking' mathematics to strengthen cognitive development and support learning had not been fully explored.

While the questions were fine-tuned to meet the learners at their level, it was noted that the extent to which the questions encouraged exploratory talk and language development by stretching the learners' use of language through interaction varied. The extent to which questions supported the learners' mathematics thinking also varied.

Use of language

This section focuses, in the first instance, on the nature of the teachers' language use and the way it supported the learners' movement from everyday language to academic language in mathematics as well as their movement from everyday thinking to academic thinking in mathematics. Together with these distinctions the use of calculational and procedural knowledge as opposed to conceptual knowledge is explored. In the second place, language use is examined regarding the extent to which teacher talk served to provide comprehensible language input and to facilitate learners' use of negotiated language output. Teacher talk is regarded (Wong-Fillmore, 1985; Mercer, 1995; Wells, 2000) as a critical factor in providing the first steps to second language learning and also in facilitating the subsequent steps of language development involving learners' language use. The fact that all three teachers were found to use high levels of teacher talk meant that the learners received a large amount of comprehensible input of an educational and educated nature. This modelling of language, according to Krashen (1989) and Ellis (1999), acts as an important first step in the process of language and content knowledge development. It was found, however, that the teachers differed in their approach to the use of educated and educational language (Mercer, 1995).

As far as the use of teacher talk is concerned, it needs to be noted that the fact that Anine and Lillian especially were concerned with teaching mathematics to Afrikaans and isiXhosa-speaking learners at the same time was a challenge in this research. While the study interested itself with the teaching of learners whose first language is not the language of instruction, is was not always possible to isolate instances when the teacher was speaking directly to the isiXhosa-speaking learners and ones where she was speaking to the group as a whole.

While keeping this challenge in mind, certain trends were distinguishable regarding the use of teacher talk. Marlene focused mostly, but not exclusively, on providing language input in the form of the educational register regarding the actions and behaviour required in the classroom. To this end she made use of high levels of repetition, rephrasing and simplification, but with minimal verification regarding the learners' understanding. The input provided by Lillian and Anine concentrated more on educated discourse and their use of explicit and simplified language focused on facilitating mathematics content development. A feature of Lillian's, and to a lesser extent of Marlene's educated input, was the scaffolding of educated discourse by highlighting the link between language and the conceptual knowledge it conveyed. Anine, owing to the isiXhosa-speaking learners' levels of language proficiency, was able to focus more on facilitating learner participation in educated discourse patterns in a spontaneous manner.

While Mercer (1995) and Wong-Fillmore (1985) both emphasise the importance of teacher talk for the modelling of both educational and educated registers to second language learners, Ellis (1999), Swain (1985) and Long (1996) argue that learners need to receive optimal opportunities to use the registers as modelled by the teachers in an increasingly proficient manner. They stress that in order to optimise the use of talk as a social thinking tool, everyday and academic concepts and everyday and academic language need to be strengthened through negotiated output. This, they argue, would enable them to talk about what they are learning so that they can gradually internalise the thinking processes to what Vygotsky (1986) refers to as inner speech. Through careful scaffolding and strengthening of their awareness of the interrelated skills of language use and thinking, learners become increasingly able to take part in the construction of shared meaning which is necessary for effective learning.

The crucial question that arises here is whether, in the light of the importance ascribed to learners' language construction, the facilitation of educated and educational learner talk in mathematics was foregrounded in the practices of the participating teachers. In other words, how were the learners' Afrikaans language skills developed to support mathematics content development? Based on her perceptions regarding the learners' lack of linguistic confidence, Marlene opted to concentrate of providing language input without conscious efforts to encourage and scaffold learner talk. As a result, instances of learner talk were found to be minimal, mostly consisting of group chants, monosyllabic responses and chorusing of responses. While Lillian also expressed an awareness of the low levels of oral confidence among the learners in her class, they were observed to be more comfortable with speaking Afrikaans to one another than the learners in Marlene's class. This could be the result of the fact that the ratio between isiXhosa and Afrikaans speakers in Lillian's class was much more balanced. Lillian provided some of the individual learners with more conscious scaffolding for extended talk, but instances of such support during group activities were found to be limited. Anine, whose learners displayed high levels of Afrikaans proficiency, were encouraged and guided by her to describe their thinking process and discuss calculations and procedures with one another in groups and especially in pairs.

Strategies to mediate mathematics

In this section the strategies and forms of mediation used by the teachers in teaching mathematics will be discussed in a way that highlights the main findings and implications regarding the teaching practices observed.

In sociocultural terms (Lantolf and Thorne, 2007), mediation involves ways of bridging the distance between teacher knowledge and learner knowledge. The sociocultural view is that such mediation is accomplished through collaboration where the teacher as an expert collaborates with the learners as novices to enable them to master tasks that they could not have done on their own. The question from a sociocultural position to learning is whether learners receive opportunities for interactive meaning making that gradually empowers them to work independently or whether they remain passively dependent on the input of the teachers. The sociocultural view further foregrounds the role of language use in the process of mediating both language and cognitive development through the linguistic and cognitive socialisation of second language learners.

All three teachers expressed an awareness of the need to simplify language and content for the learners and provided and modelled basic forms of educational and educated mathematics discourse. Marlene's high levels of repetition were found, however, to focus on directive and regulatory knowledge rather than mathematics content development. The facilitating of learners' verbal reflection on her communications was not foregrounded.

Ellis (1994) argues that while explicit and simplified language helps to create a bridge that will increasingly help learners to master educated discourse, the scaffolding process needs to increasingly facilitate and strengthen learner use of language to describe and reflect on content and concepts. For this to happen, learners need to be able to take part in exploratory exchanges. The scaffolding Marlene provided did not provide optimal opportunities for learners to cope with educational and eventually educated discourse. While both Lillian and Anine's use of explicit language focused more on mathematics content development than Marlene's, their approach to the scaffolding of the learners' use of educational and educated language differed. Lillian's scaffolding strategies remained mostly teacher-directed and Anine displayed a greater awareness of the need for explicit directions and encouragement of learner-to-learner exploratory talk.

All three teachers made regular use of concrete and semi-concrete support for teaching and context-embedded support for language and thinking. They used, for example, metaphoric language as a further method to link everyday concepts with mathematical concepts, particularly relating to measurement and time. The development of more abstract thinking in context-reduced tasks was found to be less foregrounded.

7.3 Summary

This chapter offered an analysis of the data collected by means of interviews and class observations and involved a discussion of the salient features of the conditions related to the school contexts and the teachers' classroom. The classroom conditions were explored in terms of four main themes, namely structure, interaction, language use and strategies to mediate mathematics. Within the theme of structure the effects that the lack of explicit planning have on clear lesson structuring were highlighted, as well as the effects a lack of overt communications to learners regarding underlying teaching principles have on the co-construction of knowledge in the classroom. In terms of interaction, the complexities regarding classroom discourse in a second language class were investigated, as well as the ways in which group work strategies and interactional patterns facilitate the use of exploratory talk. As far as language practices were concerned, the discussion focused on the use of teacher and learner language in the classroom and the extent to which language use supported mathematics thinking and content knowledge development. The strategies used to mediate mathematics looked at the way in which the teachers used modified language and resources as a means to bridge the gap between teacher and learner.

Chapter 8 CONCLUSION

8.1 Introduction

This concluding chapter makes recommendations regarding the findings and implications emerging from this case study investigation. Based on these insights I suggest possible avenues for further research into teaching practices and the education of teachers. I also reflect on some of the limitations of the study.

8.2 Summary of findings

My key findings regarding teaching practices which govern the mediation of mathematics in second language classrooms are summarised below alongside their primary implications:

- Teachers' detailed planning and reflection on their teaching (through formal and informal assessment of learner performance) is required to provide them with a clear understanding of the structuring of learning so that the overall goals and lesson outcomes are well-established before teaching begins.
- An explicit awareness of the importance of structure and routine is needed from teachers to ensure that consistent amounts of time are optimally spent on teaching content. The relation between sets of lessons and between lesson episodes also needs to be clearly established.
- A careful sequencing of general and specific teaching events is essential to provide secure opportunities for the effective scaffolding of language from context embedded to context reduced tasks, and subject content from cognitively undemanding to demanding tasks. For such sequencing to be optimally effective, teachers need to pay sufficient attention to detailed planning.
- While it is essential for teachers to have a clear idea of the goal of a mathematics lesson, it is also important that learners receive an understanding of the goal of the lesson at the start and during transitions by means of signaling. Learner need to know what the focus will be and why. They also need to form an understanding of how mathematical concepts and procedures relate to one another. The provision of a transparent curriculum is essential to establish active learner participation and interaction in the construction of knowledge. Such an in-depth understanding would enable them to move more effectively from conceptual to procedural knowledge.

- In order to enhance learner interpretation and cognitive participation teachers need to facilitate the type of communication that will provide learners with a clear grasp of their prior knowledge and their ongoing development of calculational and procedural knowledge. Effective interactive patterns as well as ways of developing language and thinking skills need to be put into place.
- Learners need to work in small groups where they are able to develop language and subject discourse with teacher and peers, and receive individual attention in a situation where equal participation ensures that no-one is overlooked and individual learners' language and cognitive performance and progress can be assessed and monitored.
- Teacher talk needs to be designed to develop the learners' language proficiency by providing comprehensible input and facilitating opportunities for negotiated learner output. Comprehensible input needs to be fine-tuned to meet the needs of individual learners and groups of learners, based on their particular listening and oral levels.
- In cases of low proficiency, high levels of explicit language input is needed in the form of repetition, mirroring and recasting of sentences. Language input needs to be supported through the use of non-verbal means such as concrete and semi-concrete support.
- Teacher talk needs to provide learners with models of everyday and mathematical language. The latter involves calculational and procedural patterns as well as conceptual patterns. Teacher talk should serve to enhance the gradual development of learners' use of informal and formal mathematical registers.
- Learner talk needs to be actively scaffolded by first encouraging participation through questioning and responsiveness to learners' answers through mirroring of responses. This responsiveness needs to support language development through explicit and implicit teacher feedback in the form of recasts of learners' responses.
- Learner thinking needs to be scaffolded simultaneously through the use of metalinguistic language aimed at making explicit the link between language and thinking as well as the modelling of conceptual and procedural thinking.
- Through the use of differentiation techniques the scaffolding should be fine-tuned to meet the needs of individual learners and groups of learners and should be aimed at gradually developing learners' awareness and ability to use and apply language to express their

own calculational, procedural and conceptual thinking as a preliminary stage to the internalisation of these types of cognitive processes.

- Teachers need to display an awareness of the importance of interaction and provide effective opportunities for teacher to learner and learner to learner interaction. Collaborative problem-solving that is primarily aimed at developing learners' ability to express their thinking through the use of educational and educated discourse needs to be foregrounded.

8.3 Some possible ways forward in relation to teacher education

This investigation pointed to the fact that teacher education regarding second language learning appears to be inadequate. All three of the teachers who participated in this study indicated a need to receive training and guidance in order to strengthen their pedagogical knowledge regarding appropriate support for second language learners. For this reason, in-service and pre-service training programmes need to incorporate courses specifically aimed at equipping teachers for the challenges posed in contexts where learners are taught through a language that is not their mother tongue. The findings listed above could contribute to inform such programmes.

Policy makers and educationists should take cognizance of the further challenges faced by teachers who are unable to speak the language of learners they teach. These challenges are particularly poignant at Foundation Phase level. While the study brought to the surface some of the mediation strategies that teachers intuitively apply, such as repetition and other forms of modified language, other critical aspects received limited attention in their teaching. The teachers demonstrated, for instance, insufficient awareness of the necessity of the establishment of learner uptake and understanding.

Some of the study's further implications for teachers, academic institutions and departmental institutions involved in teacher training and policy makers alike, include essential preconditions for effective teaching such as the need for transparency and the need for a gradual build-up of learners' skills regarding the use of exploratory talk by scaffolding educational and educated registers to support the sociocultural notion of ensuring the co-construction of knowledge. It is vital that teacher training programmes reflect on ways of providing student teachers with the skills and insights regarding such preconditions to ensure the development of effective teaching practices of learners for second language learners in general and in particular learners who learn content subjects like mathematics through a second language.

8.4 Possibilities for future research

This study, which focused on the teaching practices of Afrikaans-speaking teachers who teach isiXhosa-speaking learners mathematics through the medium of Afrikaans, points to a number of other avenues for further research. These include:

- Exploring the contextual background to the second language teaching practices in more depth by looking at, for instance, the perceptions of parents who choose to enrol their children in schools where they are required to learn through a second language, particularly isiXhosa-speaking parents who choose to enrol their children in Afrikaans schools in the Foundation Phase.
- Exploring mathematics teaching practices by focusing on the perceptions and progress of learners learning through a second language, especially isiXhosa-speaking learners who learn through the medium of Afrikaans in classrooms where the teacher is not able to speak their mother tongue.
- Exploring the benefits of a multilingual approach to the teaching of mathematics through a second language by looking at how teachers' mediation of learning through a second language could be supported and strengthened through the provision of written texts in both the LoLT and the learners' mother tongue, especially during the assessment of learner progress.

8.5 Closing comments

This case study investigation has aimed to highlight key features of the teaching practices of Afrikaans-speaking teachers who teach mathematics to isiXhosa-speaking learners through the medium of a second language. The study aimed to provide insights into the contextual background of the participating teachers as well as the structuring of their teaching and the strategies they used to mediate learning.

It is my hope that this investigation will provide insight into the challenges impacting the teachers' practices and alert those in positions of professional authority of the need to put more effective support structures in place to assist such teachers in providing optimally effective levels of teaching. I conclude with the words of Gibbons (2006:273) as she argues for a need for teaching practices that provide a fine balance between developing language skills and thinking skills in the teaching of second language learners,

> [V]iewing the curriculum through the lens of language is essential to the design of programmes that are concerned both with students' language development and with the development of subject knowledge. While teaching and learning activities are usually consciously planned by teachers, the interactional means by which they are played out is rarely at the level of explicit awareness. Becoming aware of the range of interactional options available to teachers means holding up to the light what is frequently below the level of conscious thought, but… such scrutiny may lead to recognizing points of 'leverage' for interactional and educational change.

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APPENDIX A: Permission letters

A1: Letter from the researcher

Dear

Permission to conduct my proposed research at

I am presently conducting research as a member of the Rhodes University group of scholars taking part in the Cape Foundation Phase Research Programme funded. The topic of my research is: Investigating the practices of non-isiXhosa speaking teachers teaching mathematics to isiXhosa speaking 3rd grades through the medium of Afrikaans.

The Programme has received permission and ethical clearance for the research, but I hereby request permission from you as the Headmaster to conduct my study in the grade 3 (Afrikaans) class at your school. My data collection will involve class observation (through video recordings and field notes) and interviews with the grade 3 teacher. I refer you to the attached letter about ethical clearance and would like to state that, as far as the video recordings are concerned, I undertake to honour all requirements regarding the protection of the identities of the learners and will seek the necessary permission in this regard. I plan to conduct my research in three different schools in the Grahamstown and Alexandria area.

I trust that my request will receive your favourable consideration. If possible, I would appreciate it if you could grant me the necessary permission in writing.

Yours sincerely

S. Knoetze

S.Knoetze

A2: Letter from the supervisor

RHODES UNIVERSITY

Grahamstown • 6140 • South Africa

FACULTY OF EDUCATION
Tel: +27 (0) 46 603 8393
Fax: +27 (0) 46 622 8028
PO Box 94, Grahamstown, 6140
E-mail: education@ru.ac.za

DATE: 30 July 2012

To whom it may concern,

Dear Sir / Madam

PERMISSION TO CONDUCT RESEARCH

CANDIDATE: SAN KNOETZE

STUDENT NUMBER: G11K0015

This letter is to confirm that San Knoetze is a registered student in the Education Faculty at Rhodes University. She has been registered for a Master's in Education.

San is a masters student in a large research programme funded by the European Union in conjunction with the Department of Higher Education and Training. Its overall goal is to examine the nexus between quality teaching and quality education programmes, and by so doing, improve the quality of teacher education programmes on the one hand, and teaching practices on the other hand. The overall research programme has obtained ethical clearance from Rhodes University as well as from the Provincial Department of Education.

San will be required to conduct research for her thesis. This letter serves to request permission for her to conduct research in your school for this purpose.

Her proposal was approved by the Education Higher Degrees Committee on 24 May 2012. The proposal complied with the ethical clearance requirements of the Faculty of Education.

Yours Sincerely

Prof J. Baxen
Chair: Higher Degrees Committee
Deputy Dean: Research
Faculty of Education

www.ru.ac.za

APPENDIX B Letters of consent

B1: Letter of consent from the Eastern Cape Department of Education

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Province of the
EASTERN CAPE
EDUCATION

STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES
Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)43 702 7428 • Fax: +27 (0)43 702 7427/38 • Website: www.ecdoe.gov.za

Enquiries: Dr Heckroodt Email: bernetia@iafrica.com

08 January 2012

Professor JM Baxen

27 Fitzroy Street

Grahamstown

6139

Dear Prof Baxen

PERMISSION TO UNDERTAKE RESEARCH: QUALITY TEACHING AND TEACHER EDUCATION PRACTICE RESEARCH PROGRAMME – THE CAPE FOUNDATION PHASE RESEARCH PROGRAMME

1. Thank you for your application to conduct research.

2. Your application to conduct the above mentioned research in 60 selected Primary Schools of the 8 selected Districts (see Appendix 1 which forms part of this letter) in the Eastern Cape Department of Basic Education (ECDBE) is hereby approved on condition that:
   a. there will be no financial implications for the Department;

   b. institutions and respondents must not be identifiable in any way from the results of the investigation;

   c. you present a copy of the written approval letter of the Eastern Cape Department of Basic Education (ECDBE) to the District Directors before any research is undertaken at any institutions within that particular district;

   d. you will make all the arrangements concerning your research;

building blocks for growth

Page 1 of 2

Ikamva eliqaqambileyo!

e. the research may not be conducted during official contact time, as educators' programmes should not be interrupted;

f. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to the Director: Strategic Planning Policy Research and Secretariat Services;

g. the research may not be conducted during the fourth school term, except in cases where a special well motivated request is received;

h. your research will be limited to those schools or institutions for which approval has been granted, should changes be effected written permission must be obtained from the Director – Strategic Planning Policy Research and Secretariat Services;

i. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis. This must also be in an electronic format.

j. you are requested to provide the above to the Director: The Strategic Planning Policy Research and Secretariat Services upon completion of your research.

k. you comply to all the requirements as completed in the Terms and Conditions to conduct Research in the ECDBE document duly completed by you.

l. you comply with your ethical undertaking (commitment form).

m. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Director: Strategic Planning Policy Research and Secretariat Services.

3. The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDBE.

4. The Department will publish the completed research on its website.

5. The Department wishes you well in your undertaking. You can contact the Director, Dr. Annetia Heckroodt on 043 702 7428 or mobile number 083 275 0715 and email: annetia.heckroodt@edu.ecprov.gov.za should you need any assistance.

DR AS HECKROODT

DIRECTOR: STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES

Ilamva eliqaqambileyo!

B2: Letter of consent from Rhodes University

RHODES UNIVERSITY
Where leaders learn

Rhodes University Ethical Standards Committee, Rhodes University, P O Box 94, Grahamstown, 6140
Tel: +27 46 603 7366 • Fax: +27 46 603 8934 • email: M.Gobel@ru.ac.za

24 Nov 2011

Dear Prof Baxen,

Ethics Clearance: 2011Q4-4
Principal Investigator: Prof Jean Baxen

This letter confirms that a research proposal with tracking number 2011Q4-4 and title: The Cape Consortium Foundation Phase Research Programme: Quality Teaching and Teacher Education Practices, was given ethics clearance by the Rhodes University Ethical Standards Committee at its meeting of 10 November 2011 pending clarification of the following points:

1) The Informed Consent form seems to be only for teachers, not the other individuals (heads of schools, Department of Education Officials, children and parents) and organisations mentioned in the proposal.
2) Most participants are envisated to be IsiXhosa speakers. The proposal does not say how translation of the interviews, questionnaires, consent form and other information will be managed, and by whom. Will this be done by researchers themselves? Are the materials to be investigated in IsiXhosa or English?
3) Identifying features of children, i.e. faces, should be obscured in the camera recordings.

Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on completion of the research. The purpose of this report is to indicate whether or not the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloguing number allocated.

Yours sincerely

Matthias Göbel

Professor M. Göbel: Chairperson RUESC.

Note:

1. This clearance is valid from the date on this letter to the time of completion of data collection.
2. The ethics committee cannot grant retrospective ethics clearance.
3. Progress reports should be submitted annually unless otherwise specified in the clearance letter.

APPENDIX C Contextual background to participating schools

C1: Contextual background to Winter Primary

History, learner numbers, profile and background of learners, number of teachers and their language profiles, parent choice and involvement

Winter Primary[25] (WP) is situated in Grahamstown[26] in the Makana District of the Eastern Cape and caters for Grade R to 7 learners. It was founded in 1884 as an English medium school with close church links and later became an Afrikaans medium school, classified as a school for coloured learners and administered by the House of Representatives[27]. In the early 1990's WP became dual medium. According to the present principal, this change was made to accommodate isiXhosa-speaking learners from the surrounds. The principal intimated that, in a context of diminishing learner numbers, the management at the time saw offering tuition in English as a possible way to draw more learners. In 2012, when this study began, the school had 23 teachers of whom only six were isiXhosa-speaking and 17 were Afrikaans-speaking coloured teachers. Two of the staff members were on incapacity leave and, according to the principal, no substitutes had been provided for these teachers.

The school has three classes in each grade; two with Afrikaans and one with English as the LoLT. In 2012, WP had 797 learners of which 623 (79%) were isiXhosa-speaking black African learners and 174 (21%) were coloured[28] learners with either Afrikaans or English as their mother tongue. From the statistics above it is clear that the majority learners in this school receive tuition in a second language. The profile of the Grade 3 class that participated in this study to a large extent mirrors the school profile. The class consists of 37 learners. Of these, 33 are isiXhosa-speaking; 18 are boys and 15 are girls. There are also 4 coloured Afrikaans-speaking learners; 3 are boys and 1 is a girl.

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[25] Pseudonym
[26] The town has a population of 67 265 with the following racial makeup: Black African (78.9%), Coloured (11.3%), Indian/Asian (0.7%), White (8.4%) and Other (0.6%). The first languages of the population are isiXhosa (72.2%), Afrikaans (13.7%), English (10.8%) and Other (3.4%). The town is administered by its own municipality, called Makana. (Lehola, 2011)
[27] See page 2
[28] See footnote 3 in Chapter 1 on racial categorization

The isiXhosa-speaking learners speak their home language at home and, according to Marlene[29], the Grade 3 teacher who participated in this study, they have limited or no exposure to Afrikaans outside the school context. Marlene describes their language contact as follows:

> Basically it's just at school where they speak Afrikaans. You will only get a handful of learners who live near the coloured community and who play with Afrikaans-speaking friends and speak Afrikaans. There are a few learners in the class who come from Afrikaans-speaking areas, but the majority hears Afrikaans almost exclusively in the classroom. At break time they speak isiXhosa on the playground and they would also speak isiXhosa to isiXhosa-speaking teachers.

The school has been classified as a Quintile 3[30], non-fee paying school as it is situated in a low socio-economic area with high unemployment and it draws the majority of its population from areas with high levels of poverty.[31] The majority of the isiXhosa-speaking learners live far from the school and commute on a daily basis. They rely on private transport which is mostly, but not exclusively, subsidized by the Department of Education.

Although acquiring information about the socio-economic status of the learners in the class lies beyond the scope of this study, certain probable indicators of a low socio-economic background were observed that are relevant to the academic progress of the learners. During my fieldwork I noted that by far the majority of learners in the school partake in the feeding scheme meal that is provided on a daily basis. I also observed that many learners do not have their own stationery and wear clothing that is not part of the school uniform. The principal commented on the fact that before the current departmental feeding scheme was introduced, many of the learners arrived hungry at the school. He said, "[T]he feeding scheme plays an important role in the lives of these

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[29] Pseudonym

[30] South African schools are classified into five quintiles or school poverty score is based on "the relative poverty of the community around the school" South African Schools Act, 1996 (Act no 84 of 1996) Staatskoerant 31 August 1996. According to data from the national Census conducted by StatsSA or any equivalent data, surrounding areas are assessed in terms of the income, unemployment rate and level of education of the communities different schools serve. Quintile 1 represents the poorest schools. Quintile 5 the least poor schools (Kanjee & Chudgar, 2009) According to the headmaster Quintile 3 schools receive a 'paper budget' from the Department of Education with specification about how the money should be used; the funds are not sufficient to fulfil in their needs, however, especially not for municipal expenses. The school is therefore required to raise the necessary funds through their own initiatives.

[31] Stats SA 2011 reflects the in Makana district "poverty levels are high with 45% of the population not receiving any income. And a further 10.5% earn less than R801 per month, therefore technically falling under the poverty line." Stats SA provides the following socio-economic dimensions of the Makana area of 2011: "17.6% of the potential workforce is unemployed and a further 45.8% were not economically active in 2011. The remaining 36.6% of the labour force were unemployed." http://www.makana.gov.za/wp-content/uploads/2013/07/IDP%20%202013-14%20Revision%20One.pdf

learners. It has improved school attendance because learners know they will receive a meal at school. For many it is the only square meal of the day."

School building

The Grade 1 to 3 classes are housed in the same building as the rest of the school and at break time the learners are fully integrated with the rest of the learners of the school.

Management and academic programme of the school

The general running of the school displayed certain structuring routines like, for example, a full school assembly on a Monday and a Friday, a staff meeting every Tuesday after school, and at least one parent meeting per term. As far as an academic enrichment programme was concerned, WP had put various measures in place to support the academic development of the teachers, learners, and parents. As it relates to teachers, attendance of in-service training programmes was encouraged. An example of one such programme is the NICLE in-service Maths training sessions run by the Rhodes Numeracy Chair. A number of WP's Foundation Phase teachers, including Marlene, participated in this programme since its inception in 2012. In addition, all teachers were expected to attend the Department of Education's CAPS (Curriculum and Assessment Policy) training sessions. The school recently started a Wordworks literacy support programme, which was available to Grade 1 and 2 learners whom their class teachers had identified as being in need of extra support in either LOLT.

Parent involvement in academic programme

Although the principal felt that parent meetings were generally well-attended, Marlene was of the opinion that the parents were not as involved in their children's schooling as they could be:

When we hold parent meetings, I usually get about 10% of the parents who come. When I want to talk to my parents, I usually send a letter home. But I am still waiting for an answer, for example, from Vuyo's[32] parents to whom I sent a letter last week. So many parents ignore you ... they are not as involved as we would want. We always say the parents come whenever they want

[32] Pseudonym

to fight, but it's hard to get them here ... yes, I don’t even know half of the parents of the children in my class and we have already had so many meetings.

According to Marlene the learners at their school are also not able to receive much parental assistance with homework, because the majority of parents of isiXhosa-speaking learners have very low levels of Afrikaans proficiency. She said,

> Many of the parents … will tell you they understand the work better in English and we should rather send the instructions of what we want the children to do in English and they will explain to their children (I'm sure in Xhosa) what to do. Some of the children will come and say my dad or mom or grandma says they do not understand Afrikaans and they cannot help us.

The school’s admission and language policy

As stipulated by the Language in Education policy of 1996[33], the school’s language policy is determined by the School Governing Board (SGB) which consists of teachers, non-teaching staff and parents. The SGB of WP supports the current dual medium status of the school. The principal said that he did not foresee a change in the school’s language policy and that its profile as a dual medium school would continue, even though there seemed to be a greater demand for tuition in English. According to him, there is a feeling among parents and teachers that the school serves an Afrikaans-speaking community. He explained, “[Y]es, I do not think they can return to one language, Afrikaans or maybe just English. They also serve an Afrikaans community." He added,

> If the languages of this school are to change to English and isiXhosa, the parents will not be able to enroll their children here and receive subsidized transport. The Department’s policy is that a child must go to the nearest school and many of our learners go past four or five schools to come to our school. They make that choice. They will then have to go to those schools.

The principal and Marlene were both of the opinion that the teaching of isiXhosa-speaking learners through the medium of a second language, especially through the medium of Afrikaans, poses great challenges for the learners and teachers at their school. The principal put it as follows, “[I]t is definitely a big challenge. The children enter the school in Grade R and then it is difficult for them to master the language.” The principal linked this lack of progress to what was said by Marlene earlier about children only hearing the language at school.

[33] See page 5

According to him, the lack of departmental foresight to address the language mismatch caused by the post-1994 shift in learner demographics (referred to in Chapter 1) created a major challenge in schools such as WP. No practical measures in the form of remedial and other developmental programmes were put into place to address the needs of the teachers and learners in this regard. The principal explained the situation as follows:

> When changes were introduced in the beginning, they did not think of the consequences. They said we are now opening everything, but they did not have all the necessary mechanisms in place. When they were in the middle of it, they found out that it was quite complicated. It was not just a question of walking in and doing it. On paper it all works perfectly, but in practice it's a totally different story.

The principal was of the opinion that the teachers did not feel equipped to use strategies that would specifically help to strengthen and support the second language learners' language needs. Although teachers discussed and share ideas regarding the strengthening of the learners' Afrikaans language skills, the school did not have a formal programme in place to assist either the Afrikaans-speaking or the isiXhosa-speaking teachers in this regard. He expressed his views as follows:

> Teachers feel they must now do what they can, but they do not have that theoretical background and do not exactly understand what the processes are that could help these learners to perform optimally ... They did not, for example, give the teachers enough information about code switching, because now you get the teacher who teaches the entire lesson in the home language and that is not what it's about, so you cannot achieve anything.

According to Marlene, the way in which the staff handles language challenges was further complicated by their perceptions regarding the status of English and Afrikaans at the school. As mentioned above, WP has two Afrikaans and one English class in each grade. The perceived difference, she maintained, in status between the two languages influenced the teaching and learning at their school by saying, "[L]anguage does play a role. It is as if the English classes see themselves as superior to the Afrikaans classes." As a result of these perceptions, it would appear, teachers did not act as a unified group to address the school's language and literacy challenges.

The perceptions regarding language status was further exacerbated by what Marlene described as "informal streaming". It was generally held that the English class, called the A class, was academically stronger and that one of the two Afrikaans classes catered for academically stronger learners than the other. According to Marlene, many learners in the C class had learning disabilities. However, she felt that there were learners in the C classes who were academically quite capable, yet they were not necessarily perceived in this light. Marlene explained that, for administrative reasons, the principal did not allow shifts to take place from Afrikaans to English classes, or vice versa. In this regard, Marlene said, “If you enroll your child in the Afrikaans class, your child will stay in that class throughout his school career. Because, if you shift one learner, then all the learners want to move.” For similar reasons the principal also did not allow shifts to take place from one class to another within a grade for ability or any other motivation. According to Marlene, this policy affected staff morale. She mentioned, for example, that a teacher who had been teaching a C class for many years, felt demoralized: “It depresses her when she sees other classes working well while she has to battle with her class.”

C2 Contextual background to Park High

History, learner numbers, profile and background of total learners, number of teachers and their language profiles, parent choice and involvement

Park High[34] (PH) is situated in Grahamstown[35]. It is an Afrikaans medium primary and high school offering Grade R to 12. PH was founded in 1956 as a state school for white learners. The school was opened to all races as a Model C school in 1994. In 2012 the majority of the staff was white Afrikaans-speaking teachers. There was one class per grade. The principal mentioned that the school experienced an insufficient provision of teachers in the senior classes, but that this was not the case in the Foundation Phase. According to him they had been able to adhere to the school's policy of keeping the learner numbers below 30 in Grades 2 and 3, with no more than 25 learners in the Grade 1 class.

As far as the learners' language profile was concerned, the school had 391 learners of whom 78 (20%) learners were isiXhosa-speaking and 313 (80%) learners had Afrikaans as their mother tongue. This meant that 20% of the learners at the school received tuition in a second language. In the Foundation Phase department they had, in some classes, an equal number of isiXhosa- and Afrikaans-speaking learners. The language profile of the Grade 3 class that participated in this study mirrored the Foundation Phase profile. The class consisted of 26 learners. Of these, 10 were isiXhosa-speaking; 4 were boys and 6 were girls. There were also 7 coloured Afrikaans-speaking learners; 1 was a boy and 6 were girls. There were 9 white Afrikaans-speaking learners; 4 were boys and 5 were girls.

PH had been classified as a Quintile 5[36] school. It is situated in a middle class area. According to the principal the parents of the learners were, however, from a range of socio-economic backgrounds, varying from unemployed to middle and upper middle class. The school buildings consist of a main building accommodating the administration section and the Grade 4 to Grade 12 classrooms. The Foundation Phase department (Gr R to 3) is housed in a separate building in a separate area on the school grounds.

[34] Pseudonym
[35] See footnote 2
[36] See footnote 29

According to the principal the two parts of the school function as one combined school. This, he believed, was beneficial to both teachers and learners, because it allowed for administrative, academic and social continuity. The Foundation Phase learners and teachers attended the weekly school assembly and the teachers all attend the weekly staff meeting.

The school's admission and language policy

PH's language policy, which is determined by the SGB, stipulated that teaching, as well as all staff and parent meetings, were to be conducted through the medium of Afrikaans. The principal did not regard the phenomenon of isiXhosa-speaking learners learning through a second language as a major challenge at their school. His view, which was shared by both the Foundation Phase Head of Department (HOD) and Anine[37], was that the majority of isiXhosa-speaking learners who started their schooling in Afrikaans during the Foundation Phase, did not find the LoLT to be a stumbling block. The earlier these learners started their schooling in Afrikaans, the principal believed, the quicker they began to develop their Afrikaans proficiency as well as a sense of belonging. He said,

> I think that if you enter the school in Grade 4 only and you have to write exams ... and answer in Afrikaans... if you do not have the language to master it, you cannot do it… you will also have to be able to read and we have often found that if children from other schools enrol at such a late stage, they struggle with reading. The parents move the child to us, but it is not always to the benefit of the child. (20 November 2012)

According to the principal, parents of isiXhosa-speaking learners who enrol their children in PH, did so because they were happy with the school's language policy and that they wanted their children to learn Afrikaans. He believed that they were also satisfied with the level of education that their children received at the school. He stated,

> It is the same for all the parents of our children. They want to put their children here because they receive a good education with us and they do not have a problem with an education in Afrikaans. Parents, especially the black parents, have expressed a wish for their children to be trilingual.

The HOD indicated that the steady increase in the number of isiXhosa-speaking learners in the Foundation Phase meant that the opportunities for these learners to speak Afrikaans had diminished. She articulated the shift as follows:

> There are now more isiXhosa-speaking learners and they play together and they talk and play in isiXhosa. This has had an effect on language acquisition. In earlier years these learners were required to speak

[37] Pseudonym

> Afrikaans on a regular basis because they were exposed to a larger amount of Afrikaans. Now it is different. I do think we battle more these days to facilitate language learning.

Notwithstanding this challenge, she felt the ratio between isiXhosa- and Afrikaans-speaking learners was still balanced evenly enough to ensure active participation in Afrikaans communication. Peer support was still seen to be an important enabling factor, because many of the learners had been in the same class since Grade R. The Afrikaans-speaking learners were therefore used to offering language support to their isiXhosa-speaking peers.

The HOD and Anine both expressed the opinion that the Foundation Phase teachers worked closely together and that their unique skills and collaboration structures supported the linguistic and academic development of the isiXhosa-speaking learners. The Grade 1 teacher, for instance, spoke isiXhosa fluently and when the isiXhosa-speaking learners entered Grade 1, often with minimal knowledge of Afrikaans, she was able assist them through code-switching to gradually build their linguistic proficiency. According to the HOD the Grade 1 teacher on occasion assisted the other teachers to build links between terms in isiXhosa and Afrikaans. As far as academic development for learners was concerned, the teachers provided remedial help, mostly after school, to the learners in their respective classes. These lessons involved general academic support, however, and was not specifically aimed at language development for second language learners. A structured reading programme was run by each teacher individually and was made possible because each class had a class library with a wide variety of Afrikaans reading books on offer.

C3 Contextual background to Duiker Primary

History, learner numbers, profile and background of total learners, number of teachers and their language profiles, parent choice and involvement

Duiker Primary[38](DP) is situated in a small farming town[39] in the Eastern Cape. It is an Afrikaans medium primary school offering Grades R to 7. DP was founded in 1928 as an Afrikaans medium church school. In 1985 it became a state school classified as a school for coloured learners and administered by the House of Representatives[40]. The majority of the school's staff members are Afrikaans-speaking coloured teachers. There are two classes per grade. The principal mentioned that teaching was affected by insufficient teacher provision, especially in the light of the high percentage of LSEN (learners with special needs in education) at the school. The school did not have any remedial teachers and made use of academic assistants to address the needs of the 117 learners who have been diagnosed as LSEN.

As far as the learners' language profile was concerned the school had 388 learners of which 188 (48%) were isiXhosa-speaking black African learners and 200 (52%) were coloured Afrikaans-speaking learners. This means that 47% of the learners at the school receive tuition in a second language. According to the principal there has been a gradual and continuing shift in the profile of the school body: "The number of isiXhosa learners increases every year." (14 November 2012) The profile of the participating Grade 3 class mirrored the school profile. The class consisted of 24 learners. Of these, 13 are coloured Afrikaans-speaking learners; 7 were boys and 6 were girls. There were also 11 isiXhosa-speaking learners; 2 were boys and 9 were girls.

The school has been classified as a Quintile 3[41] non-fee paying school as it is situated in a low socio-economic area with high levels of unemployment. According to the principal the majority of learners live in the area around the school that was previously classified as a coloured area. The community depends mainly on income in the form of state pensions and social grants. In this

[38]Pseudonym

[39]The town has a population of 10 085 with the following racial makeup: Black African (77.4%), Coloured (16.3%), Indian/Asian (0.3%), White (5.2%) and Other (0.8%). The first languages of the population are isiXhosa (72.8%), Afrikaans (20.2%), English (4.2%) and Other (2.7%). The town falls under a greater municipal district that includes six other towns (Lehola, 2011).

[40] See Chapter 1, page 2

[41] See footnote 29

regard the principal said, “[T]he socio-economic circumstances of the people of this area are poor. We have more unemployed people and people dependent on state pensions for an income than skilled workers”. A departmental feeding scheme is run at the school, but it was noted that a number of learners in the Grade 3 class that participated in this study brought their own lunch and, as a result, did not partake in the meal that was provided.

School buildings

The school is housed in a face-brick building with a Foundation Phase playground consisting of grass and cement areas.

Management and academic programme

The management of the school displayed certain structuring routines such as a short staff meeting every morning before school and a weekly school assembly meetings run, on a rotational basis, by the staff. The staff was also required to attend and take part in the various social and sport programmes organised during and after school hours. The academic enrichment programme for learners and staff included, for example, a ‘drop all and read’ period on a Monday morning where all staff and learners are required to read a book. This, according to the principal, set the atmosphere for a love for learning and reading for the rest of the week. Learners of all grades were encouraged to take part in the Conquesta Maths and Language Olympiad. The school also managed a Wordworks literacy support programme which is run by parents and volunteers from the community. This notwithstanding, the principal and participating teacher both felt that there was a need for stronger emphasis on language development. The principal made the point that departmental language subject advisers did not assist in training the teachers who teach through a second language. He said that a language programme similar to NICLE[42] would help to strengthen language skills among learners.

Teachers were encouraged to attend in-service training programmes. A number of teachers, including Marlene, participated in the NICLE in-service Mathematics training sessions run by

[42] See footnote 20

the Rhodes Numeracy Chair. In addition, the teachers attended the Department of Education’s CAPS training sessions.

Parent involvement in academic programme

According to the principal the parent involvement in teaching and learning is limited. He explained,

> [The parents] are slow to get involved in the learning programme. We have four parents' meetings, one per term, so that parents can come and look at their children’s progress and talk about problems, but very few attend. It's just at the end of the year when the teachers determine whether children are promoted or not, that parents get more involved.

According to Lillian the isiXhosa-speaking learners speak their home language almost exclusively at home, but during class observations it was noted that they speak mostly Afrikaans in class. Lillian encouraged the use of Afrikaans in class interactions, but allowed learners to explain concepts to one another in isiXhosa when needed.

The school’s admission and language policy

The language policy of the school, that has been an Afrikaans-medium school from the beginning, is determined by the SGB and reviewed annually. According to the principal the school is able to accommodate all eligible learners, and the majority of isiXhosa-speaking learners pick up Afrikaans quite readily when they enter grade R. The school has therefore not felt the need for a change in the internal language policy. In his experience the isiXhosa-speaking learners who enter their school in later grades battle to make progress.

In his dealings with the parents of isiXhosa-speaking learners, the principal had found that they were happy with the school’s language policy and with the fact that their children were learning through the medium of Afrikaans. He said,

> Each year we review the school's language policy and each year we make adaptations. So far, the isiXhosa-speaking parents say to us: ‘Sir, I want to enrol my child here because I want my child to learn

APPENDIX D: Transcripts of three mathematics lessons per teacher

D1: Lesson transcripts: Marlene (Winter Primary)

Teacher 1 Lesson 1
Date: 14 August 2012
Topic: Mental maths, halving and doubling, place value

1 Teacher hands out plastic bags with counting cards. Each learner has a 100s chart on their desks as well. Teacher speaks clearly and with emphasis.
2 T Your counting cards are on your desks. (To learner) You must first pack those out.
3 T Pack out your counting cards, clean your table. Take these. (Learner asks something)
4 T Where are my other counting cards? Who did not put them in the plastic bags yesterday? Who did not hand them in? Look on the table. Check on your desks, look in your ... in your plastic bag, not everyone had counting cards yesterday.
5 T Watch what you're doing, Tokozani. Pack out quickly. Pack out quickly. Look in your bag. Where are your counting cards?
6 ***
7 (Learners pack out counting cards in neat rows on their desks. Learners help one another. They are attentively involved in this activity.)
8 T (to learner) I am going to get 4. He has 2 4s, get one from him.
9 (Learners softly discuss and order cards)
10 T Pack out your 1000s , and then your 100s ...
11 (Teacher assists learners in 'slower group'. She checks to see whether all the cards are available.)
12 T (to learner) First pack out everything …I will come again … Pack out quickly, pack out quickly. Is it Phumzi and the others who are talking? ... Sipho and them?
13 T (moves to front of class) Right, see how far you have packed them out? People are already waiting. Cherine, have a look. There is something lying on the ground ... what is it?
14 ***
15 T Right. Build 24. Everybody build 24. What number do you read in front of you?
16 Ls 24
17 T What number do we read?
18 L 24
19 T Break up the number.
20 (Learners break up number.)
21 T What does 24 consist of?
22 Ls A 20 and a 4.
23 T A 20 plus a 4… a 20 plus a 4. Right, when we want to halve a 20. Tell me first, what are we going to do? What does 'halve' mean?
24 L (inaudible)
25 T Speak loudly, Henry, so that everyone can hear.
26 L Halve of the number.
27 T What is half of 20?
28 Ls 10
29 Teacher addresses learners from the group she calls 'the slow group'.
30 T Who of you can tell me… if I put 2 with 68, what number will I get?
31 Ls (hesitate)
32 T If I put 2 with 68, what number will I get? If I put 2 with 68?
33 Ls (still hesitate)
34 T What did I say, what are we going to do? We are going to keep the number in our heads and do what?
35 L Count on. (softly)
36 T We are going to count on. So count on from 68. What will I get if I put 2 with 68?
37 Ls 70

38 ***
39 T And if I count in 25s from 25? Which three numbers did I say should you remember?
40 Ls (Recite) 25 , 50 , 75
41 T Right, I'll ask again, what are the three numbers you need to remember?
42 Ls (Recite while looking at their counting chart) 25 , 50 , 75 ...
43 T Right, now count for me the multiples of 25.
44 Ls 25,50,75, 100, 125…
45 ***
46 T Right, you say, what is it? You say 'tag ', then you also write 'tag ' for me... twintag (twenty)... go on. L 20 , 40 , 60 , 80 , 100 (Teacher counts with learners) ... 120 , 140 , 160 , 180 (some learners mouth the words but are obviously not sure of the next number)
47 T Right, count in multiples of 20 for me, begin at 520 ...
48 Ls (Learners start counting , some are obviously not keeping up with the rest, some are not concentrating) 520 ...
49 T Right, I want to see your finger on 520… put your finger on 520…put your finger on 520 (emphasising number) The first counting card on the big one is 500e ... 520 , 520 ... 520 (Some learners are yawning. Not all the learners attempt to find the number.) Why are you talking? Go on...
50 Ls 520, 540, 560 , 580 , 600 ...
51 T ... Right next to it is the 600 counting card ...
52 L 620 , 640 , 680 , 700
53 T Right, now we are going further and we count in 50s ... 700 ... go on.
54 L 750 , 800 , 850 , 900 , 950 (Teacher helps learner to look on counting chart, she adjusts his finger)…1000
55 T Right, we are just going up to 1000, right ... we are quickly, quickly count in decades ... we are going to count backwards ... we'll start at 1000
56 L 1000 ... 1000 ... (look at teacher who shakes head) ... 1000 ... 990 , 980 , 970 , 960 ...
57 T Right, when we count in decades, what do we count, multiples of...
58 L 10
59 T Multiples of 10 ... go on ... 970 , 960 , 950 , 940 , 930 , 920 , 910 , 900 , 890 , 880 , 870 , 860 , 850 , 840 , 830 , 820 , 810 , 800 , 790 , 780 , 770 , 760 , 750 , 740 , 730 ...
60 T We can stop there. Right, we never got our work finished... we are now going to complete our activity ... yesterday you broke up the numbers ... you're going to open your book and then we are just going to continue with our activity ... Right, if you look on the board you will see...when you break up the number, what will you say, what is the answer?
61 L1 90 plus 5
62 T A 90 and a 5 ... remember, we took the counting cards and then I said pack out...
63 ***
64 T I want the place values, place value (emphasises) of the 1 in this case ...what is the value of 1?
65 Ls 100
66 T (points to the question on the board) You are going to give me the place value of each underlined number ...the number under which I have drawn a little line, yes? Then you are going to double it for me... now yesterday I saw someone's work... what do we do when we double? (points to the question on the board)
67 Ls Add the same number to it.
68 T You are saying it to me so nicely… add the same number… but Cherine, when I look at your books then you halve. Listen, when we double, then we are going to add the same number... when we halve ... what do we do then?
69 L Take away... (some exclaim to show that they disagree)
70 T Take away? We've just used the counting cards to halve (emphasises) we ...
71 L We divide by 2 ...
72 T We divide by 2... we give half of it... halve means to divide by 2 or to take half of it. Is that clear?
73 L Yes, Ma'am
74 T Now quickly take out your books ... we'll just take 10 minutes to finish the activity... you started writing yesterday, now quickly finish it...
75 Teacher hands out books.
76 ***

77 T Add the same number... Right, if you are not going to talk we are going to get our work finished faster.
78 L (points to the board and asks the teacher something softly)
79 T You must also draw the diagram, yes, you need to draw the diagram in your book. Draw a line from the number to the name, Peter, a line goes from the number name to the number symbol ... your line goes from the number name to the symbol (the teacher points it out in learner's book, then moves on to the next learner at other table and shows him how to draw line, then moves to the next table) We do not want to sit all day with maths.
80 ***
81 T counters ... Do you want counters? Are you looking for counters?
82 L (nods his head)
83 T Double and halve.
84 L (repeats to girl next to learner) Double ...
85 T (moves from one group to next) Do you need counters ? Would you like counters? You don't really need counters. Make sure of your answer, use your counters... put away your bags (learners put their bags in cloth bags on the backrests of their chairs), your diagrams do not have to be so big, use line spaces, count your lines spaces.
86 ***
87 T You know how the story works, not so? We throw all the beans back into the bottle ... if we want to count in the bottle ...right, people who are done, put up your hand, I want to come and see how you have worked.
88 ***
89 T (Hands out next worksheet) Name, name, name and date, we do not stick in in because it is printed on the front and on the back...
90 L (asks friend in isiXhosa for a sharpener, then takes out own pencil bag)
91 T Right, there are people who are talking too much, Bongani, you talk too much.
92 ***
93 T Write your names. We are now going to explain. We are just going to...You are just going to put it into your files, you are not going to stick it into your books. (To one group) Clean your table, your table looks untidy, put away everything that can be put away.
94 L (Writes and chats to friend in isiXhosa.)
95 ***
96 T Everyone put down your pencils and we look at the page. (Teacher waits , holding up the worksheet) The people who are done with yesterday's work may start with this activity. We need to listen. Nolu sit. Cherine sit. Come and sit down Tani. And we look at the page. You are going to write your name and date for me at the top of the page, right? What is the date today?
97 L August 14.
98 T (repeats) August 14.
99 T Right , this is a counting exercise ... in the train they give you numbers, what numbers do you see in the train? Read me the numbers that you see in the train.
100 Ls 23 , 25 , 29 , 33
101 T Right, read the numbers again.
102 ***
103 (Teacher explains the exercise again)
104 T Connect the number with the number symbol to connect.
105 T (at slowest group)
106 T What will my answer be? Think about it carefully and write down the answer. This afternoon when you're done with your other work, you can finish your maths .

Teacher 1 Lesson 2
Date: 21 August 2012
Topic: Multiplication

1	The teacher instructs learners to each pack out their sets of counting cards on their desks. The cards indicate counting in 1s, 100s, 200s, 300s etc.
2	T Let's start by counting in 1s backwards from 163.
3	Ls 163, 162, 161, 160…
4	T Don't use your finger… count faster… are you ready to fall asleep?
5	Ls (counting faster) …159, 158, 157,156,155,154,153…
6	T Right, let's stop there. Count backwards from 130.
7	Ls 130, 129, 128,127,126,125, 124…
8	T Not one hundred and twenty and five… just one hundred and twenty five (Afrikaans: not "een honderd en vyf en twintig", just "een honderd vyf en twintig")
9	Ls…123, 122, 121, 120…
10	T Right, now count in decades from 120 onwards…
11	Ls 120, 130,140,150, 160, 170, 180, 190, 200, 210, 220…
12	T Now we count in 40s from 220…
13	Ls 220, 260, 300, 340, 380… (learners hesitate)
14	T Right, think carefully… 380 plus 40…
15	Ls 420, 460, 500…
16	T Right, let's stop there. Right… I have 63… how much will 3 be more than 63?
17	Ls (hesitate)
18	T What are we going to do?
19	L1 Take away.
20	T Are we going to take away?
21	L Add (Afrikaans: 'Sit by…')
22	T Yes, we're going to add... So what is 3 more than 63?
23	Ls 66 (It is observed that not all the learners participated in working out the answer.)
24	T Between which numbers is 66?
25	Ls 65 and 67
26	T Now look at this number. (writes 97 on the board) What number do we have here?
27	Some learners say 97, some say 79.
28	T It is a 9 and a 7… not a 7 and a 9… so it is…?
29	L 97
30	T Right, if I have 110 and I add a 100… (waits) I do not just want to see three hands.
31	Ls 210
32	T And if I take away 1?
33	Ls 209
34	T Now add 20….
35	Ls (give different answers)
36	T How many? I have 209 and I add 20.
37	Ls 229
38	T Right, pack away your cards. I'm going to hand out dice and we're going to play a game. (Teacher hands out dice to learners.) Now the game works as follows… you are going to ... with your partner you are going to... just one rule ... you are going to take the dice (teacher first uses Afrikaans word for dice and then English word),you are going to throw it in front of you, you're not going to throw it on the other table (emphasises and gestures) ... right? We throw our dice and when it falls on the 2, right, if you throw it and it falls on 2, it says that we have to make two rows ... (Teacher moves to board and draws to support explanation) so we will have two rows ... we are going to throw twice ... and if I throw it again and it falls on 5 ... 4 ... then it says that we are going to have 4 dots in each row . I will say it again, if we throw the dice and it falls on 6 ... the first time I throw it ... and it falls ...on what did it fall?
39	Ls 5
40	T Then it says we should have 5 rows ... and when I throw again... and it falls on 6 ... what does it say? We have to have 6 in each row. Can we see that?

41 Ls Yes Ma’am.

42 T Can we see? Each one ... now listen carefully ... Thandokazi go first ... We play with our partner, we play in groups of 2, then Sandla gets a chance. But you are not only going to give me the rows... you are also going to give me the calculation... (points to the top picture) How many rows do we have?

43 Ls 4

44 T No no, how many rows , how many rows ... how many rows do you see?

45 Ls 2

46 T I see two rows (Teacher writes on board: 2 X ...). How many are in each row ... 4 ... (Writes it on the board) so my answer is how much? Count for me ...

47 Ls 8

48 T So my answer is 8 ... (points to the next picture) How many rows we have down here?

49 Ls 6

50 T 6 (looks again) No ... no, how many rows do we have? Count, Cherine.

51 L 5

52 T We have 5 rows. How many are in each row?

53 Ls 6

54 T How we ... (writes) 5 X 6 ... how many do we have? Let’s count..? 30 (Writes). Count in multiples of 5 (points to the second picture on the board).

55 Ls 5,20,15 , 25 , 30 .

56 T (writes) So my answer is 30 . So that's what we will be doing today. We are just going to practice ... you are going to give me the rows ... we're just going to try a few times ... I'll give you a piece of paper...for you and your partner ... the rules ... the rules are ... Peter ... if I have to speak to you and your partner and say don’t make such a noise , then you and your partner are out of the game ... so if you do not want to be out the you have to say to Sandla ' keep quiet because I don’t want to be out. We are not going to shout... we are going to play together... we are not going to throw our dice close to Avile... or on the ground ... And when we're done , then each group 's dice must come back ... we are not going to put it in our pocket and think we will go home and play with it, right? I want it back. Right.

57 T You’re just going to be out. You and Babalwa ... (then continues, speaking slowly) How many rows do we have? If I throw the dice a second time, then it says to us how much ... how many dots in the row ... right, when she has thrown, when it is her turn to throw, then Andile will write... so each of us will have something to do, Sipho ... when Sipho throws and he throws a 4, then it says that we are going to have 4 rows…then Thuli is going to draw the 4 rows with her pencil on the page, as Sipho throws a 4, then Thuli draws 4 dots…Zanatole and Sibolele, I'll take your dice away (waits) ... and when Sipho throws again and he throws a 3, then Thuli is going to make 3 dots in a row, then they are first going to say what the sum is... and when you have finished writing, it will be Thuli 's turn to throw ... and then Sipho writes... every time you throw the dice, and you have your rows, then you need to write the sum next to it, I will come and see, and if you do not write the sum and just throw and throw, then you are going to be out... there are a few rules, and if you do not keep to these rules, then you are going to sit on the mat…sit on the ground…right, you can start.

58 ***

59 T (moves to group in the front and explains to two learners working together) Look here, the first dot you are also going to take as a row, right? When you take the first one, then you are going to take that as well … you said that you threw a 5... (the teacher waits as the learner writes) now you count how many there are ...

60 ***

61 Ls (discuss in isiXhosa, Afrikaans boy counts)

62 Ls (Teacher focuses on other group, boy throws dice, girl draws dots, but not in the way indicated by teacher. They discuss the answer in isiXhosa)

63 ***

64 T Right, let’s see if you can get the right answer. If I were to ask any of you what 5 times 4 is, what would you say? I have 5 and I put four in each row. What is your answer? Look on your page.

65 L1 12

66 T Thuli says 12 ... 12 ?

67 L2 20

68 T 20 ... take out the page that you used earlier... If I tell you , I have 5 ... check on your page, quickly

put up your hand , right? (gestures) ... I have 5 ... no, I have not even asked ... 5 times 2 ... what is your answer ?

69 L3 10

70 T No, we are not going to shout it out ... look at your page, you have the sums in front of you ...

71 L4 10

72 T 10 ... if I said 5 times 6, what will be your answer? Nomsa ? ... 5 times with 6 ... (waits) look at your sum , look at your sum (Teacher gestures to the rest of the class to wait for the learner's answer.) ... I cannot hear you ... Nomsa , 5 times 6 (emphasises) 5 times with 6 ...

73 L5 30

74 T 30! And if I say, Sipho, what is 6 times one, what will you say?

75 L6 6

76 T 6 ... And if I say, Sibuyise, 3 times 3?

77 L7 9

78 T 9 ... Lulama , 4 times 5 ... (waits) 4 times 5? (waits) Have you counted correctly?

79 L8 20

80 T Shhh, is your name Lulama? Is your name Lulama? 4 times 5, Lulama ? ... Count in 5s for me ... and you ... Sanele (teacher gestures, counting on her fingers) 5s ... how many should I add? How many 5s can you count?

81 L9 Four 5s .

82 T Four 5s ... now count four 5s for me, you two... (waits) How many 5s can you count Lulama? Count for me… how many 5s? I can count four 5s... count for me, multiples of 5 ... 5 ...

83 L10 52 (starts counting)

84 T Shhh ... so what are you ...

85 L9 25

86 T 25? ... How many 5s? What is your answer?

87 L9 20

88 T 20 ... here you counted correctly... Right, when I say Lisa, what is 4 times ... 4 times 2?

89 L10 ?

90 T Are you sure? 4 times with 2, how many 2s do you need to count? Four 2s. Count 4 2s for me.

91 L 8

92 L 8

93 T 8... make sure that you have written it correctly.

94 ***

95 T 1 3 times ... Darren?

96 L1 3

97 T 3 times 5 (waits) 3 times 5

98 L2 6

99 L3 15

100 T 15 ... Deyi, if I said ... Deyi, Deyi ... when I say 6 times 1.

101 L4 6

102 T Right. Zanatole, 5 times 1 ... (waits, then gestures, holding up one hand to stop gasping sound from the rest of the class) I have 5, just once, how many would that be? (waits) ... I do not say two times 5, I say 5 only once ... how much is it? Just how much is one 5? (waits) ... Right (to the rest of the class) Give Zanatole a chance ... Zanatole , 5 only once, only 5… is how much? (Teacher holds up her hand.) Look at me, look at me, Zanatole, look at me, Zanatole , how many do you see?

103 L5 (softly) 5

104 T (turns and addresses the class) When we say 5 only once, then we say only one 5, 5 times 1 Deyi and Nomsa... 5 times 1 means I only have one 5... Sibulele, 3 times 1?

105 L6 3

106 T 3 Asanda Z, 6 times 1?

107 L7 Only one 6 .

108 T Just one 6... Zanetole ... if I say 'time 1' then I say that you count it once... Ziyanda, 4 times 1?

109 L8 4

110 T 4 ... Right, we're just going to do one revision exercise on the page ... right , Zandi and Michael and Sipho , we're going to listen. You're going to do the multiplication sums for me... you now have an idea ... when I say 6 times 5 ... you've made your row ... I have 6 and I have 5 in each row, then you

need to write your answer for me ... so , we have two ways in which we are going to do the work ... I give you the sum Thuli ... I give you the sum and then I made you blocks for the two different ways in which you can count the sum… I will give you a page on which you can do rough work... so that you can draw your lines as we have just done it... the first sum says... 6 times 5... how many rows will I have ?

111 L 6

112 T 6 ... how many in each row?

113 Ls 5

114 T 5 in each row ... now I can... you count incorrectly and then you shouting out as well... 5 times 6 Sinetole , I have 6 rows ... (Writes on the board) I have 5 in each row, count for me ...

115 L 6

116 T Right, let's all count… how many in the row? (counts with class while pointing at the dots on the board) 1,2,3,4,5 ... so multiples of what do we have?

117 L 5

118 T We count in 5s ... (points at the rows, moving down while learners count)

119 L 5 , 10 , 15 , 20 , 25 , 30

120 T Right, before we shout out our answer we must make sure that we count correctly ... so now you are going to write the sum in two different ways ... the first one says 6 times 5 and the second one says 5 times 6.

a. ***

121 T Right, you write me the date, August 22.

122 L (asks to fetch pencil - inaudibly but presumably in Afrikaans)

123 T Why is your pencil with your brother and you are here in the class? Your pencil should be in your pocket. Go and fetch your pencil. Hurry ... right, write your name for me ... your name at the top of the page.

124 L Ma'am, Nomsa does have a pencil.

125 T I told you we cannot write with our finger. Write your name and then you write 22 August for me, the date. I've only given you five sums... write 22 on the line, write 22 on the line... Write the date on the line ... August 22.

126 ***

127 T 6X5 times ... how many dots am I going to put in the first triangle?

128 L1 1

129 T 1?

130 L2 5

131 T I am going to put 5, because it says I must count 5 times 6 times... so I'm going to have 5 triangles... 5 dots in the first triangle. So that means I have to count in multiples of what?

132 L 5

133 T We count...

134 L 5,10,15,20,25,30.

135 T But my sum is still not finished. What should I do? What should I add?

136 Ls 10

137 T I should add another 10. So my answer is going to be ...

138 L 40

139 T So my answer is 30 plus 10 is 40. Right ... but how many dots am I going to have in the triangle… in the square?

140 Ls 6

141 T I'm going to put ... 6. So now I also know ... (fills in the dots on the board) Right, how many 6s must I count?

142 Ls 5

143 T I must now count 5 6s. If I count 5 6s and put 10 with it, then what will my answer be?

144 Ls 50 ... 40 ...

145 T 50 ? 40 ?

146 L 60

147 T 60? What was my answer to the sum above?

148 Ls 40

149 T 40 ... so am I going to have a new answer in my second row?

150 Ls No

151 T It's the same answer ... we only count in ... in the sum above we counted in 5s, now we count in 6s ... and if you can’t count in 6s... I want you to say 6 ... take out your counting card… then you’re going to say to me 6 and another 6 ... is how many?

152 Ls 12

153 T 12 ... and if I add another 6?

154 Ls 18

155 T 18 ... and if I add another 6?

156 L2 25... 24

157 T 24 ... and if I add another 6?

158 Ls 30

159 T 30 ... then my answer is 30 ... that’s how every sum ... this is now sum number 1 ... can you see I have a triangle and a square... you must first count in so many and then you count in the next number. (looks at their writing) I want to see the dots... you can colour in the dots... do for me ... you can use different colour pencils. Then you write the answer in the block... you do not only answer... I want to see the dots that you have made me ... he’s just going to write the answer for me... I want to see all the dots in each triangle and in each square ... you use colour pencils to make your dots and make it clear ... lend from each other if you do not have.

160 END

Teacher 1 Lesson 3
Date: 22 November 2012
Topic: Time

1 Lesson starts with each learner finishing off the paper plate clocks that they started making the previous day.

2 T (holding a clock for the learner to see) Sipho, you now have to look at me. Babalwa, why are you talking? I did not tell you to do anything with the clock hands…Did I say stick on the hands?

3 Ls No Ma’am.

4 T I just gave you the hands and said colour in your clocks and stick it on the paper plate. Now listen, I want to see, put down your paper plates ... put down the pencils ... put down everything ... I want your attention with me... Sinevuyo ... Right, let’s look at time. We said that when we do analogue time... now before we get there, what day is it today?

5 Ls Thursday

6 T What comes after Thursday?

7 Ls Friday

8 T What day comes after Thursday?

9 Ls Wednesday

10 T How many days do we get in a week?

11 Ls 7

12 T How many months do we get in a year?

13 Ls 12

14 T In what month are we now?

15 Ls November

16 T November is which month of the year?

17 Ls 11ste (incorrect Afrikaans form)

18 T The?

19 Ls 11de (give correct form)

20 T Not the 11ste…the 11de

21 T What is the first month of the year?

22 Ls January

23 T January when we speak English ... what do we say in Afrikaans?

24 Ls Januarie

25 T Which is the 3rd month of the year?

26 Ls March
27 T March... which is the 5th month of the year?
28 Ls May
29 T May ... Right, now we know it all has to do with time, not so? Time passing. It's all to do with time ... but when we have to read time ...we know the first thing we said ... there are two arms… two legs ... we call it the hands (Afrikaans: wyser), not so? The short hand and long hand ... which one did we say works the hardest?
30 Ls The long one ... (Some learners say the short one.)
31 T The long one... he's big so he has to do the most work ... the long hand is the minute hand.. he must quickly run down the minutes ... the short hand is the hour hand , he shows us what hour it is ... Now if my hands, both my hands sit on 12 hours ... what time is it ?
32 Ls 12 o’clock
33 T Right...12 o’clock. Now the hand has to walk right around… he must walk right around (emphasises) And if he walks around, we say it runs a full what?
34 Ls A full hour.
35 T A full hour. Right from the 12, right around ,Nomsa, to the 12, then it's a full hour. Now who can tell me, if it moves right around , how many minutes?
36 L1 24
37 T 24 minutes?
38 L2 60
39 T 60 minutes? How many minutes? Are you sure?
40 L3 12
41 T 12 minutes? Right, I said we count when we walk from the 12 to the 1... how many minutes?
42 Ls 5 minutes
43 T 5 minutes ... so from the 12 to the 2 ... how many minutes will it be?
44 Ls 10
45 T So let's see, how many minutes are in 1 hour? (indicates on clock while learners count)
46 Ls 5,10,15,20,25,30,35,40,45,50,55,60
47 T (indicates end of counting) Right, we have 60 minutes when we go from the 12 to the 12 again ... when the hand moves so (indicates)... now when the big hand…when the big hand moves (indicates) then it's 5 minutes ... Right, now we are going to use the clock on the board. Right, this is work that we have done before…(Teacher colours in the right side of the clock drawn on the board) I just want to see if you can remember the part that I have lightly coloured in…it is the…?
48 Ls Past (Afrikaans: Oor)
49 T This is the ‘past’ side, and that means ... past (oor) means ... past the time ... ‘before’ (voor) means we're still going to that time (displays clock) ... so it’s the past side ... right, when he has walked right around it ... Xoli?
50 L An Hour (Some learners answer ‘past’ and ‘before’)
51 T An hour ... right, what is the time here? Sibulele? (waits) What time is it now? Speak loudly, we want to hear.
52 L 12 o’clock
53 T 12 o’clock... so if the hand goes right around, right around, and it's ...
54 Ls Hour
55 T Right, now that's easy to say, isn’t it? (then shows 7 o'clock)
56 Ls 7 o’clock...
57 T (Shows 11 o'clock)
58 Ls 11 o’clock
59 T The short hand, the hour hand will point to the number and the long one will be on the 12. Right when we speak of an hour, the long hand will be pointing to the ...
60 Ls 12
61 T After 12 ... Right, we know hours… we have been doing hours for a long time now...when the big hand lies on the 6, then we say...
62 Ls 6 o'clock (Some learners say half an hour)
63 T 6 o'clock? Half an hour? (Moves to the board and indicates on clock drawn on board) the long hand moves around now ... not (indicates with big paper in hand drawn clock on board) the long hand just moves to the middle of the clock ... that's why we say we are now talking about a half hour

... now remember , I said in English we're going to say ... half past… in Afrikaans we said when the big hand is on the 6 ... now we're talking about half-hours... when the big hand is on the 6 and the short hand is ... can you see I put it a little bit past the 1 ... we don’t put it straight on the 1, because we put it as a little bit over the first and then we'll say what time is it?

64 Ls Half past twelve. (Some say half past one).

65 T Half past twelve? It is half past one. Remember, you said in English we say ...half past 1, in Afrikaans we name the number that we get after the hand ... in English it will be half past, in Afrikaans it is half before two. (Moves the time on the clock to half past 3) So if I ask you what time it is ... put up your hand.

66 L Half past 3.

67 T.Half past 3. If I ask you what the time it is now…(shows half past 8 on the clock)

68 Ls Half past 8.

69 T Half past 8. What time is it now?

70 Ls Half past 11.

71 T (to the researcher) They surprised me ... they remember what we did. Half past 11. Right, now you know your hours and half hours... but in the test I asked you what time it is now and there were probably only three people who answered me correctly. (shows 20 past 9) What time do you say is it now, Silomsi?

72 L 10 past 9 (answers in English)

73 T 10 past 9, that's correct, but let's speak Afrikaans ... 10 minutes past...

74 Ls 10 past 9 .

75 T 10 past 9 ...good... (teacher shows 20 past 9) If I ask you , what is the time now? Are we going to say, listen carefully, it is 4 minutes ... the minute lines are the fine lines, what do you say Sinevuyo, what is the time now?

76 L 29 past 10.

77 T What is the time now? (20 to 10)

78 Ls Forty ...

79 T Forty is right ... but remember we said when we draw the clock’s symmetrical lines… Where are we going to draw it, when we draw one symmetrical line?

80 Ls From the 12 to the 6.

81 T From the 12 to the 6. It's just one symmetrical line, if we were to divide him in two...what does symmetrically mean again? The one side ... looks ...

82 Ls Exactly...

83 T Looks exactly like the other side... but one side of the clock does not exactly look like the other side ... why not? On this side we’re going to see what? (Points to the left side of the clock on the board) small numbers ... and on this side we see bigger numbers. But ... when we count from the 12 to the 6, we count in 5s ... then it will be ...

84 Ls 5,10,15,20,25 ...

85 T Right , Nomsa, are you feeling ill? I can see, she's not one who lies down, so she must be sick…when we count from the 12 to the 6 on this side ...count for me ...

86 Ls 5,10,15,20,25,30 .

87 T The same… (points to the left side) 5, 10, 15 ... as we read the time ... we can say 20 but when you count in 5s and you come from this side to that side … then we can say 40… you said 40 ... we count 5,20,15,20 ... then we'll say 20 to 10. Right, you've coloured in your clock, I said colour in the two quarters ... (draws quarters on the clock on the board) When we divide into quarters, how many quarters do we have?

88 Ls 2

89 T 2? If we divide it into quarters, how many parts do we divide it into again?

90 Ls 4

91 T If we divide into quarters, how many parts do we divide into?

92 Ls 4

93 T We divide into 4. (teacher draws quarters on the clock, draws arrows at 9 and 3) If the long hand lies on 3, then what time is it?

94 L Quarter past.

95 T Good. He says quarter past nicely. He says quarter past nicely ... how does one say it in Afrikaans again?

96 L 15 minutes past. (Afrikaans: 15 minute oor)

97 T We can say 15 minutes past ...but how did we divide the clock just now? In quarters. If we say 15 minutes ... how else can we say it?

98 Ls Quarter past?

99 T Tell them Henry ... we said 15 minutes is correct ... we can say quarter past ... if your clock's long hand lies on the 9 we say a quarter to ... right ... Lisa, Sinevuyo, I think the two of you should now answer because I do not know what you're busy with... she doing everything except listening, not so Sinevuyo?. Remember I said the teacher sees everything you do (referring to the researcher)... Sinevuyo now , as the clock 's long hand , remember I said that the long hand tells us what we need to do ... we need to look at what the long hand does in order to tell us the time... if he is lying on the 3, what did we just say, what is it ... Noxolo or Sinevuyo , can either of you tell me ... tell them again, Henry…quarter past ... Lisa look ... what is the time?

100 Ls Quarter past.

101 T Quarter past ... the long hand lies on the 9, then it is, what we say? Quarter...?

102 Ls Quarter to.

103 T Quarter past ... Right ... (shows quarter past 10)...what is the time?

104 Ls Quarter past 10.

105 T (Shows quarter past 1) What is the time now?

106 Ls Quarter past one.

107 T (Shows quarter to 4) What is the time now?

108 Ls Quarter to 4

109 T Quarter to 4 (Shows quarter to 5) What is the time now?

110 Ls Quarter to 5

111 T Quarter to 5 ... Right, let's see ... what did we say? When the big hand lies on the 12 then we say…

112 Ls 12 o'clock

113 T Of an ...

114 Ls Hour

115 T So when I put it him so that the big hand is on the 12, we say ...(showing 4 o'clock)

116 Ls 4 o'clock

117 T The long hand tells us ... the minute hand ... the short hand shows us the hour…when the big hand is on the 12 we say?

118 Ls 7 o'clock

119 T 7 o'clock ... right, but when the long hand moves just to the middle of the clock, then what do we say is the time? What do we say… how many hours?

120 Ls Half an hour.

121 T Half an hour? Half an hour?

122 Ls Half past 12

123 T Half past 12... Look carefully at my clock, the short hand is not lying directly on the 1, he is just a little past the 12 …Sinevuyuo M ... what is the time now? (waits) Seems Sinevuyo is asleep today ...what do you say Sanetolo? I have not heard ... you should speak up ... the long hand is lying on the 6... then what do we say?

124 L Half an hour (Afrikaans: halfuur)

125 T Half an hour ... What is the time now? (others have put up their hands)

126 L Half past 3 (Afrikaans: halfdrie)

127 Ls Half past 4 (Afrikaans: halfvier)

128 T Why don't we say half past 3? When we talk about half hours, we say the number after the ... on which the little one…short hand lies.... (speaks to feeding scheme cook at the door) Right, what do you say, Sipho? (Shows him the clock) What do you say, Sipho?

129 L Half past 3

130 T Half past 3... so when the long hand lies on the 3, then we say what?

131 Ls Quarter ...

132 T Quarter what?

133 Ls Quarter ..(not sure)

134 T Ouarter to or quarter past?

135 Ls Quarter past

136 T Quarters past. So the time is now ... (showing quarter past 12)

137 Ls Quarter past... (learners all give different answers)
138 T Quarter past ... ?(not giving answer)
139 L Quarter past 3
140 T Quarters past 3? No, Cherine , now ... you're just guessing…Cherine, look at the clock and tell me what time is ... where is the little one ...
141 Ls On the 12
142 T On the 12... so we say it is ...
143 Ls Quarter past 12
144 T (repeats slowly , with emphasis) Quarter past 12 ... (moves hands of the clock) It has just been12 o'clock... and now the long arm moves to... and what is the time now ...
145 Ls 5 past
146 T 5 past ... You like the English ... you 're right , but how we say it in Afrikaans ?
147 Ls (Learners give different answers ...) 1o'clock
148 T 1 o'clock?
149 Is 5 past 12 (some say 5 past 1)
150 T5 12 minutes ... why can't we say 1 o'clock? Why can't we say 1 o'clock?
151 L Because the short hand ...
152 T Because the long hand ,Cherine,is not on the 12... remember, we said when we say hours... Come (gestures to the learner at the back to come and sit in front) Leave your chair, leave your things, come and sit here so long... I think you are playing at the back... I can't see what you're doing... right, I want to know ... I want to know, Cherine , why can't we say that this is 1 o'clock ... I want to know why this can't be 1 o'clock? You did say 1 o'clock! Then she said no, it can't be 1 o'clock... now I know why is it not 1o'clock?
153 L The long arm is not on the 12... and the short arm is ... (not clear) helping out
154 T The long arm is not on the 12 ... and small ... the long hand must be where when we speak of an hour, Thandi ? Put down your pencil ... the big hand must be on the…?
155 Ls 12
156 T Must be on the 12. So what time is it now? Except not in English ... let's say it in Afrikaans.
157 Ls 5 minutes past ...
158 T 5 minutes past 12. The long hand walks …remember, we call it the minute hand ... so he's going to show 1,2,3,4 ... 5 minutes ... 6,7,8,9,10 ...(teacher counts) so what time is it now?
159 10 past 12
160 T We wanted ... it was 12 o'clock (shows12 o'clock) We are now going past 12 o'clock ... we won't have 12 o'clock anymore ... (shows quarter past 12)
161 Ls Quarter past ...
162 T I'm looking at Sinevuyo who's saying…do you want to say 5 or 15? What do we call it when it is lying on the 3?
163 L (Not sure)
164 T If we count in 5s, what is it ... 5,10,15 ... 15 ... so we can say 15 minutes past 12 or a quarter past 12.
165 L Half past 11. (Afrikaans: Halftwaalf)
166 T Half past 11?
167 L Half past 12 (Afrikaans: Halfeen)
168 T Half past 12... remember the short hand... as the long hand moves, so does the ... what did I say ... who's the short hand here in class? The short hand moves slowly .. and he moves so slowly? We all know ... so you must always remember the short hand moves slowly ,the long one moves faster ... (shows quarter to 1)
169 L (Learners give different answers)
170 T : I don't see that Andile and Sipho...looking and listening ... and Xoli .. what is the time now?
171 Ls Quarter past...
172 T Quarter ... ?
173 Ls Quarter past ... (teacher checks correct answer)
174 T Quarter ... ? Is it quarter to or quarter past?
175 Ls To (Afrikaans: Voor)
176 T Quarter to ...?
177 Ls Quarter to 1

178 T Right, and then he moves to the twelve and we say it is now again…?
179 Ls 1hour
180 T Right, Do you remember I said you have analogue time in your houses? You have a clock in your home ... or your parents or you have a watch (teacher writes digital time on the board) and we call it digital time, right? Digital time (Teacher uses English) ... we say ... (Writing on the board) ... if we're talking about 1 o'clock ... before we talk about 1 o'clock… what did we said ... how many minutes are on the clock?
181 Ls 60
182 T 60… how many minutes ... how many minutes are in an hour, Sibulele?
183 Ls 5
184 T 5?
185 L 25
186 T No, sit up straight, Cherine you just talking out of your head. How many ... you've just told me how many minutes on the clock? In one hour? I heard 6, I heard 10, I heard 24 ... let's count ... how many minutes are in an hour? (Moves long hand as learners count)
187 Ls 5,10,15,20,25,30,35,40,45,50,55,60 .
188 T Now I ask again ... how many minutes are in an hour?
189 Ls 60
190 T 60 minutes ... Right, how many ... you said to me the other day ... how many hours in one day ... how many hours in a whole day?
191 L 60
192 T 60 in a day? How many hours do we get in a day?
193 L 24
194 T 24 ... is it only Lwazi who remembers? I say 24 hours. Right ... now we start counting ... we have 1 hour ... it is early in the morning, we are still asleep ... then we get... (Learners count while teacher writes digital hours in blocks on the board)
195 Ls 2 o'clock, 3 o'clock, 4 o'clock, 5 o'clock, 6 o'clock, 7 o'clock, 8 o'clock, 9 o'clock, 10 o'clock, 11 o'clock, 12 o'clock.
196 T Right, now we arrive at 12 o'clock in the afternoon. (Draws additional blocks)
197 T Right, we're going to do the digital time. How do we write 1 o'clock in the morning?
198 Ls 1o'clock (Afrikaans: 1uur)
199 T How am I going to write it?
200 Ls 1 and two zeros (teacher fills it in on the board, then adds 2:00 and 3:00 while saying it)
201 T Right, who wants to write 4 o'clock for us? (Learners each go forward and write digital time in blocks on board) Come Subenati you , you can write 4 o'clock and 5 o'clock... we are now talking about the morning, not so? ... you do not have to write so small ... you can write bigger... Cherine ... 6 o'clock… Thembeka will write ... Phumzi can write 7 o'clock ... just sit down at the small table , Thembeka ... Sipho ... Sandla ... Xoli ... Sibulele ... you have to walk a little faster ... 10 o'clock ... wait a bit ... right, can we have a zero in front of the10?
202 L No Ma'am. (Teacher corrects his answer)
203 T Right, 11o'clock, Sibulele... Right... 12 o'clock, Zandi, right, what comes after 12 hours when analogue time we do? Then we get back to ... 1 o'clock and then 2 o'clock, 3,4,5,6... Right, remember we are now at 12 in the afternoon and after 12 hours we get I o'clock again… Siya ... write for me ... 1 o'clock digital time in the afternoon ... 2 o'clock in the afternoon, Asanda ? (he writes incorrectly, other learners gasp) ... Asanda, look at how Siya wrote ... how will 2 o'clock be written?
204 Ls 14uur .
205 T Hush, give Asanda a chance ... go Sinevuyo , 3 o'clock... and then Sisolo 4 o'clock... Write bigger, we can't see ... Sisona ... go ... Babalwa , Sivuyise... take chalk from the table ... Henry ... Noma ... come and write and come and sit down... Sanele… Thokezani ... 12 o'clock... will you write it? We are talking about 12 o'clock at night ... will you try? Right, tell me ... have we written our digital time correctly?
206 Ls Yes Ma'am .
207 T Did we write it correctly?
208 Ls Yes Ma'am.
209 T Right ... we say ... 1 o'clock in the morning we also call 1 o'clock in digital time ... 12 o'clock we

write the same... but when we get to the afternoon, Cherine , then we don't write 1 o'clock as we write 1 o'clock in the morning... we now write thirteen hundred, fourteen hundred, ... 13 is 1o'clock, 14 is 2 o'clock... but tell me, who can tell me when I am talking about … what's the time now?10 minutes past 9 ... who wants to write the digital time for me? We speak of the morning, not so?... we are not now in the evening ... we are in the morning ... Babalwa, you can try... just wipe it off with your fingers as you write10 minutes past 9 ... 10 minutes past 9 ... how are we going to write it in digital time? (Learner writes answer on the board) Do we write it like this ?

210 Ls No

211 T In the digital time, how do we write? Who wants to tell me how are we going to write? Lulama , let's see if you can write for us? Right ... Babalwa, you thought... on the analogue time (teacher indicates on clock drawn on board) the 2 will be 10 minutes because we count (writes minutes in) 5, 10 ... but in digital time it will be 10 minutes past 9 ... right, who can give me the digital time writing ... ( ) right ... 11AM ... who can say half12 me go ? Who can write for me in digital time…half past 11 (Afrikaans: halftwaalf)? Noma ? It is 11 o'clock, then we go to ... (learner writes 12:30) In English that will be half past 12 ... (addressing the class)... Noma has written 12:30 ... if I had been an English-speaking person, and I want to tell you the time in English, then I would say, if I am looking at my digital watch… I would say it's now half past 12 ... who of you can give it to me in Afrikaans ... how do we read when we write in Afrikaans ... how do we write half past 11 ... wait ... let 's say ... Cherine come and show me how ... before we go to the digital time reading in Afrikaans… Half12 ? (Learner hesitates waits ...) Tell me in analogue time. (Uses paper hands on clock on board) What does half past 11 look like? Half past… (adds long hand) Where should the short hand be?

212 Ls Between the 11 and the 12. (teacher adds short hand)

213 T Just a little bit past the ...

214 Ls 11

215 T So what does half past 11 look like? The digital time ... when we read Afrikaans? Seems to me Cherine is asking San, Teacher please help me... Cherine, do you want to try? (Learner shakes her head and goes back to her desk) Who will write half past 11 for me? Let Sibulele try... Half past 11. You've said in Afrikaans ... When we speak of half-hours, then we say he does not lie on the number, we read the number after the ... (waits while learner writes) Now why has Sibulele taken our 12 o'clock away , where are we now going to get a 12 o'clock? ... you 're right when you say that when we speak of half-hours then it be 30 ... (teacher adds 12) tell me what the time is now… What time is it now?

216 Ls Half past 12. (Afrikaans: Half12) (Some learners sound unsure)

217 T What time is it now?

218 Ls (still hesitating) half past 11

219 ***

220 T We are going to work in groups of 4. One in the group gives a time… and then the others must place the hands on the correct time. Right… Henry, Sinevuyo, Silomsi and Noma… are you going to work together (teacher organises learners into groups) So one in the group must say… show me what 12 o'clock looks like… or 5 minutes past 6… then you need to place your hand in the correct position… I'm just going to give you a few minutes before you go off to eat.

221 T (asks group to build half past 12)

222 Ls (one get it right, three display half past 1)

223 T (indicates on learner's clock) He's (referring to the short hand) past the 1. Is this half past 12?

224 Ls (corrects hands and shows teacher)

225 T Yes (moves on to next group)

226 END

D2: Lesson transcripts: Anine (Park High)

Teacher 2 Lesson 1
Date: 17 October 2012
Topic: Adding, subtraction and division

1 At the end of the Life Skills lesson on the mat the learners move to their desks for the mathematics lesson. The lesson starts with a counting activity.
2 T Good, count for me in 10's and begin with 671.
3 Ls 681, 691, 701, 711, 721, 731, 741
4 T Good, now count back in 5s from 855
5 Ls 855, 850, 845, 840, 835,830, 825, 820
6 T Good. And the last one. In 2s from 884.
7 Ls 884, 886, 888, 890, 892, 894.
8 T Good. (Holds the wall clock in her hands) Now we are going to do another exercise. You're going to have to think carefully. Write the date and draw a line and then you stop talking. You write the date. 17 October. Good, are you ready? You are going to count in 3s for me… again… and write it as fast as you can… and today we're going to start at 3… You are going to see how fast and how far you can count… but today I'm going to give you two minutes. You're going to see if you've made any mistakes and we're going to see counts the furthest. Write down 3 for me and fold your arms. (Looks at the wall clock) On your marks, set, begin!
9 L1 Ma'am, I got to 132.
10 T Congratulations, you've won again. Now I'm going to give you 2 minutes to count in 5s. Start writing!
11 L2 I got to 270 ma'am.
12 T Well done. You're the winner… Now, everyone, take out a book to press on. You are not going to stick in the test.
13 L Ma'am…I can't. (Learner indicating that she does not feel confident to try these sums.)
14 T Okay, but you always do well with these sums ... okay, I will do one with you...
15 L Yay!
16 T Right. Say for instance we take... (Writes numbers on the board as she says it) 245 + 136 ... how do I ... what can I do with this sum?
17 Ls (Learners all answer at the same time.)
18 T Shush, shush (loudly) Your hand is up... (focuses on one learner)
19 L The hundreds…
20 T Well, let's put together the hundreds. (Writes while learners dictate)
21 Ls 100 + 200 is 300
22 T Good
23 Ls 40 + 30 = 70 ... 5+ 6 is 11
24 T Okay, now we add them together.
25 Ls 300 + 70 + 11 is 381
26 T Okay, now we have one minus calculation to do ...
27 L1 No ma'am, I thought…?
28 T No, no, no ... (writes numbers on the board as she says them) 752-377
29 L2 Ma'am, I struggle with these sums ...
30 T Then you look closely ... you've all have had a turn ... umm , Ntombi ... what are we going to do first?
31 Ls (all answer together)
32 T Don't all shout together ... we minus 752 from 300 equals 452 ... now we count in 10s ... 452 ... 442 ... (holds up hand and counts down on her fingers)
33 Ls (join in) 432, 422, 412, 402, 492, 382 ...
34 T (writes answer) 382
35 L Ma'am, Brandon did not count with us.

36 T And then the last?
37 Ls Minus 7... (Learners all speak at the same time)
38 T Shuut ... whose hand is up?
39 L 376
40 T Shall we see if she is right?
41 Ls (Start counting)
42 T (Stops them to make sure they start counting together)... 382? (Holds up hand to count on her fingers)
43 Ls 381 , 380 , 379 , 378 , 377 , 376 , 375 ...
44 T Right ... Thanks Michelle , 375 . Okay, so it's an addition and a subtraction sum ... you do it every day in your workbook and you do it for homework ... right, take out a book for me to keep you work closed. (Learners quietly work on their own, completing the work written on the board.)
45 ***
46 Teacher calls a group to the mat and two learners hand out the mat books of the group taking who are going to work on the mat. Learners gather on the mat.
47 T Michelle , are you almost done ?
48 L Yes, yes ma'am.
49 T Thuso, you also have to come to the mat ... have you completed your test?
50 L Yes ma'am.
51 T Xoli, sit up straight for me... with your feet together and your hands at your book (Wipes whiteboard)
52 ***
53 T 1335 ... now you break it up for me ... no, I have just said break it up, I did not say halve or double ... (walks around to check learners' writing ...) just break it up, only break it up ... did I say halve or double?
54 Ls No
55 T No, so you just break it up ... (waits) ...then below that you halve it ... so under the hundreds ... (stands up to shows one learner) ... so under the hundreds ...look here ... each little number you are going to halve below it... write the half of each little number ... that's right ... (waits)
56 L Do we have to write the answer?
57 T Yes ... I want to see the whole sum ...
58 ***
59 L 500 plus 150 plus 15 plus 2 and a half (Teacher writes as learners say the numbers.)
60 T Good, let's first add the hundreds together.
61 Ls 500 plus 100 ...
62 T Is?
63 Ls Is 600
64 T And?
65 Ls 50 plus 10 ... (thinks out loud) is 667 and a half ...
66 T Okay, who got that? (Learners put up their hands and teacher addresses learner who did not put up her hand and then looks at her calculation.) ... oh dear, there was no need for you to make that mistake... Now you must write down for me 1599 ... and then you break it up ... 1599 ... (waits) ... 1599 ... don't draw any lines… put away that ruler, because you're not finished ... okay, now you're going to halve it for me beneath each number ...
67 ***
68 Ls 500 , 250 ...
69 T And what is the easy sum for half of 500? Where do we get it come from?
70 L Half of 50 is 25 ...
71 T Half of 50 is 25 ...
72 Ls And then it is....
73 T 250 (Writes it on board) ... and half of 90?
74 Ls 45
75 T 45 ... (Learner at the desk tells teacher something and she gets up and goes from the mat and goes to speak to learner)…I'll be with you now…and half of 9?
76 Ls 4 and a half
77 T 4 and a half…good…please add the 100s together...what do I get?

78 L 700
79 T 700…Shirley, add the 10s together for me....what do I then get?
80 L 90
81 T 90...and Michelle, add the 1s together…what do I then get? (waits)
82 L 9
83 T And a…? half…what happens if I forget to add the half? Then my sum is incorrect, not so? Good, so what is our answer?
84 L 799 and a half (teacher writes answer on the whiteboard)
85 T (checks to see whether learners got the correct answer) Good…now I want to do multiplication and division that I am sure you…
86 L (from the desks) Ma'am, Lisa is crying…
87 T (walks over to the learner who is crying and addresses learners on mat) The children on the mat, write down for me as many as possible multiplications by 3 sum and their answers…as many as you can…you don't need to use your ruler…
88 ***
89 After attending to learner at the desks, teacher returns to group on mat.
90 T (working at a fast pace) 27 divided by 3?
91 Ls 9
92 T 21 divided by 3?
93 Ls 7
94 T 15 divided by 3?
95 Ls 5
96 T 9 divided by 3?
97 L 27
98 T That's multiplied by…how many 3s in 9?
99 L 3
100 T 18 divided by 3?
101 Ls 6
102 T Wow, you're all so quick... 12 divided by 3? Michelle?
103 L 4
104 T 4 .... okay ... 33 divided by 3 ...
105 Ls 11
106 T 11 ... so what is 36 divided by 3 ?
107 Ls 12
108 T Okay , right , I'm going to give you a sum and the sum looks like this ... (Writes on whiteboard) 72 divided by 3 ... I'm going to use numbers that are easy for me to divide by 3 ...
109 L 12 divided by 3 or 3 divided by 3 ...
110 T Like 3 divided by 3 ... yes, you're quite right. Well, let's take a 30 out of 72... What is 30 divided by 3?
111 Ls 10
112 T 10... Well, what is left?
113 L 2
114 T No ... What was left of the 72?
115 L 22 (corrects her own response) ... 42
116 T 42 (confirms learner's answer and then recaps process)...What is 40 plus 30?
117 Ls 70
118 T And the 2 that is left over?
119 Ls 72
120 T So there is a 42 left... Can I take out another 30?
121 Ls Yes
122 T So, I have another 30 ... and it's easy, you don't even have to think ... I go and fetch another 30 ... What's my answer?
123 Ls 10
124 T 10 ... So how much have I now taken out of 72 altogether?
125 Ls 60
126 T 60 ... What 's left? Think carefully...

127 Ls 10
128 T There’s only 10 left?
129 Ls (shout different answers)
130 L 20
131 T Shhh ... you said 20 ... what is 6 plus 2? What is 6 plus 2?
132 L 8
133 T What's 60 plus 20?
134 L 80
135 T Where did we get to? 72... So we have a 30 and 30... what is left?
136 Ls 12
137 T (Writes it on the board) 12 ... and do you know what 12 divided by 3 is?
138 Ls Yes... 4
139 T (writes it on the board)
140 L It’s 20 plus 4 ... that’s 24
141 T So what is 72 divided by 3?
142 L 72 divided by 3 is… 24
143 T Are you going to try a little sum?
144 Ls (Some say ‘yes’ and others say 'no’)
145 T I'm going to give you an easier one...
146 Ls Yes!
147 ***
148 T (recaps on process) Now when you do a division sum, then it is the easiest to take out that 30... you do know what is 30 divided by 3, right? What is it?
149 Ls 30 divided by 3 is ... (Some learners say 10, but not everyone seems sure.)
150 T How many 3s are there in 30?
151 Ls 10
152 T It's 10... okay ... well, here comes another one for you ...right (Writes and says sum) ... 42 divided by 3 ... now what is the first sum that you can take out of there? What number can you take out of there?
153 Ls 30
154 T Right,write it down ... yes... There 's your sum. Then you take out 30... (gets up and checks each learner’s work. Helps one learner on mat to write it correctly, works through steps with the learner, explaining, asking questions, not clearly audible) Excellent! You're very good. (moves on to next learner) How many 3 's in 30 ?
155 L 10
156 T But it's 30 ... and what is left?
157 Ls 12
158 T Do you know what 12 divided by 3 is?
159 Ls 4
160 T (Teacher moves from one to the next.) Right ... that's right ... what 's your answer ? Right ... okay ... fine ... you are getting it really right ... (One last learner holds up answer. Teacher checks and agrees. Learner sits down and writes a next answer) ... now here comes 75 ... (adds and writes on board) divided by 3 ... sorry ... your teacher almost wrote only half a sum... divide by 3 ... now what 's the first step you need to take? What do you need to take out first?
161 Ls 30
162 T 30 ... that's an easy one ... divided by 3 (waits ... then moves to desk to check on learners working at their desks)
163 END

Teacher 2 Lesson 2
Date: 12 November 2012
Topic: Division

1 Learners work with division sums at their desks.
2 T Now we have in the last while been practicing our division sums... and I see here is a child who does

not hear what I am saying and who is not going to know what to do ... we have lately been practicing division sums and today you are going to… with your partner… solve a division sum. And there are different ways in which we can break up 135 to divide it by…? (checking whether they are concentrating)

3 Ls 3

4 T So what's the easiest way - without thinking - to divide by 3?

5 L1 100 ... (some say 30)

6 T 100 divided by 3?

7 L1 Maybe 30, ma'am?

8 T Okay, so we have 30 that we can divide by 3. Or you can... 60

9 L2 90

10 T Okay. Or 90

11 L3 Or 120

12 T Or 120. Fine, but you have to think what will be the easiest... so you can ... there are going to be different ways in which to do this sum... some of you are going to use 30, 30, 30, 30 and what is left you will divide by 3… or you are going to say 60, 60, 60... shoot straight to 60 ... because you already know ... but ... What is the secret to these sums? Can you take a number of which you do not know the answer?

13 Ls No.

14 T Mbuyi, what is 120 divided by 3?

15 L4 (No answer)

16 T You do not know the answer, so you leave the 120. What, do you know, can be divided by 3?

17 Ls (Attempt to answer, but are stopped by teacher, who keeps focusing on Mbuyi)

18 L4 30 and 3

19 T Okay, we are not talking about 3s now, we are talking about 30, because a 3...

20 L4 30 divided by 3

21 T (Affirming, repeats) 30 divided by 3. Okay, so we are not going use 120, because we do not immediately know what the answer is. What is 30 divided by 3?

22 Ls 10

23 T What is 40 divided by 4?

24 Ls 10 (Some answer 4, but the incorrect answer is ignored)

25 T What is 50 divided by 5?

26 Ls 10

27 T Okay, so these are the easy ones, so don't shoot to 120 if you do not know ... Right, you are going, with your friend ... You are going with your friend... you are going to discuss... to explain what you are going to write… and then you write together what you have spoken about. You are going to work out this division sum together for me…

28 L Ma'am, I...

29 T And then we'll see who got different sums. Yes? (Attends to learner)

30 L Ma'am, Marne and I are going to... (inaudible)

31 T Yes, good… you may not write before you have spoken about it...

32 L Ma'am, may we just write the sums... (inaudible)

33 T You may write sums ... (points to the board) Those are your sums. That is the sum that you must do.

34 (Learners speak softly and discuss calculation)

35 T Uh... Sibu , you may not write before you and Lwazi have spoken about it... what is it that he doesn't know?... (Almost inaudible) You are going to show him your sum ... and then he is going to shows you how he does it ...

36 (Researcher focuses on two isiXhosa speaking girls who are discussing in isiXhosa. When requested to explain to researcher what they are doing, one of the learners explains.)

37 L5 We wrote, we wrote... we wrote 135... divided by 10... then we had 30 and another 30… we are going to fetch another easy number to divide by 3.

38 Learners receive worksheets for extra work. Group is called to the mat, learner asks to hand out books.

39 T Charne, come to the mat for me. Everyone sit in a neat circle.

40 L Where is Charne 's book ?

41 T Okay , then Lizelle ... you can come to me ... Write today's date and draw me a line ... (to one

learner) write today 's date ...

42 T (Hands out dice - two for each pair) Finished writing? 12 November ... 2, 4, 6, 8, 10 ... you two share ... This is how it works. Between the two of you ... Erik and Unathi, you share, Luyolo, you and Ilona share ... You two share ... share ... you two and your two share ... You will throw the dice.

43 L Ma'am, they have two ... they have two…

44 T You two ... she has two ... where's your other one? Give it to her ... Charne, you're with her ...

45 T (demonstrates) Well, that's how it works ... you go... you are going to throw the dice, your turn (to one of the learners) throw it ... (asks partner) 6 + 6 ?

46 L 12

47 T Then you divide those little numbers by 3. Okay? 12 divided by 3?

48 L 4

49 T What if I throw 4 +3?

50 Ls 7

51 T Now divide it by 3 ... how many 3s in a 7?

52 L 2 rest 1

53 T (works through it with group using fingers for counting) 3 + 3 ... 6 ... and what is left?

54 Ls 1

55 T Okay, so 2 rest 1

56 T Then it's your turn again ... then you throw together ... 5 +1 divided by 3. Okay, we tried it.

57 Ls (each holds dice and wants to throw. Teacher decides who should start.) You can start ... Ilona and Andrea ...

58 T (to learners who are unsure what to write in their matbooks) Well ... you can both write ... (speaks to whole group) ... if you have the calculation, let's say you threw 10, 10 divided by 3 ... then both of you write... (Teacher tries to interrupt) Hey, Likhaya, I am talking... if you throw the dice ... they have 10 divided by 3, then write down 10 divided by 3... and she gives the answer ... it was her answer ... it was her turn ... okay ... and what was your answer ... what have you found? Count for me in 3s .

59 L (counting on fingers, slightly unsure) 3,6,9 ...

60 T So many 3s in 10?

61 L 9

62 T 9 3s? (holding up fingers and wiggling them)

63 L 3 (holds up fingers and looks at them)

64 T What's left?

65 L 1

66 T Rest 1.

67 L Ma'am, do we need to do it like this?

68 T 8 x 3? I thought you have to divide by 3?

69 L (shows alarm and corrects h is answer)

70 T Okay... okay who 's turn is it?

71 L Mine. 8 divided by 3… count… 3,6,9,12 ...

72 L (realises partner's mistake) Teacher, I know ...

73 T It's not 8 3s ... it's 8 divided by 3 ... how many 3s in 8? ... (Learner unsure) Well, count for me in 3s.

74 L 3,6,9 ..

75 T Okay, now you're already past 8... 3.6 ... ? How many are left?

76 L (counts on fingers and thinks a while, then smiles) 3.6 ... That's 2 !

77 T How many 3s do you now have?

78 L 2

79 T And what is left?

80 L Rest 2

81 T Yippee ! (to the partner) Now it's your turn ... now you must also give the answer.

82 L1 (excited) We have thrown three times 5.

83 T Wow, but you are smart ... hmm, why does he have more sums than you?.

84 L1 Ma'am, I'm behind ...

85 T (to learner's partner) You must wait for your partner... you've got to work on the same sums.

86 L Ma'am, I have two of the same. (inaudible)

87 T Whose sum is this?

88 L1 Mine.

89 T (to learner's partner) She must answer, not you, right? You must see whether she is correct. Let me see what you have done. Well, 12 divided by ... ow ... whose sum was it?

90 L Mine, ma’am.

91 T Okay . How many 3s in 12?

92 L 3

93 T 3 3s? 3,6,9 ... Count for me in 3s ... The answer is 4 3s. You need to tell her if she is wrong.

94 Ls 3,6,9,12,18,12,24,30

95 T Okay , your turn ... 11 divided by 3 is 33? I know 11 times 3 is 33. But 11 divided by 3... Whose sum is that?

96 L Mine.

97 T Okay. So how many 3s in 11? Count for me quickly.

98 L (counts softly)

99 L (other) Ma’am, I’m struggling ...

100 T You're already past 11, you are already at 11...

101 L (Counts again) 3

102 T Well, with how many remaining?

103 L 2

104 L Ma’am, can you help me?

105 T I 'll be right with you ... okay ... how many 3s in 5 ... you cannot say no 3,6,9 ... 3 ... you said when there 's 2 on 3s ... how many are there in 5?

106 L 1

107 T Well ... why do you say 3 3s? You said there are 3 3s in 5... (Teacher starts rubbing out) So how many 3s?

108 L 2

109 T Two 3s? (Counts) 3, 6 ...

110 L (thinks) 1 !

111 T Aha!

112 T Well, I’ll give you another minute, you can still do about two calculations.

113 T (looks at learner’s work) Okay, 5 divided by 3 ... Mbuyi ... they are sitting at the same sum at which you are sitting... quickly explain to them how many 3s in 5.

114 L If you say 3, 6, 9 ... (battles to explain)

115 T Let's count ... 3,6 ... okay there, we are already past 5 ... so it's a 3 and what is left ?

116 L 1 rest 2

117 T Yes, you have taken away 3... what is left?

118 L 2

119 T Okay, so your answer is 1 ... ?

120 L Rest 2.

121 T Good! Thanks Mbuyi , they are right.

122 Okay, right, draw a line for me ... (looks at pair 's work) Write the answer ... Well, draw a line then we will soon have a calculation done .

123 T Write 453 for me. Write 453. Check to see whether your friend has copied it correctly. copied (Learners check each other’s writing) Okay, you’re now going to break up the number for me... break it up in our usual way... in the easy way that you all know... good ... just break it up… not add it again ... check to see if your friend has done it correctly... not halve... not double... break it up ... now I want you to break it up using four numbers. Don’t look at your partner’s work ... break it up using four numbers ... (checks on learners at desks while the learners on the mat complete their work.) Give us your answer.

124 L 300 plus 100 plus 25 plus 25 plus 3

125 T Five numbers ... someone's ears are not working ... your turn ... Did you use four numbers? Good. Now you need to use six numbers... You are going to break up 435 using six numbers ... (moves to learner to discuss) You can add 100 plus 100 ... together they have to make 435 ... you need to use six numbers… I don’t want four or five or seven... (checks on learner) Good... well done. If you are done and I have looked at your work you are going to use seven numbers ... (checks on each learner) ... great, you’ve used halves as well... now I am looking for seven numbers ...

126 T Good, now we have one more thing to do (draws on the whiteboard)... A man works in a fruit shop... he packs oranges in bags ... he has 153 oranges... only six oranges can fit into bag.

127 L How many?
128 T Six. How many bags will he need for all those oranges? (draws on the whiteboard) Imagine this is a pile of oranges… How many bags is he going to need for the 153 oranges? How many fit into a bag?
129 Ls Six
130 T So, it is going to be a multiplication sum?
131 L1 6 times 153
132 T Okay so you want to tell me you are going to multiply 153 oranges by 6?
133 L2 No, it's a division sum, Ma'am.
134 T It's a division sum ... but what kind of a division sum? What is it going to look like?
135 L3 153 divided by 6
136 T Yes, Ilona is right, because I want to know how many 6s... How many piles of 6s I can take out of 153... (writes and uses gestures) Did you hear that? We want to know how many bags of 6 we can take out of this pile... So what is my sum going to look like?
137 Ls 153 divided by 6
138 T Oh dear, look carefully. I'm going to change this sum a little. I'm going a make it a little easier, because this one is a little too hard. Let's put three oranges in a bag ... So now it's bags of?
139 Ls 3
140 T So what is my division sum going to look like? I can't hear you.
141 Ls 153 divided by 3
142 T Good… we have done quite a lot of division, so try ... I've taught this to you often… What is the easiest number to take out of that big number?
143 L1 30
144 L2 60
145 L3 90
146 T Yes. Wow, I almost gave you a really wild sum... (Learners start working)
147 L Ma'am, can I take out another 30?
148 T Yes. Can you take out another 30?
149 L Yes
150 T Good, you do it, you can do whatever you want ... How many have you been taken out?
151 L 60
152 T Fine. Can you take out another 30?
153 L Yes
154 T Good… (moves on to next learner) Good, some of you have moved past 30... you are working with bigger numbers ... how many have you taken out ... 30 and 30 and even 30 ... well ... is there another 30? (moves on to next learner) Well, you sums looks completely different ... Well done. Good, I want you all to put your books here for me and go back to your desks to do the work on the board.

Teacher 2 Lesson 3
Date: 12 November 2012
Topic: Time

1 First mental maths ... then ... time (analogue and digital) Mat
2 Ls 700 , 650 , 600 (some say 500)
3 T Right, 650...?
4 Ls 600 ...
5 T Well , now we take turns ... the boys do a number... and the next number is the girls ... boys , 500 ?
6 ***
7 Ls Half past 6, a quarter to 7, 7 o'clock, a quarter past 7...
8 T A quarter ... ?
9 Ls A quarter past 7
10 T Okay, stop right there.
11 ***
12 T Okay , 1000 ... boys ...
13 Ls (boys) 950
14 Ls (girls) 900

15 Ls (boys) 850
16 Ls (girls) 800
17 Ls (boys) 750
18 Ls (girls) 700
19 Ls (boys) 650
20 Ls (girls) 600
21 T Stop ... now return to our girls ... ...
22 Ls (girls) 550
23 Ls (boys) 500
24 Ls (girls) 450
25 Ls (boys) 400
26 Ls (girls) 350
27 Ls (boys) 300
28 Ls (girls) 250
29 Ls (boys) 200
30 Ls (girls) 150
31 Ls (boys) 100
32 Ls (girls) 50
33 Ls (boys) 0
34 T Okay , fine. okay .. , while looking a little at the calendar ... Brandon , how many days are in November? Move a little closer so you can see ... close up the gaps... move closer, move closer, Michelle... how many days are in November, Brandon?
35 L1 (counts softly)
36 T Can everyone count? Matthew, how many days are in November?
37 L2 30
38 T 30 ... how do you know it's 30?
39 L2 There are 30.
40 T (points to the last calendar day) There are 30 ... so how many days are in November?
41 L 30
42 T 30... which is the first day of November?
43 Ls Thursday
44 T Thursday. Okay ... Bheki , what day is the last day of November ?
45 L Friday
46 T Friday ... okay ... eehm ... Carla , if the last day of November is a Friday, what day will the first of December be?
47 L Saturday ...
48 T A Saturday ... it's easy ... and if the first day of November is a Thursday, Lizl, what is the last day of October?
49 Is also a Wednesday ...
50 T Okay ... quickly say the months of the year ... please ...
51 Ls January, February , March, April , May, June , July (singing) ... December ...
52 T Okay, who can tell me, what 's the 3rd month of the year?
53 Ls March
54 T Okay , who can tell me, what is the 6th month of the year?
55 Ls June! (some shout April)
56 T You mustn’t shout out... make sure your answer is right ...
57 Ls June
58 T Which is the 7th month?
59 Ls July
60 T Good ... which is the last month of the year ?
61 Ls December
62 T What is the first month?
63 Ls January
64 T Which is the 5th month?
65 Ls May
66 T Okay, well, now I want to know ... let’s quickly count on our knuckles (demonstrates) ... starting

with the index finger knuckle ... not those not (points to second joint) ... that knuckle ... and we will see which days have 30 days and which have 31 days ... so January is on the top ...
67 Ls On the mountain (Learners point to own knuckels)
68 T What is on the top of the mountain?
69 Ls 31
70 T February?
71 Ls 30
72 T March?
73 Ls 31
74 T April?
75 Ls 30
76 T May?
77 Ls 31
78 T June?
79 Ls 30
80 T Julie?
81 Ls 31
82 T What now ?
83 Ls The same
84 T August ?
85 Ls 31
86 T September, how many days ?
87 Ls 30
88 T October?
89 Ls 31
90 T November ?
91 Ls 30
92 T of December?
93 Ls 31
94 T Correct
95 L Ma'am, the biggest month is on the biggest knuckle.
96 T Yes , that's a big month ... Okay, well , here comes a little question... we're going on a little holiday and ... on the 15th we get into a bus ... with all our bags in a bus... and we go to the sea ...
97 L Ma'am, we're go camping.
98 T Yes, we're going camping ... with all our tents and everything ... we got in the van the 15th ... and come back the 29th ...
99 Ls (inaudible)
100 T Yes, our holiday starts here... (points to day on calendar) from the 15th ... and we had a good holiday and we come back ...
101 Ls (inaudible)
102 T No, we don't shout out ... how many days were we away?
103 L 14!
104 T If you shout out I will not ask you... let's have a look... we give everyone a chance to first work it out...
105 L (some start putting up their hands)
106 T Well, Hlumi ... how many days did you get ... you say 15 days away ...
107 Ls (some say 14, others say 15)
108 T Well , did anyone get something other than 15? Now, if we look ... from here to there (points to calendar) ... how many days are there? 1,2,3,4,5,6,7,8 ...
109 Ls (count along)
110 T So from here to there it will also…?
111 Ls 8
112 T From here to there will also be 8 ... let's look quickly. (count together) 1,2,3,4,5,6,7,8 ... 14,15 ...
113 Ls Yes!
114 T Very nice ... 15 days ... well, as you are all right ...
115 L Ma'am, I got 17, so then I had another look...

116 L So did I…
117 T (uses clock) It's a quarter past 11 ... When we count time, in which multiples do we always count... Think carefully… What pattern?
118 Ls In 5s
119 T We count in 5s... Why do we count in 5s?
120 L Because there are 5 lines between the numbers.
121 T Let's see if she is right ... 1,2,3,4,5 ... so that's why we count in 5s ... Now when I break up the clock into parts, when I cut it into parts... (draws with koki on the clock) ... I'm going from the 12 ...
122 L Into quarters, ma'am?
123 T Yes, quarters ... I'm going to cut it from the 12 into halves... okay... luckily one can wipe off the koki... How many minutes are on that side? (points)
124 Ls 30
125 T How many minutes are on this side?
126 Ls 30
127 T How many minutes are there altogether?
128 Ls 60
129 T Okay , I'm going to cut it again ...
130 Ls Quarters
131 T Now how many minutes are in that quarter?... And in that quarter ...
132 Ls 15 ... 15
133 T Yes
134 L : I know why is it 15 ... because 15 plus 15 is 30 .
135 T Yes ... and how many 15 minutes we can get out of 60?
136 Ls 4
137 T Yes ... (points at clock) ... so there is 15 plus 15 plus 15 plus 15 ... well ... How many minutes are in that half?
138 Ls 30
139 T Plus this quarter?
140 Ls 35
141 T (raises eyebrows)
142 Ls 45
143 T So 30 plus 10 plus 5 ...
144 Ls 45
145 T So half an hour plus a quarter of an hour is 45 minutes ... so it's the easiest ... we then add quarters ... and that's what we're going to do on the board today... we are going to count in 15s... and we're going to count in quarters ... quarters of the clock ... quarters of an hour...
146 L Ma'am, I already see a pattern ...
147 T Do you already have a pattern ... can everyone can see on the board?
148 L Ma'am, I can show the pattern?
149 T Let's count first, then you can show me the pattern... okay, here it is ... 1 o'clock... (points to the board) ... what's this?
150 Ls A quarter past 1 ... Half past 1 (Half2 in Afrikaans) ...
151 T Half2 ... stop right there ... now why do we not say "zero two thirty" not?
152 Ls (all try to speak together)
153 T I want to see who sits the quietest with his butt flat on the mat and his legs crossed ... Ahlemile... can you tell me why do we not say "zero two thirty" for half past 1?
154 L Because it was not yet 2 o'clock...
155 T It was not yet 2 o'clock, so we cannot say "zero two thirty "... what was the previous hour, Louis?
156 L 1 o'clock
157 T The previous hour was 1 o'clock... and what does this 30 stand for? Luyolo?
158 L (does not answer)
159 T What does the 30 stand for?
160 L Half
161 T Half… okay ... what else does the 30 stand for?
162 T How many minutes have gone past...
163 T How many minutes have gone past (nods) ...past what?

164 Ls 1 o’clock
165 T Past 1 o’clock...
166 Ls (try to explain their insights at the same time)
167 L Ma’am, can I say the pattern? If they say 15 minutes past 1, then it means 15 minutes have gone past... (points at clock)
168 T You're absolutely right ... (points at the time on the board)
169 Ls A quarter to 2… 2 o’clock, a quarter past 2, half past 3 (half3 in Afrikaans), a quarter to three ...
170 T Good, Lizelle , why do we not say 3:45 for a quarter to 3?
171 L Because it's not yet 3o’clock ...
172 T It's not even 3 o’clock ... and what does the 45 stand for, Keisha?
173 L For a quarter to...
174 T And what else does it stand for?
175 L 45 minutes past 2
176 T Okay ... and then it's before the…?
177 Ls Before 3
178 T Before 3 ... how many minutes before 3?
179 L 15 minutes to 3
180 Ls A quarter to 3
181 T A quarter to 3... how many minutes?
182 Ls 15 minutes before 3
183 T And then it is…? (points to time on the board)
184 Ls 3 o’clock
185 T Hlumelo, look on the board ... (points)
186 Ls (start counting) A quarter past 3, half past 3 (half4 in Afrikaans), a quarter to 4
187 T Well, let’s count boys, girls, boys, girls... girls
188 Ls (girls) 4 o’clock
189 Ls (boys) (some say "a quarter to four ' others say 'a quarter past 4 ')
190 T Well , if there are children who are not going to count along, they will have to stand... then you're out of the game ... we want to see which team is the best and who counts the most beautiful together ... boys or girls ...
191 L We can do it ...
192 T Right, girls ...
193 Ls (girls) Half past 4 (Half5 in Afrikaans)
194 Ls (boys) A quarter to 5
195 Ls (girls) 5 o’clock
196 Ls (boys) A quarter past 5
197 Ls (girls) Half past 5 (Half6 in Afrikaans)
198 Ls (boys) A quarter to 6
199 Ls (girls) 6 o'clock
200 Learners keep counting
201 ***
202 T Well let's see if you can see any patterns…
203 L Ma’am, you count in 2s as 1,3,5,7,9 ...
204 T Okay , there’s a pattern ...
205 L And 2,4,6,8,10,12 ...
206 T Wow, beautiful, you 're right ...
207 L2 And ma’am. If you take 9 for example, you just add 15... 15 plus 15 is 30 plus 15 is 40…
208 T You're quite right, so we counted in multiples of ….?
209 L2 15
210 T 15, yes... (points to next learner)
211 L3 Ma’am, I see a pattern… on the one side are odd numbers and on the other hand, even numbers ...
212 T You 're right, here are the odd numbers, and here I move over to even numbers... Wow, that’s great.
213 L4 (moves to the board , points to numbers as she explains) Ma’am, it’s 0,15,30,45...
214 T You're quite right ... here's the 0, so it is on the hour... what is this?
215 Ls (say the answer with teacher as she points to numbers on board) A quarter past ...
216 T And this? (points)

217 Ls (give answers while teacher points) Half past ... a quarter to... 3 o’clock... a quarter past… half past…a quarter to...
218 T Good (wipes off the digital times) There are just a few things that I saw yesterday… you did strange things in your books ... let's write (writes as she draws) ... let's take 3 times 5 ... and when I say 30 times 5 ... and when I say 3 times 50 ... and then you went and said… okay ... 3 times 5 is what(closes up 0) ...
219 Ls 15… 150
220 T 15 ... and you've got your 0 ... I found it again yesterday ... children who do not add their answers together ... and then your answer is wrong ... then you get a cross... please watch out for that for me…girls ... you may go and sit at your tables...
221 (Teacher writes on the board)
222 T I'm going to start for you ... write ‘Time' at the top for me and draw a line ... that's all you need to write ... write neatly, in cursive...
223 L And the date, ma’am?
224 T And the date ... we have not yet written the date...
225 L We have ...
226 T No, we have not ... we worked in our red books.... ' Time ' starts with a capital 'T'.
227 L May I go and drink water, ma’am?
228 T When you’re done... you have been to the bathroom, so we will not go again now... good so you are going to start at 1 o’clock (writes on the board) ... and between each time you are going to put a finger space ... what will the next one be?
229 L 01:15
230 L If we write out the name, is it wrong?
231 T No, but I have just taught you that, so try to do in that way... you must always do it like that... okay , I will give you the first ones... what comes next? I am going to give you one minute ...
232 (Teacher has written the following on the board : 1:00 , 1:15 , 1:30 , 1:45 , 2:00)
233 T I want you to start now. (To one of the learners) You’d better sharpen your pencil quickly. I want to start now. Start writing please… (looks at her watch) ... you may begin... (Learners write times that follow as fast as they can. Teacher moves around to look at answers written by some of learners.) ... and you have to write neatly, your numbers have to touch the bottom line or you’ll be dropped from the game ... (Teacher speaks to one learner) Don’t worry, you 're right, you just need to add a dot there.
234 T Okay, pencils down.
235 L1 Ma’am, I just quickly added my zero.
236 T Well ... who got to 10 o’clock?
237 Ls Nobody
238 T 9 o’clock? Did anyone go past 9? No one? Who went past 8 o’clock ?
239 L2 I am at 8 o’clock.
240 T Did you go past 8 o’clock?
241 L2 No, I'm at 8 o’clock.
242 T Okay, so you have gone the furthest.
243 L3 I’m at 7 o’clock.
244 T Okay , I’m asking who got to at 8 o’clock? Hands up. (Three learners put up their hands) Good, very nice ... a quarter to 8? Very nice. Okay, draw a line. Okay, now you are going to do the work on the board ... you will be multiplying and dividing again because the group that got it right, was small today. Okay, so we're going to try and get the pile of books of good work higher…okay, so we are going back to you multiplying and dividing...
245 L4 Perhaps everyone can be on that pile...
246 T Yes, perhaps everyone on that pile ... well now you can be quiet and begin writing... (Teacher writes sums on board)
247 ***
248 (Group goes to the mat and teacher gives feedback about homework)
249 T Put down your pencils and your rulers and your books. Louis, sit up staight. Okay, you got a sum yesterday that said 107 ÷ 5 ... it was the man who worked in the fruit shop and who packed apples in bags... how many apples in a bag?
250 L1 21 rest 2

251 T No, you people don’t hear what I am asking ...
252 L2 5
253 T Thanks Louis, your ears are working ...
254 L3 I also said.
255 T Your ears as well ... good, 5 apples in a bag ... So some of you went and wrote 5 5s .... how many 5s can I take out of 7, Keisha ?
256 L 1
257 T 1 ... what is left?
258 L 2
259 ***
260 T One of you wrote…. 7 divided by 5 is 11
261 L That was not me ...
262 T (looks for names on book) How do you think did she get to that? Cherine, tell us how you got to 11.
263 L Maybe she added ...
264 T Maybe she added? Right ... 7 minus 5? 11? Cherine ... how many 5s in 7? (waits) Let's quickly count in 5s.
265 L 5...
266 T Okay ... now you’re already past 7… how many 5s in 7?
267 L 1...
268 T (Writes) 1 ... rest 2 .... so you almost had it right ... okay ... right ... thanks Cherine , that is your book ... Lindekuhle ... where's your calculation I saw here ... 1 rest 2 ... you added the rest… you must not add the rest ... Well, I will give you one more sum... Today there are 215 apples (writes on board then wipes off) ... no let's make it 132 apples ... and how many fit into a bag? (Writes 3)
269 L 3
270 T So do that one for us ... there are 132 apples, I want to put 3 in each bag... (Learner comes from his desk to ask whether his calculation in correct) How much is 9 4s? (waits, learner unsure) Ahlemile, can you count in 9s?
271 L Yes, ma’am.
272 T Count with us quickly...
273 Ls (with teacher) 9, 18, 27... 36
274 T So 4 9's give me 36 ... so 4 times 90 is ...? (waits)
275 L 360
276 T Yes ... go and fix it... (then moves to check on the work of learner on the mat) No, we do not divide 50 by 3 ... we 've never done that... Keisha please erase those 50, I have taught you about 30's ... (boy brings book for teacher to check) I 'm not going to look at it now ... I'm going to look at it this afternoon... (moves on to check others, then addresses learners) No, no, no Keisha, you said 30, 60, 90 ... you've only got 90 so far ... count in 30s for me quickly...
277 L 30 , 30 , 90 , 120 ...
278 T Now, can you not take out another 30? Why would you stop at 90? (Learner corrects her work, teacher turns to other learners) When you are done, look at each other's work and see what the other person is ... (turns back to learner) ... well, what's left? Right, now it is correct. Nice Keisha ... right, here comes your next sum... (check everyone 's work) good ... good... good ...
279 L What is the answer, ma’am?
280 L Ask Keisha ...
281 T Well, what are we going to do next? (refers to her planning) You are going to get a word sum… with time ... (Learner comes to ask teacher for help. She asks one of the other learners to help him.) ... Ahlumile, I’m just busy at the moment ... now, here are your questions ... how many minutes ... how much time passes ... how many hours pass from 3 hours to 7 hours ? (waits while learners think)
282 Ls 4 hours
283 T Let's see ... (with learners counting using their fingers to count) Right, let's see ... half past 2 (half3 in Afrikaans) to 3 o’clock?
284 Ls Half an hour
285 T Half an hour ... how many minutes is that?
286 Ls 30
287 T Right... half past 2 (half3) to 4 o’clock?
288 Ls An hour and a half ...

289 T (Teacher points to one learner) What do you say?
290 L 30 minutes
291 T From half past 2 to 3 o'clock is 30 minutes, but I say half past 2 to 4 o'clock... (asks other learner) what do you say?
292 L An hour and a half
293 T Why do you say that?
294 L Because from half past 2 to 3 o'clock is half an hour and then with another hour is 4 o'clock ...
295 T Yes, it's an hour ... well, now they say ... let's say Shirley does swimming lessons ...
296 L Ma'am, I really do swimming lessons ...
297 T Well, Shirley goes every Monday to DSG 's pool and her training begins at half past 3 (half4 in Afrikaans) and then she swims until 5 o'clock... how long does she swim?
298 (Teacher supports the learners' thinking with writing on the board , but not when calculation is easy enough)
299 Ls An hour and a half.
300 T Well, why do you say an hour and a half, Louis? From half past 3 to 5... why do you say it is an hour and a half?
301 L Because from half past 3 to 4 is half an hour ... and then there is another hour left...
302 T Well ... an hour and a half ... excellent ... now Louis goes to tennis practice ... and we have a long lesson on a Wednesday afternoon... Louis comes at 4 o'clock and he stays there until half past 5. Now go and work it out and write down the answer for me ... he arrived at 4 o'clock to half past 5 ... (Writes on the board while she speaks - after repeating she supports with writing as well - important shift mode – gestures, body language also now) Half past 5… have you got an answer?
303 L No, I'm still thinking (indicates with gesture and then continues)
304 T (puts clock on chair, then asks learners at desks how far they are with their work) At what sum you are you now?
305 L (Explains how far he has gone)
306 T Very nice.
307 L Ma'am, may I go to the toilet?
308 T When he comes back you may go ... It is now 5 minutes to 12 ... how many minutes to go to half past 12 (half1 in Afrikaans)?
309 Ls 35
310 T (nods and looks at learners' answers in mat books, one learner battles, tries to count on fingers) Count for me in hours ... start at 4 o'clock.
311 L 4 o'clock, 5 o'clock, 6 o'clock...
312 T Okay, no, now you have already passed ... an hour passes...
313 L 4 o'clock
314 T Okay, but you cannot count 4 o'clock on your finger... an hour passes, then it's 5 o'clock… (teacher points to finger) now how much time is left before half past 5?
315 L (counts, unsure)
316 T From 5pm to half past 5 (half6)? (waits) From 5 o'clock to half past 5 (half6)? (picks up clock to help) From 4 o'clock to 5 o'clock… how long ... From 4 o'clock to 5 o'clock... how long?
317 L Two hours
318 L Two hours? How long?
319 L One hour
320 T One hour ... (nods) and then how long before you come to half past 5 (half6)? (shows on clock)
321 L One minute
322 T One minute? 4 o'clock to 5 o'clock one minute?
323 L One hour
324 T Right... now from 5 o'clock to half past 5 (half6)?
325 L Half an hour
326 T And how much from 4 o'clock to half past 5 (half6)? (waits)
327 L One and a half hours
328 T Lovely... now write it down. Right, you can all put your books down and go back to your desks to finish the work on the board.
END

D3: Lesson transcripts: Lillian (Duiker Primary)

Teacher 3 Lesson 1
Date: 2 November 2012
Topic: Doubling, halving, place value, bigger than, smaller than

1 Learners start the day with mathematics on the mat, learners pack out counting cards on carpet. They have writing books on mat.
2 T Let's go. Sit up straight. We count in 10s, we count in 10s. We begin at 810. Everyone has look here… Chester… let's begin.
3 Teacher points to 100s chart on the board
4 Ls (at brisk pace) 810 , 820 , 830 , 840 , 850 , 860 , 870 , 880 (It is observed that some learners, especially two, are not focusing on board and are packing out their place value cards.)
5 T Stop right there …what is this?
6 Ls 880
7 T What is it?
8 Ls 880
9 Teacher writes 880 on the chalkboard.
10 T We write it as 880 and its number name is, Asanda, eight hundred and eighty (sounds it out slowly, with emphasis)
11 Teacher stands to one side and waits for learners to write it in their books. After a few seconds she starts moving around, checking the learners' writing, commenting here and there.) Ooo! (indicating pleasure) ...full stop... (to one of the learners) Start on a new page. We are going to write a lot.
12 ***
13 Learners count in 5s from 800 while teacher points at 100s chart.
14 Ls 850, 855, 860, 865, 870, 875, 880.
15 T Stop right there, 800 and...?
16 Ls 80
17 T 880 (moves to write on board) I want to… (writes while saying "break up 880") Leave the ruler, leave the ruler, you can write straight, you don't even have to write straight. (waits for learners to finish writing).
18 ***
19 Learner in front (with place value cards) holds up 800 card and 80 card.
20 Ls 880
21 T Break it up… break it up. Put the 800 in that hand, no come ... (He takes a moment to get it right).
22 T Read it to me.
23 Ls 880
24 T Now we are going build it.
25 Ls 800
26 T Plus
27 Ls 80
28 T Equals ...
29 Ls 880
30 T (Learner goes and sits on carpet. Teacher writes on the board and reads) 800 + 80 = 880. Don't write. Don't write. Don't write, Langa. Sandi.
31 T Are there other ways you can break it up?
32 Ls Yes ma'am… me ma'am ... (Learners shout out, but stop immediately when teacher selects a learner.)
33 T Uh ... Natalie.
34 L 400 + 400 + 40 +40
35 T Well, Natalie says... (writes on board) 400 +400 +?
36 L 40 + 40
37 T Equals?
38 L 880 (Some learners write this down.)

39 ***
40 Ls (continue with counting) 580, 680, 780, 880 (Learners spontaneously stop at 880)
41 T Give me the last number ...
42 Ls 880
43 T 880… you mustn’t write it, I’m going to wipe it off.
44 T Double 880 for me. Who wants to double it for me?
45 Ls (all shout) Me, ma’am… me, ma’am.
46 ***
47 The teacher has now discussed and written on the board “3 more than 880 = 883”. She also writes:
48 double 880

49 The lady from feeding scheme arrives at the door and enquires about the number of learners who would like a meal today. The teacher counts the hands and then continues with lesson.
50 L Me, ma’am…me, ma’am!
51 T Give someone a chance. (She chooses a Xhosa-speaking girl)
52 L I 've never ...
53 T Oh my child, do not talk nonsense. (Shakes her head)
54 T (Asks learner to write on the board) What are you going to do first?
55 L Break it up.
56 T Let me see. (reads as learner writes) 880. You need to put something there? (points)
57 L No.
58 T You don’t have to put anything there? So what should you do now?
59 L Double.
60 T You are going to double. So what must you do when you double?
61 L Add the same number.
62 T Add the same number ... Good ... Hmmm ... (Points to help when learner hesitates.) Same story ... And your answer?
63 L (Thinks a while)
64 L 2 That’s easy!
65 T Shhh ... (after a while) Do you need help?
66 L Yes.
67 Ls (shout out) Me, ma’am, me ma’am!
68 T Now break it up then. Look. Draw your block first. Put your thousands.
69 Double 880

800	80
1600	160
	1760

70 T Very nice. I think she deserves a hand. (learners clap) So softly? Very nice. Can you tell us what you did, Phumeza? Tell us what you did. Just speak loudly.
71 L Broke up. (Speaks softly.)
72 T You first broke it up.
73 L And then I doubled it ...
74 T And then?
75 L I added them together.
76 T Yes, then you add them together.
77 (Learners start writing it down.)
78 T You may write it down.

79 ***

80 T Well done, give her a hand. Marcelle says she broke it up, then she halved 800 and halved 40 , and then added them together, so half of 880 is 400 and ...?

81 Ls 40

82 T Write it down quickly.

83 ***

84 T I have 880 ... let’s say Smarties …sweets... I divide it equally among 4 children. I want to know (says the rest of the sentence slowly and with emphasis) how many do each get? Listen again ... listen again. I have 800 ... Thembani, you are not listening, man ... I have 880 sweets, I divide it equally among 4 children, how many does each child? (Silence) What will you do ?

85 Ls Divide it by.

86 T Divide it by. Now let's see, how do you divide 880 by 4?

87 L Do we need to show places?

88 T Only these, dear ... I want to see a number sentence. You need to tell me what you are doing here… and I want an answer as well.

89 T (Looks at a learner’s work) Is this correct?

90 L Ma’am, here 's my answer.

91 T Who has already written an answer? Let me see.

92 Teacher shows learners’ answers to researcher.

93 ***

94 Now everyone must pack up. Only the Elephant group do not pack up.

95 L Ma’am, Chester is doing Robert 's work.

96 T (looking at different learner’s work) That's not right yet. What is 200 +20?

97 L 220

98 T Now write down 220.

99 ***

100 Teacher explains to learners at their desks what they need to do. They need to complete an exercise in their CAPS work books.

101 T Colour your answers in in blue.

102 ***

103 The Elephant group work on the mat. They have packed out their place value cards. Teacher gives sum, selects learners who answer individually.

104 T Listen to the sum: 14-6… give your answer.

105 L 8

106 T 9+5?

107 L 19, ma’am.

108 L2 14

109 T 14, good.

110 T 9 +8? I see some people are still counting on their fingers. They want to complete ten.

111 L 16

112 T 16 (Mistake overlooked)

113 T 7 +8?

114 Ls (Shout out) 15

115 T Zuki?

116 L 15

117 T 15

118 T 8+6?

119 T I only see Unathi 's hand

120 L 14

121 T 14, Unathi

122 T 12-5?

123 T I only see Unathi 's hand

124 L 7

125 T Good, 7

126 T 11-5?

127 L 7 (some say 6, others 5)

128 T Take it slowly, Preston, you have given many different answers. Decide…11-5?
129 L (thinks) 6, ma'am.
130 T 6. How did you get there?
131 L I counted backwards.
132 T You counted backwards, okay. That's enough. (Gets up ...)
133 T Take out 445 for me… listen… 445 (with emphasis, indicates position) Have you got it? Bring it here, Tabiso . Let's see. There it is. Show it to the group. What is this? Say it. Say it ... 400 ... No, that's not right ... listen again ... 445 (imitates position in number) Take it out, listen again…,
134 L2 I know...
135 T Wait, we want Tabiso to take it out (gets up and walks to learner) 400, take out 400, 445.
136 L I have it, ma'am.
137 T Tabiso , 5 ... Don't help him ... Thembani, look at me , 5 ... yes , move it .., 40 ... shift the card under the other one…that's better, now read it, 445 (reads aloud with learner while pointing at each digit) There you go. Put it back. Put it back… You didn't listen, Candon man. 381 (With emphasis, imitating the positions)
138 Ls I've got it ma'am.
139 T Natalie has it here ...
140 L I have it.
141 T Okay, does everybody have? Let's all read it.
142 L (Read Alone) 381
143 T Again.
144 Ls 381.
145 T Put away the tins.
146 ***
147 The next group comes to the mat.
148 T Everybody must come closer. We call this one… What do we call it? (writes plus symbol on the board)
149 Ls Plus
150 T Plus. If we sound it, we call it plus. This sign we call... (writes smaller than symbol on the board)
151 L Less than…
152 T (writes multiplication symbol on the board and waits for answer)
153 Ls Multiply
154 T Its long name. Who can give me its long name? Chester? What is its long name? (Gestures to imitate the fact it is a long name) Beginning with 'ver' (Afrikaans)
155 L Double (verdubbel in Afrikaans)
156 T No, this is something else. Who knows its long name? Does one of the Monkeys know its name?
157 L Multiplication
158 T Yes, its looong name is multiplication, and we just say it's 'times' because it means 'so many times'. And the symbol? (writes divided by symbol on the board)
159 Ls Divided by
160 T (Nods) Divided by. They all have names.
161 T (wipes off symbols) When I want to say one number is bigger than ... Sandi? When I want to say a number is bigger than another number, I do not write everything in words. I have 9, Jayden, and I have 4. Is 9 more or less than 4?
162 Ls More
163 T 9 is more than 4 ... now I do not write ... 9 is more than 4 (emphasises words) ... so many words. I'll just write a symbol (writes symbol) and it says 9 is more than 4.
164 Ls 9 is more than 4 (say words with teacher)
165 T So the sign says?
166 Ls (with teacher) Is more than...
167 T (writes on board 306 and 300) First read the number.
168 Ls 306
169 T And this number?
170 Ls 300
171 T Is 306 more or less than 300?
172 Ls More

173 T (hands chalk to learner who comes to board and adds ' more than' symbol. She asks the class what learner had written.)
174 T It says 306 is more than 300.
175 Ls (as teacher points at board) 306 is more than 300
176 T There is another symbol. (writes 14 and 41 on the board) The number is? Butlebelo? Sibulele?
177 T (first points at numbers and then asks learners to read numbers)
178 T Is 14 more or less than 41?
179 Ls Less than ...
180 T Zuki, let’s see whether you know what the ‘less than’ looks like.
181 END

Teacher 3 Lesson 2
Date: 3 November 2012
Topic:

1 The day begins with whole class teaching of mathematics on the mat. Learners each have their mat books open and they are ready to write in them.
2 T (to learner) Look, how are you going to work in your book if you pack your cards on your book? No, my dear, it doesn’t work like that. Everybody packs their cards on the mat. Let's begin, let's begin. You need to sit up straight, thanks, sit up straight. Tabiso. Asanda. We count in 1s. We begin with 880.
3 Ls 880 , 881 ... 900 (count at a brisk pace)
4 T We stop right there. What is this?
5 Ls 900
6 T (writes on the board) 900. And his number is called… a short name… 900. You are not going to have enough space. Ntombi turn the page ... write down... (waits) Are you with us?
7 Ls No ma’am. (Teacher waits)
8 T Are you ready?
9 Ls Yes ma’am.
10 T Take out 900 for me.
11 L I’ve got it ma’am. (Teacher takes cards)
12 T What is this? Say the number.
13 Ls 900
14 T Say it again.
15 Ls 900
16 T (gives card back to learner) Take it back.
17 T Add one to it and tell me what it is now?
18 Ls 901
19 T Is 901 more than or less than 900?
20 Ls More than.
21 T What do you say, Phumeza?
22 L More
23 T Now tell me what you have said ... 900
24 L 900 is ...
25 T No no , 901 ...
26 L 901 is more than 900
27 T How many more?
28 Ls 1
29 T (writes 901on board) We have learnt the ‘more than’ and less than’ signs, have we not?
30 Ls Yes ma’am .
31 T Who is going to come and make the symbol for us?
32 L Me ma’am.
33 T Come then. There you go. Let’s read first. Unathi, you’re talking.
34 LS 901 is more than 900

35 T (waits for learners to finish writing)

36 (Lady from feeding scheme comes to the door. She writes down number of learners.)

37 T Take 910 out for me. Look at the ones at the back. They're sleeping at the back… 910… Asanda has it, Asanda has it... Let's read the number.

38 Ls 910

39 T When you break it up ... I want someone else now ...

40 Ls Me ma'am. Me ma'am.

41 T Why is everyone saying "me ma'am"? Unathi ...

42 L It's a 900 and a 10

43 T Equals? We are going to break up 910… 900 plus 10 equals 910. You don't need flard cards

44 T Ntombi, before you start writing, break up 900 for me. Good. Does anyone have a different plan? I want to see someone else try. Phumeza, come and tell me what you are doing, break it up and then you tell me what you are doing. 800 plus 100 equals? Read to me what you have done.

45 L 800 plus 100 equals 900

46 T There are many different ways to break up 900. We are just doing three. (waits for learners to write down from board) Are you done? Are you asleep? Don't spend time drawing lines. You're wasting time.

47 ***

48 The top two groups are working at their desks and they are doing exercises from the board on analogue and digital time. They use a stamp of a blank clock and print six clocks on a page in their exercise books before filling in the time indicated in the exercises on the board. The third group works with the teacher on the mat, revising time. The teacher uses an clock and the learners use cardboard clocks.

49 ***

50 T (explains to the groups at the desks) On your clocks I would like you to do 2:30, 7:15, 3:25, 8:45, 7:50 and 5:55. Okay, let me draw you a clock next to each. When the Monkeys are done, they can come and sit on the carpet. (Teacher helps a few learners with stamps, but leaves the rest to do their own printing.)

51 T Can we begin? Thanks, Tabiso… Henry. Tell me, what is the time now? (displays a quarter past1 on the clock)

52 Ls 1 o'clock.

53 T No. First look at me. Then you can look on your clock. What is the time here? Branden, leave it now.

54 L A quarter past 1

55 T Say again ...

56 L A quarter past 1

57 T Well done, Zuki

58 L What is the time, everyone?

59 Ls A quarter past 1

60 (Teacher moves hands on clock to 1:30)

61 T The time has walked on, Unathi.

62 L Half past twelve

63 T You need to think carefully. Not Zuki again.

64 L2 Half past 1

65 L3 Half over two

66 T You're right about the 2… Half…

67 L3 Half before 2.

68 L2 Half past 1.

69 T Half past 1. Why do you say that?

70 (Learners hesitate. Teacher prompts.)

71 L2 Because the…

72 T Because the... Say it, Chester.

73 L2 Because the long arm is at the 6 and ...

74 T And?

75 L2 And the short arm is at ...

76 T Is going to the... The short one is going to the…

77 L2 2

78 T The short one is going to the 2.

79 (Teacher moves hands to indicate 1:45)

80 T The time is here ... you 're right ... come Tabiso…No, look here.

81 Ls A quarter to 2. (One of Xhosa-speaking learners mouths the answer with others, but does not seem sure of the answer.)

82 T A quarter to 2. And then he walks and he walks and he walks... Rozelle, sit up straight, girl. Put your clock at 25 past 2. (Teacher puts down clock and gets up to check individually whether the learners are getting it right.)

83 L Here, ma’am.

84 (Teacher nods, looks at others learners' clocks. She goes and stands next to X-speaking learner at the back and helps him adjust the arms on his clock.)

85 T Count in 5s, count in 5s, 5... Count again in 5s… 5, 10, 15, 20... look at the long arm... the clock does not walk that way round... 25... (nods ... helps learner move arms) ... hold onto the long one... move the short one ... 25 past two ... past 2, past 2, good... (walks over to check others ' clocks) ..There’s a mistake, Lita ... here's the long ... (Learner on mat starts singing song with next door’s class.) Chester, I can hear you, are you in that teacher’s class? Good… (to next learner) Does everybody have 25 past 2? (keeps checking)

86 Teacher draws 2:25 on the clock on the board. She draws a rectangular block under clock in which learners are required to fill in the digital time.

87 T 25 past 2. Now listen very carefully to me ... 25 past 2 ... you need to give me the digital time ... (first in Afrikaans and then in English) Give the ' digital ' time, right? The digital time is early in the night ... early… before the afternoon... so you need to write the digital time in there... (The teacher explains this while handing out a white board marker to each learner.) ... you should press down hard down... you have to write it down there ... digital time (in English), digital time (in Afrikaans).

88 T (assists one of the learners) Have a look here. Let me help you. This side we have the hours. So many hours ... how many hours are there? On your clock? Yes, say how many hours.

89 T Thank you . 2 ... now write 2 so long... on the hours’ side... this side... (Teacher turns her attention to learners working at their desks) Asanda, you've got time for jokes, right? You didn’t make enough jokes during the weekend? (returning attention to answers written by learners on the mat) Rub it out… Now the minutes ... yours is right! what are you going to write now? Just go on... you’ve already put in the dots. The minutes you need to fill me here ... how many minutes? Count the minutes. (The learners at desk are speaking in X while doing stamps in books) Just 5? Uhu ... count the minutes ... start again at 5… 5, 10, 15... how many minutes? 25 ... good... yes ... write. Now it is still 2:25 ... but now it's in the afternoon ... it's in the afternoon ... (Teacher writes nm (Afrikaans for pm) next to rectangular block on board ... how many hours? Those hours are now going to be different... (Teacher takes clock to demonstrate.) Come let me help you first...(Shows 12:00)

90 Ls 12 o’clock

91 T It's 12 o’clock. If you count digital time, how many hours do you then have? (Turns clock on to past 13:00) What comes after 12 ?

92 Ls 5 ... 60 ...

93 T What comes after the number 12?

94 Ls (Unsure) 11 ...

95 T After twelve?

96 Ls 13 ...

97 T 13 hours ... and now after 13 hours?

98 Ls 14 hours

99 T 14 hours .. that is now in the afternoon ... and the minutes are the same ... (puts down clock, displayed on chair.)

100 T (addresses learners at desks) Are you finished with that work?

101 Ls Yes ma’am

102 T (points to the board) There is the work. Now you are worried about that work. (Moves over to X - speaking learners at desk) Quarter past ... look on that watch which side is quarter past ...

103 T (Moves over to slower group) Hey, but you are slow… you haven’t even started with anything... are you looking for attention?

104 T (moves back to faster group) ... half past 2... good ... a quarter past 7

105 ***

106 T Right, this group can go back to their desks. Do not pack up. Leave your clock, your cards. Just take your mat book to your desk… you need to do the same work with the clocks. (One of the learners asks the teacher to look at her completed work.) No, you did not right down correctly.(Next X-speaking girl brings her book)… 5 past 6, well done, quarter past 9…good.

107 ***

108 Ls (read time as teacher moves hands on clock) 10 past 8, a quarter past 8, half voor 8 (Afrikaans given incorrectly).

109 T There isn't 'voor' (before) with half… There isn't 'before' and 'after' with half past.

110 Ls Half 9 (Afrikaans for half past 8)

111 T Why half9? Because it's half an hour to...

112 Ls 9

113 T Half an hour to 9.

114 T (shifts to 9:35)

115 L 35 ...

116 T No, now you count that way (shows on the clock) Phumeza?

117 L 25 to 9

118 T 25 to 9 ... go on(Teacher continues to shift hands.)

119 L 9 20 ... a quarter to 9, 10 to 9, 5 to 9, 9 o'clock

120 T First just show it to me on your clock… 20 past 9… you've got your clock, 20 past 9…

121 (Teacher goes to desks and checks on work of learners. Learners on mat seem unsure of how to show 20 past 9. They do not know whether it is 20 to or 20 past)

122 T (returns to mat) What did you have to do? The digital time you need to write under the clock... (checks learner's work) No, Phumeza hours come this side (points to board and then checks next learner's work) first turn the clock at the top to the right time. (Learner moves hands to 8:45) This is the long one ... (Learner confused) Count for us... (Teacher points to 12 and then moves finger down left hand side) 5...

123 L 10, 15, 20...

124 T 25... (keeps finger there) The long hand before 9 ... hold on... 9… (Learner still unsure) There it is! I told you 25 to 9, right? Now, you have 9 o'clock…counting on from where you are… (Learner wants to count on the left, but teacher takes her hand and shows her to count on the right.)

125 L 5…10 (Learner counts in English)

126 T Afrikaans!

127 L 5, 10, 15, 20, 25, 30 (stops)

128 T You're not done yet ... count over...

129 L 5, 10, 15, 20, 25, 30, 35 (smiles proudly at teacher)

130 T Now write!(checks on next learner) No, Jarred, rub out quickly... (Teacher rubs out digital time) ... hours ... (points) ... this side... there you go… count your minutes from this side (Teacher points as learner counts.) How many minutes?

131 L 35

132 T Now write it down.... listen to me ... it was 9:35 in the morning ... now write for me 9:35 in the evening (with emphasis) Now you need to add your hours... (rubs out hours on board) ... now you show me how many hours it is ... (Teacher shows) that's 12 hours, 13 hours ... until you get there ... I don't want to have to tell you what it is... (checks on learners' work at desks) ... 25… count... count again ... (back to learners on the mat) ... have you counted how many hours ? How many hours?

133 L 12 o'clock

134 T Not yet ... it will be more than 12 hours... (checks on learner's answer) Well done, clever child! (checks on next learner's work) No, not yet. You must only count on the hours .. 12 hours

135 L (counts to 21 and writes it in) Good... well done... pack up your cards (moves to the board) and look what I'm going to do now... (writes a space for vm. and nm. (Afrikaans for am and pm) and space for digital time) before 12 and after 12... you need to put the digital time in for me... put hours and minutes, hours, minutes, hours and minutes. do you understand what you need to do? Do you understand what you need to do? (Points to the board) You are going to write digital time in…digital time in... (points to every sum) here, here and there ... you can take your clocks to your desks... take any one ... just wipe it off first... (Learners move to their desks)

136 END

Teacher 3 Lesson 3 **Date: 7 November 2012** **Topic: Analogue and digital time**	
1	After the whole class counting lesson phase on the mat, Lillian goes into a whole class session at the desks, working further with analogue and digital time. As preparation for a CAPS workbook exercise, she uses the clock and revisits the times (on the hour) after 12 o'clock.
2	T Now the 12 o'clock is in the afternoon. So it is 12 o'clock, right? 1 o'clock in the afternoon is what time?
3	L1 (isiXhosa-speaking learner in Group 1 is the only one who gives an answer) 13:00 (The majority of learners do not join in.)
4	T And 2 o'clock will be?
5	L1 14:00
6	T And 3 o'clock?
7	Ls (give different answers)
8	T And then you go on like that. 12 o'clock midnight… in the middle of the night… what is the time going to be?
9	Ls (unsure)
10	T Chensil, count…
11	L2 12:00
12	T In the middle of the night?
13	L 3 60 minutes
14	T Hours, dear… where is my clock? Let's look on the clock. Let's see... (holding up the clock) 1 o'clock is…
15	Ls 13:00
16	T 2 o'clock is…
17	L 14:00 (only a few of the learners join in to answer the questions and the teacher seems unaware of this)
18	T (moves to each hour and when she gets to 5 o'clock, more learners join the counting) I'm not going to turn the whole time. 12 o'clock?
19	L4 24:00
20	T Thanks, my child. 12 o'clock at night is…?
21	L (with teacher) 24:00…
22	T Right, then you look at the following one… (brings and displays the workbook exercise) Read this time for me.… (points) read me this time… (Learners try to find it in their books)
23	Ls (some of the faster learners respond quickly) A quarter past 2. You must put the time in here. Then you go on. The following one is…?
24	L5 A quarter to 11
25	T A Quarter to ….?
26	Ls 12
27	T Remember, have a good look at the ones that are after. Then you put the digital time in. Then you go on. At this one (points) you need to put hands in… can you see? At the bottom one you need to put hands in. You may begin. You all look so surprised. Are you surprised? Is it very difficult?
28	Ls No, ma'am.
29	***
30	L (isiXhosa-speaking learner at teacher's desk, counting) 25, 30, 35, 40… (gets confused)
31	T Count over.
32	L Where do I need to stop, ma'am?

33	T What the minutes are.
34	L 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 (writes answer)
35	T Do this one as well. What does it say? A quarter past 1. So, what are the hours?
36	L 13:00
37	T Correct, write. And a quarter past? (learner writes in answer) Correct. And a quarter to 4? Not yet at the 4. Not yet at the 4. Count.
38	L 1,2,3…
39	T Count in 5s
40	L 5,10,15, 20, 25, 30, 35,40, 45 (writes in answer)
41	T Good. And 12 o'clock in the afternoon.(learner writes in answer) Remember you colon… and your zeros. (learner completes answer and moves back to desk)
42	***
43	(Teacher asks isiXhosa-speaking learner 1 to explain the question to learner 2. She first communicates quietly with learner 2 about answer in Afrikaans, but then decides just to write in the answer. When teacher comes and helps her with the explanation, she is able to continue explaining)
44	T A quarter to … (emphasises 'voor' as Afrikaans for 'to') So it is not 6 o'clock yet (asks learner who needs help) What number comes before 6?
45	L2 5
46	T Now write it down. (learner 1 writes in) Yes… and count the minutes this way round… in 5s… (Teacher moves back and learner 2 takes over, indicating where the answer needs to be written. Teacher returns to check and explains the position on the analogue clock. Learner 2 helps by indicating the minutes that she should count, but without talking)
47	***
48	(Teacher at her desk helps isiXhosa-speaking learner with questions in workbook exercise.)
49	T Where is 'Bear love' on the programme?
50	L (points) There ma'am.
51	T Which day?
52	L Wednesday.
53	T Wednesday… so you write Wednesday 16:00… (learner writes in answer) Games (speletjies)?
54	L (points)
55	T No, that's sport.
56	L (points)
57	T Ja, games (speletjies)… which day?
58	L Saturday
59	T (nods) Saturday at what time?
60	L 14:00
61	T (nods) Go and show Marcelle.
62	END

APPENDIX E : Teacher interview questions (1)

1 Personal background and view of teaching in general
1.1 Why did you decide to become a teacher?
1.2 How long have you lived here?
1.3 What languages do you speak?
1.4 What are your qualifications?
1.5 What is in-service training programmes have you attended?
2 Teacher's views regarding teaching in a multilingual classroom
2.1 How do you feel about teaching isiXhosa-speaking learners in Afrikaans?
2.2 What strategies, do you find, help L2 learners to make progress?
- Motivating learners?
- Selecting suitable material at right level?
- Assess learners?

2.3 Do you find that you approach L2 speakers differently? Do you simplify work for them?
2.4 Have you adapted your methods over the years? If so, why and in what way?
2.5 Do you ever make use of the learners' mother tongue when teaching mathematics?
2.6 To what an extent does the use of the mother tongue influence the strengthening of the isiXhosa speaking learners' Afrikaans proficiency?
2,7 What other methods do you use to support the learning of isiXhosa speaking learners?
2.8 What, in your experience, are possible factors that allow some isiXhosa learners to progress faster than others?
2.9 How do you think, is the status of Afrikaans viewed by parents, learners and teachers in relation to English and isiXhosa?
2.8 Do you think that teachers could benefit from training to teach in multilingual classes? If so, what kind of training do you think will be beneficial?
3 Teacher's views regarding teaching mathematics in a multilingual classroom
3.1 Do you think that teaching isiXhosa-speaking learners mathematics in Afrikaans pose specific challenges? If so, in what way?
3.2 How important, do you think, is language proficiency in learning mathematics?
4 isiXhosa-speaking learners
Which languages are spoken in class and on the playground?
How many isi-Xhosa learners have attended Grade R? Where?
What are your views on the influence of the teaching that the learners received in previous years?
How would you describe the scholastic ability and functioning of the learners in your class?
5 What are the factors that inhibit the learning of Afrikaans?
- Too many Xhosa speakers?
- Unmotivated because of background?
- Unmotivated because of slow progress?
- Unmotivated because they do not want to learn in Afrikaans?
- Previous years' of tuition?

6 Is there any remedial help available for L2 speakers?

APPENDIX F Teacher interview questions (2)

1 Planning of lessons

1.1 How do you conduct your planning of lessons for the day, week, term, year?

1.2 How much collaboration is there among F Phase teachers and grade 3 teachers specifically (regarding teaching and planning)?

1.2 What resources do you use? CAPS and other policy documents? Textbooks? Do you use one or a combination?

1.3 What learner resources are available and how do you manage it?

2 Management of lessons

2.1 What is the day's lesson programme?

2.2 What were the reasons for organising the programme in this way?

3 Classroom management

3.1 How much time is spent on whole class teaching in relation to group work?

3.2

3.2 How are the groups determined?

4 Management of mathematics lessons

4.1 How do you go about introducing and developing a new mathematical module/concept?

How do you go about introducing and developing a new mathematical module/concept?

3.8 How do you assess the learners' progress in mathematics?

APPENDIX G Principal/ HOD interview questions

1a Tell me a little about the history of the school and the area in which it is located (probe – size of school, Language(s) of Instruction, what is the ratio of Afrikaans, English and isiXhosa speaking learners, factors that have an impact on teaching, such as the financial status of the school, poverty, other socio-economic conditions, feeding scheme, school attendance, weather conditions, burglaries, vandalism)

1b From which feeding areas do most of the learners come?

2 What, according to your experience, are possible reasons why isiXhosa speaking parents choose to enrol their children in a class where Afrikaans is the LoLT?

3a How is the LoLT of the school determined? (probe – present policy of the SGB, do you foresee classes with isiXhosa as LoLT introduced in the future, what is the position of the Dpt of Ed on this matter – opportunities for professional development?)

3b What factors were considered in determining the LoLT?

4 Are there any language support systems in place for isiXhosa speaking learners at the school?

5a What is the language background of the staff at the school?

5b How does this impact on the isiXhosa learners and other learners at the school?

6 How are teachers supported to teach learners whose 1st language is not Afrikaans – by the school? – by the Department of Education? – What resources are available to the teachers of isiXhosa learners?

7 How would you describe the involvement of the parents in the education of their children? (Probe – What role does the socio-economic status of the parents play? What role does the language barrier play? Do you find apathy, ignorance, involvement, commitment to collaborate with school and to become involved?)