

**THE EMERGENCE AND EXPRESSION OF TEACHERS'
IDENTITIES IN TEACHING FOUNDATION PHASE
MATHEMATICS**

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for the degree of**

**DOCTOR OF PHILOSOPHY
(Mathematics Education)
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**By
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DECLARATION

I, Lise Westaway, hereby declare that the work in this thesis is my own idea and where ideas from other writers were used, they were acknowledged in full using references according to the Rhodes University Education Guide to References. I further declare that the work in this thesis has not been submitted at any university for degree purposes.

SIGNATURE

DATE

ABSTRACT

The assertion that learner performance in South African schools is in crisis may be clichéd but it is certainly true. The majority of learners in the schooling system are not achieving the required outcomes, particularly in language and mathematics. I use the underperformance of learners in mathematics as the impetus for my research which seeks to understand how teachers' identities emerge and are expressed in teaching Foundation Phase mathematics. The research contributes to an emerging scholarship that strives to explain underperformance and quality in mathematics classrooms beyond structuralist theorising. Recently research, particularly in South Africa, has begun to look more closely at *who the teacher is* and how the teacher is key in understanding what happens in the mathematics classroom. This emerging scholarship focuses on teacher identities.

Research that foregrounds teacher identities within the field of mathematics education tends to be situated within a social constructionist orientation, which assumes that our knowledge of self and the world comes from our interactions with people and not some 'objective' reality (Berger & Luckman, 1966). Such a perspective appears to conflate questions of how we know something with *what is*. In other words, it elides structure and agency, thereby making research that seeks to examine the interplay between the two in the formation and expression of teachers' identities, practically impossible. It is for this reason, as well as the need to move beyond the hermeneutic, that my research draws on Margaret Archer's (1995, 1996, 2000) social realist framework. Social realism posits a relativist epistemology but a realist ontology. It is underpinned by the notion of a stratified reality with structural mechanisms giving rise to events in the world whether we experience them or not. It is only through the (inter)actions of persons that such mechanisms have the tendential power to constrain or enable the projects of persons. As such, my research seeks to identify the structural and agential mechanisms that give rise to teachers' identities and how these identities are expressed in teaching Foundation Phase mathematics. In my research, teacher identity refers to the manner in which teachers express their social roles as teachers.

In the research I use a case study methodology. I provide rich data on four isiXhosa teachers teaching in low socio-economic status schools. This data is gleaned through interviews and classroom based observations which were recorded as field notes and video transcripts.

Analysis of the data occurs through the thought processes of abduction and retroduction (Danermark, Ekström, Jakobsen, & Karlsson, 2002). These thought process enable me to (re)describe and (re)contextualise the object of study. Through the process of asking transfactual questions I identify the structural, cultural and agential mechanisms giving rise to teachers' identities and their expression in teaching foundation phase mathematics.

There are three significant findings in my research. Firstly, research that attempts to understand the emergence and expression of teacher identities should consider their broad contextual realities. The historical, economic, social and political contexts in which the teachers are born and live, influences their sense of self, personal identities and social identities (teacher identities) and as such, influences their decision to become teachers and how they express their roles as teachers of Foundation Phase mathematics. Secondly, my research suggests that teachers' mode of reflexivity is key to understanding the decisions that they make in the classroom and how they deal with the structures that condition the manner in which they express their roles as teachers. Thirdly, collective agency is necessary to bring about change in the way in which teachers express their roles in teaching Foundation Phase mathematics.

My research produces new knowledge by examining the interplay of structure, culture and agency in the constitution of foundation phase teachers' identities and their expression in teaching foundation phase mathematics. I use a social realist orientation to examine this interplay and provide an understanding of the mechanisms giving rise to the phenomenon under consideration. In this way I contribute to the extensive research on learner underperformance by focusing more explicitly on *who the teacher is in the classroom*.

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ABBREVIATIONS

ACE	Advanced Certificate in Education
ANA	Annual National Assessment
AUS	Australia
BEd	Bachelor of Education
C2005	Curriculum 2005
CAPS	Curriculum and Assessment Policy Statement
CDE	Centre for Development and Enterprise
CEP	Cultural Emergent Properties
CS	Cultural System
CTA	Common Task Assessment
DBE	Department of Basic Education
DBSA	Development Bank South Africa
DDD process	Discernment, deliberation and dedication process
EU:SFTE	European Union: Strengthening Foundation Phase Teaching and Teacher Education
FDE	Further Diploma in Education
FET	Further Education and Training Band
FN	Field Notes
FP	Foundation Phase
GET	General Education and Training Band
HoD	Head of Department
JPTD	Junior Primary Teachers' Diploma
IRE	Initiate-Respond-Evaluate
LHI	Life History Interview
LoLT	Language of Learning and Teaching
MEd	Masters in Education
MHI	Maths History Interview
MKfT	Mathematics Knowledge for Teaching
MLMMS	Mathematical Literacy, Mathematics and Mathematical Sciences
NEEDU	National Education Evaluation and Development Unit
NL	Netherlands
NPC	National Planning Commission
NPDE	National Professional Diploma in Education
NSC	National Senior Certificate

OECD	Organisation for Economic Development
PEP	Personal Emergent Properties
PhD	Doctorate in Philosophy
PI	Practices Interview
PTC	Primary Teachers' Certificate
RNCS	Revised National Curriculum Statement
SA	South Africa
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SADTU	South African Democratic Teachers Union
SA.DoE	South Africa. Department of Education
SA.DBE	South Africa. Department of Basic Education
S-C	Socio-Cultural Interaction
SEP	Structural Emergent Properties
SES	Socio-economic status
SI	Social Interaction
SMT	School Management Team
SPTD	Senior Primary Teachers' Diploma
SS	Social System
Stats SA	Statistics South Africa
T1	Time 1
T2-T3	Time 2 – Time 3
T4	Time 4
TIMSS	Trends in International Mathematics and Science Study
UK	United Kingdom
USA	United States of America
VRL	Video-recorded Lesson
WCED	Western Cape Education Department

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CHAPTER ONE

THE CENTRALITY OF THE TEACHER IN EXPLANATIONS OF LEARNER PERFORMANCE IN SOUTH AFRICA

1.1 INTRODUCTION

My research recognises the centrality of the teacher in the classroom. I distinguish between teachers in secondary schools¹ who view themselves as subject specialists and primary school teachers who view themselves primarily as generalists (Day, Kington, Stobart, & Sammons, 2006; Brown & McNamara, 2011). Research with secondary school teachers suggests that the subject one teaches has a strong influence on one's identity as a teacher (Day et al., 2006). Unlike secondary school teachers who are subject specialists, primary school teachers tend to recognise themselves as phase or grade specialists. In South Africa, primary schools are divided into two phases: Foundation Phase (Grade R-3) and Intermediate Phase (Grade 4-6). Grade 7, which is part of the Senior Phase (Grade 7-9), is the final year of primary school. Typically, teachers teach a grade whereas intermediate phase teachers teach across grades.

Foundation Phase (FP) teachers are required to teach mathematics, language and life skills (SA. DoE, 2002a; SA.DBE, 2011b, 2011c). Unlike high school mathematics teachers, many primary school teachers do not necessarily choose to teach mathematics, but by virtue of their position as generalists, are required to (Bibby, 2002; Day et al., 2006). Brown and McNamara (2011) posit that many primary school teachers carry with them years of emotional stress having tried to learn mathematics when they were in school. Research suggests that a focus on identity within teacher education has the potential to address the persistent negative feelings people, especially primary school teachers, have toward mathematics (Drake, Spillane, & Hufferd-Ackles, 2001; Drake & Sherin, 2006). Much of the recent literature on teaching and teacher education thus gives prominence to identity research and argues that identity may be key in understanding the seeming lack of change in line with reform curricula (Beauchamp & Thomas, 2009). In other words, a significant body of research proposes that providing the space for primary school teachers to (re)constitute their teacher identities, particularly their teacher identities within the field of mathematics, may be significant in bringing about change in their teaching practices.

¹ Secondary schools in South Africa are also referred to as high schools and are for learners from Grade 8-12.

In this research I seek to expand current research on teacher identity, particularly in relation to the emergence and expression of teacher identities, in the teaching of FP mathematics. I situate my research within FP mathematics classrooms, in low socio-economic status (SES) South African schools, in which learners according to the various benchmarking tests, are underachieving.

1.2 LEARNER UNDERPERFORMANCE IN SOUTH AFRICA

The assertion that learner performance in South African schools is in crisis may be clichéd, but there is a significant body of research, as highlighted in this chapter, that attests to the validity of the claim. Since 1994, with the election of the first democratic government, South Africa has attained almost universal access to basic education with over 98% of children attending primary school (Statistics South Africa (Stats SA), 2010). However, increased physical access to schooling has not been accompanied with an increase in epistemological access, as the majority of learners in the schooling system are not achieving the required outcomes in mathematics (Morrow, 2007; Fleisch, 2008).

Results from international and national benchmarking tests all paint the same grave picture (Fleisch, 2008; Reddy, 2006; Schollar, 2008; Spaull, 2011, 2012, 2013a; Reddy et al., 2015). The Trends in International Mathematics and Science Study (TIMSS) and the Southern and Eastern Africa Consortium for Monitoring Educational Quality II (SACMEQ II) and SACMEQ III indicate that South African learners are underperforming when compared with their international and regional counterparts. Only 6% of South African learners in both Grade 8 and 9 achieved at the level of the top 75% of learners in ‘developed countries’ in TIMSS (Development Bank South Africa (DBSA), 2009). Criticisms of these cross-country tests assert that they are curriculum dependent and examine learners’ ability to write tests and their language competence, rather than their content knowledge and understanding of mathematics. However, these tests still hold value for international comparisons. Furthermore, two South African systemic evaluations, as shown below, concur with the international studies that South African learners are underperforming.

Data from two national systemic evaluations, the National Senior Certificate (NSC) and Annual National Assessments (ANA), show that South African learners throughout the schooling system, underperform in mathematics and that the problem starts in the FP (SA.DoE, 2005;

Reddy, 2006; Moloi, 2006; Schollar, 2008; DBSA, 2009; Spaul, 2011, 2012, 2013a; National Education Evaluation and Development Unit (NEEDU), 2013). The ANA were written annually, until 2014², in Grade 1 to 9, with Grade 3, 6 and 9 representing the final grade in each of the respective phases of the schooling system (i.e. Foundation (Grade R-3), Intermediate (Grades 4-6), and Senior Phase (Grades 7-9)). The NSC is the Grade 12 examination written at the end of formal schooling. In 2003, over one million Grade 1 children entered the schooling system and less than half of that cohort wrote the NSC in 2014. In other words, more than half of South Africa's children are pushed out or drop out of the schooling system between Grade 1 and 12 (South African Institute of Race Relations, as cited in Adler & Pillay, 2017).

A pass mark in the NSC examinations for mathematics is 30%. The pass rate for mathematics in 2015, despite being adjusted upwards by Umalusi, the National Quality Assurance body in South Africa, was 49,1% (SA. DBE, 2015; SA.DBE, 2016a). It is worth noting that only 31.9% of learners in 2015 achieved 40% and above (SA.DBE, 2015; SA.DBE 2016b). The Eastern Cape, where this research took place, was the second worst performing province in the NSC mathematics examinations in 2015 with a 37.3% pass rate (SA.DBE, 2014a). The results for mathematical literacy³ in 2015 had 71.4% of learners achieving 30% and above (SA.DBE, 2015; SA.DBE, 2016b). An increasing percentage of learners are opting for mathematical literacy instead of mathematics because they do not have adequate foundational knowledge to cope with the conceptual demands of the latter. In 2010, 48% of Grade 12 students wrote mathematics, compared with 40, 4% in 2015 (SA.DBE, 2014b; SA.DBE, 2015; Spaul, 2016). These statistics suggest that increasingly, South African learners who enter the Further Education and Training Band (FET) (Grade 10-12) are choosing to do mathematical literacy instead of mathematics.

Learner underperformance is not limited to the FET Band. Poor performance is also registered when national assessments are carried out in the General Education and Training Band (GET), that is, Grade R-9. The ANA are set nationally, but administered and marked by the teachers. The mathematics results of the ANA for 2011 to 2014 have indicated improvement in the Foundation and Intermediate Phases as noted in Table 1.1 below. For example, the mean

² The ANA were not written in 2015 and 2016 as a result of objection from the biggest teacher union in South Africa (i.e. the South African Democratic Teachers' Union (SADTU)).

³ It is compulsory for learners in the Further Education and Training Band (FET) (Grade 10-12) to do either mathematics or mathematical literacy. Mathematical literacy was first introduced in the FET in South Africa in 2006.

average in Grade 3 went from 28% in 2011 to 56% in 2014 as shown in Table 1.1 (SA.DBE 2012a, 2013, 2014c).

Table 1.1: Average % marks in Mathematics by Grade (2011-2014)
(Robertson & Graven, 2015, p. 13)

Grade	2011	2012	2013	2014	Grade averages across 2011-2014
1	63	68	60	68	64,75
2	55	57	59	62	58,25
3	28	41	53	56	44,5
4	28	37	37	37	34,75
5	28	30	33	37	32
6	30	27	39	43	34,75
9	n/a	13	14	11	12.6 (2012-2014)

Worth noting is the decrease in levels of performance as one moves up the grades. Learner achievement in Grade 1-9 is based on a 7 point scale from Level 1 (not achieved) to Level 7 (outstanding achievement). The percentage of learners that were graded at Level 4 (adequate achievement i.e. a score of 50% or more) or higher, was 58.1% in Grade 3, 23.3% in Grade 6, and only 3.3% in Grade 9. The decrease in the Grade 9 results from 2012 to 2014 has led critics such as Spaul (2013a) to question the validity of a 28% increase in the Grade 3 results. This downward trend, as learners move up the schooling system, alludes to the importance of the development of solid foundational mathematical concepts in the FP. The results suggest that learners who do not have a solid foundation in mathematics will struggle as they move up the schooling system.

A further analysis of the results in relation to the socio-economic status (SES) of the schools or quintiles⁴ as it is referred to in South Africa, shows that learners in low SES schools (i.e. schools primarily in poor and marginalised environments) or quintiles 1-3 are performing poorly in relation to learners in schools in affluent environments (quintile 5). Spaul and Kotze (2015) in their analysis of national and international mathematics benchmarking tests⁵ found that children in Grade 3 to 6 from quintile 1-3 schools are on average three years behind children in quintile 5 schools. This difference increases to four years by Grade 9. This suggests

⁴ South African schools are given a quintile ranking as an indication of the socio-economic status of the environment in which the schools are located. Quintile 1 schools being most poor and quintile 5 schools being most affluent. Quintile 1-3 are no-fee schools meaning that their entire income is from the Department of Basic Education.

⁵ These studies include: the Systemic Evaluation 2007 (Grade 3); the National School Effectiveness Study 2007/8/9 (Grade 3, 4 & 5); SACMEQ II; and the TIMSS 2011 (Grade 9).

that learners in schools in more affluent, predominantly urban, neighbourhoods are outperforming those in poor, rural neighbourhoods. The context in which my research was located, was two quintile 3 schools in a township outside a small coastal town in the Eastern Cape Province in South Africa. In other words, they were low SES schools located in a rural environment, in which high unemployment and poverty dominate. This is elaborated on in Chapter Four and Six of my thesis.

The results of the ANA, despite their contested nature, the NSC and the various international benchmarking studies, all indicate that South African learners are underperforming in mathematics, that the trajectory of underperformance starts in the FP, and that this trajectory is linked to the socio-economic status of the environments in which the schools exist⁶. Explanations for learner underperformance in South Africa are vast and varied. In the next section I offer some of the explanations given for the extent of learner underperformance in South Africa, particularly in mathematics.

1.3 RESEARCH THAT EXPLAINS UNDERPERFORMANCE

I posit that research that attempts to explain learner underperformance may be categorised broadly in two ways: firstly, research that draws on systemic issues and secondly, research that focuses on the teacher.

Research that offers a systemic explanation tends to foreground a discourse that assumes that teachers, learners and parents are products of their social system. In other words, it suggests that institutional systems, structures and discourses determine social life (i.e. the experiences, practices and meanings of persons) and underplays, or limits, the role of persons in explaining learner underperformance. Research that provides a systemic account of the general crisis in education thus seems to focus on explanations that are largely external to the teacher. These explanations tend to locate the problem in the schooling and teacher education systems. Much of this research is not limited to mathematics education, but offers an explanation for learner underperformance more generally.

⁶ In Chapter Five I suggest that one cannot separate social class from race and that any analyses of the state of education in South Africa should consider the intersectionality of race, class and gender.

Research that locates the problem in the schooling system cites education inequality as a critical issue in understanding and addressing underperformance (Reddy, 2006; Organisation for Economic Development (OECD), 2008; DBSA, 2009; Taylor, 2009; National Planning Commission (NPC), 2011; Spaull, 2011; Reddy et al., 2015). These studies all maintain a link between the socio-economic environment and learner underperformance. They note that the difference in the between-school performance in South Africa (i.e. between quintile 1 and quintile 5 schools) is the most unequal of all the countries participating in SACMEQ II and III. Spaull (2013b) goes as far as to say that South Africa, given its apartheid history, has a "bimodal schooling system" (p. 4) with the wealthy 25% attending functional schools and performing far better than the poorer 75% attending schools that are labelled dysfunctional.

Most commentators (e.g. Adler, Pournara, Taylor, Thorne, & Moletsane, 2009; Graven, 2014) suggest that the legacy of educational inequality has its roots in the apartheid system, whereas Chisholm and Chilisa (2012) trace earlier roots to the problem. They suggest, that in 1910 when South Africa became a Union under white rule, that this was the first of a series of significant turning points with respect to the divisions according to race, class and gender. These researchers contend that the complex and conflict-intense history of South Africa, plus the equally conflictual change processes since 1994, have placed enormous pressure on the education system. This violent history coupled with the urgency to establish policies that would attempt to redress the injustices of the past (e.g. the first curriculum post-apartheid named Curriculum 2005 (C2005))⁷, have militated against stability in the schooling system. The significance of these arguments is that they provide an explanation of learner underperformance that takes cognisance of South Africa's history and the lines of continuity that extend into the present. These lines of continuity provide explanations for the inefficiencies of the education system⁸.

Van der Berg, Spaull, Wills, Gustafsson and Kotzé (2016) identify four "binding constraints" (p. 5) in relation to learner underperformance. These are constraints in the education system that should be given priority as they are currently prohibiting positive change. These constraints are weak institutional functionality, influence of the unions, poor teacher content knowledge and pedagogical skills, and insufficient and wasted opportunities to learn. They concur with

⁷ I explain the 'radical nature' of C2005 in Chapter Seven.

⁸ I trace the lines of continuity that condition the present contexts that the teachers participating in this study work in, in Chapter Five, Six and Seven.

Taylor, Mabogoane and Akoobhai (2011), that “South Africa has a very inefficient schooling system” (p. 5) and contend that the decentralisation of educational powers to the provinces has resulted in an uneven education system, with provinces such as the Eastern Cape having weak institutional capacity. In other words, Van der Berg et al. (2016) and Taylor et al. (2011) contend that learner underperformance is exacerbated by weak management practices throughout the education system (i.e. teachers, principals and bureaucrats in the district offices, and provincial and national Departments of Education). Taylor et al. (2011) in their report on the findings of two low SES schools, show that individual and distributed leadership, effective systems supporting teaching, learning and curriculum delivery, and staff professionalism are instrumental in enhancing learner performance. Thus they call for better management and greater accountability throughout the education system.

Taylor et al. (2011) claim the chaotic state of public schooling in South Africa has provided a conducive environment for “destructive union activity” (p. 23). They provide an account of how the South African Democratic Teachers’ Union (SADTU), the largest teacher union in South Africa, maintains its authority by continually “perverting the labour relations mechanisms” (p. 23) and dominating the recruitment and promotion of bureaucrats, principals and teachers. The implication of this on learner underperformance is that teachers are called out of the classroom during school hours to attend union meetings, and in the worst case scenario, to strike. Van der Berg et al. (2016) maintain that SADTU does not act in the interests of the child as they actively undermine any opportunities for increased capabilities and accountability throughout the education system.

Research that locates the problem of learner underperformance in the teacher preparation system, has also attributed the inadequacies there mainly to the apartheid legacy. Inadequate teacher preparation has resulted in insufficient understanding of policies (e.g. the curriculum) and the connected pedagogic and assessment requirements (Centre for Development and Enterprise (CDE), 2007; Pendlebury, 2009). Dominant themes emerging from the Adler et al. (2009) review of 25 mathematics education journal articles and 25 mathematics education conference papers that focused on mathematics teacher education, appear to be based on three relationships.

The first of the three relationships pertains to the policy – practice dialectic, in particular, the mismatch between curriculum policy and curriculum implementation. This research compares

the principles underpinning the curriculum, the envisaged teacher and learner, the expected coverage of content and how such content should be covered, with teachers' teaching practices (e.g. Jita & Vandeyar, 2006; Adler & Pillay, 2007; Velupillai, Harding, & Engelbrecht, 2008). The second, concerns the relationship between teacher education and teachers' practices (e.g. Mopolelo, 2003; Adler, 2005; Adler & Pillay, 2007) and the third relationship focuses on mathematics knowledge for teaching (MKfT) and specifically the interrelationship between discipline knowledge (subject knowledge) and pedagogical content knowledge (Adler, 2005; Adler et al., 2009).

Debates about what constitutes sufficient knowledge for teaching have been led by the seminal work of Shulman (1986, 1987) which has been taken up by Ball (2000), Ma (1999), Ball, Thames and Phelps (2008) and locally by Adler (2005), Kazima and Adler (2006), Kazima, Pillay and Adler (2008). These researchers argue that teachers require knowledge of mathematics that is unique to teaching, knowledge of how to connect their students with the required mathematical knowledge, and pedagogical content knowledge (Shulman, 1986, 1987; Ball, 2000; Adler, 2005; Ball et al., 2008). Most of the studies relating to the disciplinary knowledge and pedagogical content knowledge relationship, try to ascertain what support teachers need to implement policies, improve or change their practices (e.g. moving to learner-centred approaches) (Brodie, 2000) and develop their knowledge base for teaching. Recommendations include better school-based support and better teacher education programmes that foreground MKfT (Adler et al., 2009).

The above-mentioned research offers an account of learner underperformance that focuses on systems. In other words, the research proposes that learner underperformance for the most part, is viewed as the effect of an unequal social system, an inefficient schooling system and a poor teacher education system all rooted in our specific South African history. These explanations suggest that teachers and their teaching practices are shaped by institutional systems, structures and discourses. While important, I suggest that these perspectives tend to overlook firstly, the role of learners, teachers and parents in learner underperformance, and secondly, how they negotiate this complex environment described above. Furthermore, the above research does not allow, on its own, for thinking about the choices that persons (i.e. learners, teachers and parents) make, and the limitations of these choices, related to specific histories, within complex environments. Through my research I seek to contribute to a fuller understanding of this complexity. My research focuses not only on systems that shape individual lives in general,

and teaching practices in particular, but also on the interplay between these systems and agents, that is, between systemic explanations and explanations that focus on the teacher. Put differently, my research seeks to offer an explanation that recognises teacher agency.

While the systemic arguments briefly reviewed above are certainly compelling and indeed such research has made an important contribution to understanding learner underperformance and the extent of the legacy of our past, key questions remain about ‘who the teacher is’, and how the teacher influences the extent to which pedagogy is likely to succeed (Ensor & Galant, 2005). The Western Cape Education Department (WCED) (2010), Hoadley (2010), the NPC (2011), and the Carnoy et al. (2011) studies, identify teachers’ poor quality teaching as central to the problem of learner underperformance. Two dominant themes emerging from this research above were, teachers’ insufficient content knowledge and poor pedagogical practices.

Criticisms relating to teachers’ poor quality teaching practices, convey concerns with teachers use of teaching time, limited content coverage and exposure, poor coherence and slow pacing of curriculum and activities, low expectations of learners and low cognitive demand, (in) ability to differentiate curriculum, pedagogy and assessment based on learners’ needs, limited use of resources, a lack of strategies for teaching, and limited feedback to learners about their learning. There is a wealth of literature and research in South Africa that elaborates on each of these claims at a general level (CDE, 2007; Taylor, 2007; Pendlebury, 2009; WCED, 2010; Hoadley, 2010; 2012; Van der Berg et al., 2016) and in relation to mathematics specifically (Reeves & Muller, 2005; WCED, 2010; Carnoy et al., 2011; Hoadley, 2012). While this particular research and literature is not the focus of my thesis, narratives of South African teachers’ poor quality teaching are widespread (Ensor et al., 2002; Reeves & Muller, 2005; Taylor, 2007; Schollar, 2008; Adler et al., 2009; Ensor et al., 2009; WCED, 2010). In this research, rather than focusing on such deficit discourses, I attempt to understand what conditions have given rise to the teaching practices as described above.

Research conducted in the field of mathematics education focuses on the perceived lack of teachers’ content knowledge and teachers’ mathematics pedagogical practice, particularly, their pedagogical content knowledge (Adler, 2005; Adler & Davis, 2006; Adler & Pillay, 2007; Adler et al., 2009; Venkat & Askew, 2012; Venkat, 2013; Venkat & Spaul, 2014a). Researchers focusing on mathematics education in South Africa attest to the lack of teachers’ mathematics content knowledge, even at primary school level, and suggest that this has

implications for teaching, and ultimately learner underperformance (Taylor & Moyane, 2005; Human Sciences Research Council, 2008; Adler, 2010; Moloi & Chetty, 2010; Carnoy et al., 2011; Shepherd, 2013; Venkat, 2013; Venkat & Spaul, 2014). Taylor (2008) declares that “teachers cannot teach what they do not know” (p. 24).

Research on teachers’ lack of content knowledge has been documented in a number of small scale regional specific studies (Taylor & Moyane, 2005; Carnoy et al., 2011). The largest comprehensive study to date, the SACMEQ III study, suggests that the content knowledge of 79% of Grade 6 mathematics teachers is below Grade 6 and 7 level (Venkat & Spaul, 2014; Van der Berg et al., 2016). Spaul (2013a) suggests that a nation-wide proficiency test be designed to assess teachers’ content knowledge and thus their capacity to teach mathematics. This suggestion has been critiqued for three key reasons. Firstly, teachers need to know more than the content knowledge that is specified in the mathematics curriculum (Shulman, 1986, 1987; Ball & McDiarmid, 1990; Ma, 1999; Ball, 2000; Hill & Ball, 2004; Adler, 2005, 2009; Adler & Pillay, 2007; Ball et al., 2008; Kazima, Pillay, & Adler, 2008). Secondly, content alone is insufficient; teachers need to know mathematics in ways that emphasise “mathematical modes of enquiry” (i.e. reasoning, justifying, conjecture, generalisation) (Venkat, 2013, p. 4). These ways of knowing mathematics were not part of the schooling and teacher education systems of the vast majority of our current primary school teachers. Thirdly, testing teachers’ content knowledge gives a partial understanding of teachers’ mathematics knowledge for teaching (Adler & Pillay, 2007; Kazima et al., 2008). Research on mathematics knowledge for teaching needs to be rooted in research on teachers’ pedagogical practices and the mathematics- and pedagogic-related decisions teachers make while teaching in the classroom.

Characteristic of studies that attempt to foreground the teacher is that they recognise the teacher and their pedagogical practices as central to understanding learner underperformance. Even research that seeks to understand teachers’ mathematics knowledge for teaching, is located within teachers’ pedagogical practices. Put differently, this research acknowledges the significance of what teachers do and say in the classroom on learner performance. The findings from this research suggest that South African teachers do not have the required forms of mathematical reasoning to teach mathematics (Venkat, 2013), that their teaching practices are largely ineffective because they do not provide sufficient opportunities for learners to learn mathematics (Reeves & Muller, 2005), and that the mathematics content and processes taught are of low cognitive demand. Despite the small-scale nature of the above research, the

consistency with which research in mathematics education throughout the schooling system produces similar findings, suggests that these problems extend beyond the individual teacher and are, by and large, also, systemic challenges. In this sense, I argue that research which attempts to focus on the teacher also corresponds with a systemic argument rendering the teacher an epiphenomenon of inefficient schooling and teacher education systems. In other words, teachers are viewed as products of the schooling and teacher education systems with little agency.

In my research I seek to move beyond accounts that centre predominantly on systemic explanations. Using FP mathematics classrooms in low SES schools as a context, I examine the complex interplay between structure, culture and agency in conditioning teachers' identities. Notwithstanding the importance of research that offers a systemic explanation, I intend to contribute to a scholarship that attempts to explain learner underperformance by recognising, in conjunction with systemic conditions, the *agency* of the teacher in the classroom.

1.4 AN EMERGING SCHOLARSHIP: EXPANDING UNDERSTANDINGS OF 'WHO THE TEACHER IS'

Increasingly over the past thirty years, mathematics education research has attempted to look more closely both at 'who the teacher is' and 'how the teacher can change the trajectory of underperformance'. Put differently, this work focuses on teacher identity and recognises the teacher as central to understanding what happens in mathematics classrooms. It acknowledges that teachers teach more than just mathematics subject knowledge and skills, they also communicate values, beliefs and emotional responses related to mathematics and pedagogy (Grootenboer & Ballantyne, 2010).

Although research on mathematics teacher identity emerged in the western world in the late 1980s, it began in South Africa in the early 2000s (Graven & Lerman, 2014). Within the (inter)national field of mathematics education, there are four broad categories of identity research: research that focuses on learners of mathematics (e.g. Sfard & Prusak, 2005; Sfard, 2006; Walls, 2009; Black, Mendick, & Solomon, 2009; Heyd-Metzuyamin & Sfard, 2012; Graven, 2011); pre-service teachers (e.g. Brown & McNamara, 2005, 2011); in-service teachers (e.g. Zembylas, 2003, 2005; Beijaard, Meijer, & Verloop, 2004; Graven, 2004, 2005;

Hodgen & Askew, 2007; Grootenboer & Ballantyne, 2010; Lerman, 2012; Chronaki, 2013; Pausigere & Graven, 2014; Pausigere, 2014a); and teacher educators (e.g. Marsh, 2002). Research that centres on learners, analyses how learners' mathematical identities are constructed and produced in the classroom and how teachers can change learner identities (e.g. Sfard & Prusak, 2005); research that focuses on pre-service teacher education that explores how students' mathematics identities are developed in and through their pre-service programmes (e.g. Brown & McNamara, 2005, 2011). Local research that explores mathematics teacher identity is dominated by research on teacher learning (i.e. in-service teacher education) within professional communities of practice (e.g. Graven & Lerman, 2003; Graven, 2004, 2005; Nel, 2012; Pausigere, 2014a; Pausigere & Graven, 2014) or official pedagogic identity within the context of curriculum reform (e.g. Woods & Jeffrey, 2002; Naidoo & Parker, 2005; Parker, 2006; Jita & Vandeyar, 2006; Johansson, 2010; Pausigere & Graven, 2013; Pausigere, 2014a).

Schoenfield (2013) and Thames and Van Zoest (2013) argue that research that focuses on teacher characteristics (e.g. teacher beliefs or teacher knowledge) on its own, is limiting if not rooted in an understanding of the effects of teacher knowledge or beliefs, on their pedagogical practices. Schoenfield (2013) writes: "The question is not 'what does a teacher know' or 'what does a teacher say he or she believes' but, 'how does a teacher's knowledge and beliefs play out in the classroom?'" (p. 629). In other words, what teachers say they believe or do and what they actually do in the classroom, are not necessarily the same (Schoenfield, 2013). This disjuncture, I propose, can be extended for consideration to research on teacher identity. In this respect, research on teacher identity is limited, if not rooted, in what teachers do in the classroom. In other words, research on teacher identity should examine how teachers' identities mediate their teaching and how their teaching, in turn, mediates their identities. Research that focuses on the teacher thus assumes, "factors to do with teachers and teaching are the most important influences on pupil learning. In particular, the broad consensus is that 'teacher quality' is the single most important school variable influencing pupil achievement" (OECD, 2005, p. 2). It is the emergence of teachers' identities and their expression in the teaching of Foundation Phase mathematics that my research seeks to explain.

1.5 THE PROBLEM STATEMENT

The importance of research that looks at the impact of the social system, which includes the education and schooling systems on learner underperformance, should not be disregarded. However, such research provides a partial explanation of learner underperformance as it portrays teachers as a by-product of the social system, suggesting they have little agency.

Notwithstanding the role that social systems play in conditioning or enabling the teaching of mathematics, recent research has shifted the gaze to the teacher and particularly, teacher identity. The focus of research on teacher identity in South Africa however, is on teacher learning in professional communities of practice and the official pedagogic identity promoted in curriculum reform. There is a paucity of research that explores how teachers' identities emerge and how they are expressed in the teaching of mathematics. My research recognises the significance of the teacher in the classroom and is premised on the view that the teacher is central to learners' mathematics access and performance (Walshaw, 2011), and that the teacher shapes the possibilities for mathematics pedagogy to succeed (Ensor & Galant, 2005). As such, my research seeks to examine teachers' identities *in the classroom* – in this instance, in FP mathematics classrooms.

I highlight the limitations with current theorising within the mathematics education community on teachers' identities and argue for research that seeks to examine the emergence and expression of FP teachers' identities, through the teaching of mathematics. In so doing, my research seeks to identify the structural, cultural and agential conditions that constrain and/or enable the emergence of FP mathematics teachers' identities and the expression thereof in teaching FP mathematics.

1.6 RESEARCH GOALS AND QUESTIONS

1.6.1 Research goals

The goal of my study is to understand the emergence and expression of teachers' identities in the teaching of Foundation Phase mathematics. The purpose is to extend current research on teacher identity within the field of mathematics education, in order to broaden current explanations of learner underperformance and quality mathematics education.

1.6.2 Research questions

1.6.2.1 Main question

- What are the conditions that enable or constrain the emergence and expression of teachers' identities in the teaching of Foundation Phase mathematics?

1.6.2.2 Sub questions

- How have Foundation Phase teachers' identities emerged?
- What are the structural, cultural and agential conditions that have led to their emergence?
- How are the identities of Foundation Phase teachers expressed through the teaching of mathematics?
- What are the structural, cultural and agential mechanisms that condition the expression of their identities in the process of teaching mathematics?

1.7 SIGNIFICANCE OF THE RESEARCH AND CONTRIBUTION TO KNOWLEDGE PRODUCTION

While there is an increasing body of research on teacher identity in South Africa, there is a dearth of research that examines the expression of teachers' identities in the classroom, particularly the mathematics classroom. The most notable South African studies in this field are those of Graven (2002a), Naidoo and Parker (2005), Jita and Vandeyar (2006), Parker (2006, 2008); Pausigere and Graven (2013) and Pausigere (2014a, 2014b), whose research focuses on the official pedagogic identities as promoted through curriculum, and Graven (2004, 2005), Nel (2012), Pausigere and Graven (2014) and Pausigere (2014a, 2014b) who explore how professional learning communities can bring about change in teacher identity. Furthermore, the need for research into teacher identities within the field of mathematics, particularly in relation to primary schooling, has begun to be noted since the establishment of the Numeracy Chairs at Rhodes University and Wits University.

What makes my research significant is that it will contribute to a relatively new field of knowledge in South Africa. I seek to contribute to the production of new knowledge in three ways: firstly, in examining the structural, cultural and agential conditions that constrain and enable Foundation Phase teachers' identities and the expression thereof through the teaching

of mathematics; secondly, by using a social realist lens to examine these conditions; and thirdly, by attempting to develop deep insights that move research on teacher identity beyond the level of the empirical (i.e. what is observable and perceived). Furthermore it is significant that my research has been undertaken in a South African context in Grade 3 classes in low SES township schools in the Eastern Cape Province. In this way I hope to contribute to the extensive research on learner underperformance by focusing more explicitly on ‘who the teacher is’ in the classroom.

The research herein is considered potentially useful for mathematics education researchers and professionals within the field of teacher education, in that it provides an understanding of the structural and cultural mechanisms that give rise to teachers’ identities, the expression of their teacher identities in the classroom through the teaching of mathematics, and how teachers ‘act back’ on the structural and cultural mechanisms by invoking their agency. This research will contribute to teacher education in that it should provide an in depth understanding of teachers and their work.

1.8 OUTLINE OF CHAPTERS

This chapter (Chapter One) has provided a rationale for my research. I have situated my research within the context of learner underperformance. Drawing on explanations for learner underperformance, I have developed an argument that suggests that researchers should focus on ‘who the teacher is’ in addition to the seemingly dominant emphasis on systemic issues as a means of addressing learner underperformance. My view is premised on the assumption that teachers’ identities emerge at the intersection of structure, culture and agency, and that these identities are expressed and shaped through the teaching of mathematics.

In Chapter Two I examine current research on teacher identity. I argue that research that focuses on teacher identity within the mathematics community, is largely underpinned by a social constructionist orientation. I draw on the literature to argue that a social constructionist orientation is limited for my research for two reasons: firstly, it presupposes either a flat or process ontology; and, secondly, it proposes an inseparability thesis which does not enable me to examine the interplay between structure, culture and agency in the emergence and expression of teachers’ identities through the teaching of mathematics.

In Chapter Three I introduce the theoretical framework that has informed my research, namely, Margaret Archer's (1995, 1996, 2000) social realism. Social realism, underlaboured by critical realism, provided me with the methodological tools for examining the interplay between structure, culture and agency in the emergence of teachers' identities and in the expression of their identities in the classroom.

Chapter Four provides an explanation of my methodological framework. Drawing on critical realism which suggests the researcher embrace 'methodological pluralism', I chose a case study research where the case, or unit of analysis, is teacher identities. I used a variety of data generation methods to firstly understand teachers' identities and the expression of their identities through the teaching of Foundation Phase mathematics, and secondly, to identify the mechanisms giving rise to teachers' identities and the manner in which they are expressed. Abduction and retrodution are the modes of thinking I use to identify the structural, cultural and agential mechanisms that condition teachers' identities and expression thereof through the teaching of Foundation Phase mathematics. Recognising that my explanations may be fallible, I end this chapter with an explanation of the trustworthiness of my data, my positionality, the potential for generalisability, and ethics.

Chapter Five presents and analyses my empirical data. It considers the deliberations of the four participants in this study to make work an ultimate concern and teaching, their project. In analysing the emergence of their decisions to become teachers, I examine the structural, cultural and agential powers and properties that enabled and constrained the four participants' decisions. I argue, drawing on the work of Margaret Archer (2000, 2007a, 2007b, 2012) that identifying an ultimate concern gives persons their strict personal identity.

Chapter Six analyses the expression of the teachers' identities in their teaching of FP mathematics. In other words, I examine the ways in which the teachers in my research personify their roles as teachers of Foundation Phase mathematics. It is the expression of these roles that give teachers their strict social identities. Through the process of retrodution, I analyse the structural and cultural mechanisms giving rise to the teachers' respective identities and their expression in the classroom.

The emphasis in Chapter Seven is both the structural and cultural constraints and enablements that condition teachers' identities and teacher agency. In particular I consider how teachers

engage with the structural and cultural constraints and enablements that condition their teacher identities and the expression thereof in teaching Foundation Phase mathematics. I draw on the concept of reflexivity in general and specifically on the modes of reflexivity of each of the teachers who participated in my study. In addition I provide insights on the teacher agency and consider the implications of this for changed practices.

I conclude this thesis in Chapter Eight. I provide an overview of my research study before highlighting the key findings emerging from my research. I offer several insights arising from my research, before reflecting on the possibilities and limitations of social realism and Archer's morphogenetic approach for further research in mathematics education.

CHAPTER TWO

LIMITATIONS WITH CURRENT RESEARCH ON TEACHER IDENTITY

2.1 INTRODUCTION

My research seeks to examine the emergence and expression of Foundation Phase teachers' identities in the teaching of mathematics. As such, I locate my research within two fields: teacher identity and mathematics education. This chapter therefore, reviews selected research on identity, teacher identity and teacher identity within the field of mathematics. In the previous chapter I provided a rationale for my study and alluded to some of the concerns with current research and theorising on teacher identity. In this chapter I attempt to explore some of this literature and provide a critique thereof in relation to the rationale for the focus of my study.

In a field like mathematics education where learners, as shown in Chapter One, are underperforming, research has tended to focus on the schooling and teacher education systems without giving much consideration to 'who the teacher is' in the classroom. However, the centrality of the teacher in the classroom has recently evoked questions in research about the identity of the teacher. Identity work in education research is complex because it depends on the subject one teaches, the phase one teaches, and one's teaching practices and experiences. This complexity is even more pronounced in the Foundation Phase (FP), where teachers are generalists and do not make the choice to teach mathematics.

I begin this chapter by examining the construction of identity from the perspectives of Bourdieu, Foucault and Giddens. I started this research process reading some of Bourdieu's work, as his concept of habitus has been key in some of the literature on identity, for instance in mathematics education (e.g. Zevenbergen, 2006). Limitations of Bourdieu's work (e.g. his overemphasis on the role of the social system in identity formation), led me to Foucault who has been influential in research on the construction of teacher identity (e.g. Klein, 2007). Realising that neither Bourdieu nor Foucault provided an adequate theorisation of agency for my research, I turned to Giddens to understand the construction of teacher identity and the interplay between structure and agency. These three substantial theorists provided me with a

meta-theory (i.e. social constructionism) which was initially useful in trying to understand teacher identity broadly and within the field of mathematics in particular.

In reading the literature specifically on teacher identity and teacher identity within the field of mathematics, I identified five broad conceptions of teacher identity: identity as being recognised as a particular person; identity as narrative; identity as learning; identity as discursive; and identity as pedagogically prescribed. Rather than offering a general review of the literature, I present examples from the literature in order to highlight each perspective and foreground some of the limitations thereof.

The above literature on teacher identity is underpinned predominantly by a social constructionist orientation. Towards the end of this chapter, I make the argument that a social constructionist orientation is limited for research that seeks to examine two things that are of particular relevance to my research. The first of these, is the interplay between structure, culture⁹ and agency in conditioning the *emergence* of teachers' identities, and the second, is the interplay between structure, culture and agency in the *expression* of teachers' identities in the teaching of Foundation Phase mathematics.

I end this chapter with a recommendation for an alternative orientation that views structure, culture and agency as ontologically distinct and irreducible to each other (Archer, 1995). In other words, I draw on an orientation that enables me to examine the role that structure, culture and agency play in the emergence and expression of teacher identities. Such an orientation I contend, illuminates how FP teachers' identities are conditioned by social and cultural systems and how teachers, as agents, (inter)act with/in these systems, in order to reproduce or change the social and cultural systems.

2.2 RESEARCH ON IDENTITY

The concept of identity is complex with many theorists and researchers contributing to the field. While there are a vast number of authors who theorise identity and identity construction¹⁰,

⁹ While my research sought to examine the interplay between structure, culture and agency, I refrain from including 'culture' in the explanation of Bourdieu and Giddens's work as neither viewed culture as distinct from structure.

¹⁰ I have chosen to use the word 'construction' here rather than the social realist term 'emergence'. I will explain this in Chapter Three. With regards to the three substantial theorists whose explanations of identity and identity

this chapter first considers the work of three key authors who theorise identity and identity construction within social life (i.e. social practice). These theorists are Bourdieu, Foucault and Giddens. Each has had a substantial influence on the literature and research on identity, teacher identity, and teacher identity within the field of mathematics. All three of these thinkers engage in the structure/agency debate, suggesting that any exploration of social life and identity construction requires an understanding of the relationship between social structures and human agents (Burridge, 2010).

This conceptualisation of identity starts with a brief explanation of identity construction from the perspective of Pierre Bourdieu. It is followed by a discussion of the works of Michel Foucault and Anthony Giddens. I consider how each of these substantial theorists contributes to explanations of teacher identity.

2.2.1 Bourdieu's theory of practice and identity formation

Three terms necessary to understand identity and identity formation from a Bourdieusian perspective are *habitus*, *field* and *capital*. The key term Bourdieu (Calhoun, Lipuma, & Postone, 1993) uses to explain identity and identity formation is *habitus*, that is,

a system of generative schemes that are both durable (inscribed in the social construction of the self), transposable (from one field to another), function on an unconscious plane, and take place within a structured space of possibilities (defined by the intersection of material conditions) and fields of operation. (p. 4)

In other words, *habitus* is a set of dispositions which are internalised by persons as they interact in fields. These dispositions are *durable*, *transposable*, and function *on an unconscious plane*. Put differently, these dispositions last over protracted periods of time, are capable of being activated in a variety of social situations, and are habitual and embodied (Maton, 2008). While Bourdieu does not explicitly suggest that persons are “preprogrammed automatons” (Maton, 2008, p. 51), he views social practice as “a result of an ‘unconscious relationship’ between *habitus* and a field of action” (Bourdieu, 1993, p. 76). Put differently, it is the interaction between persons’ embodied dispositions, their positionality in the field, and their interaction in the field that gives rise to social practices.

construction form part of this chapter, I have chosen to use their terminology for the process of being and becoming: identity formation (Bourdieu), subjectification (Foucault) and identity-making (Giddens).

As persons interact in a field, they assume the roles and responsibilities and embody the expectations of them, according to their position in that field. Fields are relational social environments (i.e. institutional settings) in which persons interact and are positioned (e.g. home, school, church) (Harrington, 2005). They are human constructs with their own rules, regularities and values which give them their internal logics or *doxa*; an implicit taken-for-granted set of rules and beliefs that are presented in the fields as natural (Deer, 2008). These rules or internal logic are internalised by persons as they interact in the fields. As such, fields are hierarchical and persons are unequally positioned in accordance with the volume and weight of their *capital* in these social fields (Bourdieu, 1985). They are thus sites of struggle and contestation (Thomson, 2008).

Of concern for persons is the extent to which they are able to accumulate capital (i.e. social, cultural and economic capital) in the field. Bourdieu (1977) argues that capital refers to the “present and past positions in the social structure that biological individuals carry with them, at all times and in all places in the form of dispositions” (p. 82). The accumulation of capital is linked to power. Those with capital know the internal logic of the fields and thus have more power as they have the practical sense to shape the rules of the game, and to decide which practices to legitimise.

While persons have the capacity to alter the structure of the field, they are not entirely conscious knowing subjects. Rather, they are bestowed with a ‘practical sense’ that is developed through the habitus (Bourdieu, 1998). The habitus, thus, is a “structured and structuring structure” (Bourdieu, 1994, p. 170). It is *structured* through the experiences of persons both past and present (i.e. experiences in the natal contexts and in schools) and *structuring* as it conditions both present and future practices (Bourdieu, 1994). When persons internalise their roles so that they become perceptual structures and embodied dispositions, the habitus is formed (Bourdieu, 1986; Harrington, 2005). These perceptual structures (i.e. the way we see the world) and embodied dispositions (i.e. the way we (inter)act within the world) organise ways of viewing, interpreting and (inter)acting in the world (Elder-Vass, 2007). This organisation (or conditioning) is so effective that the dispositions it generates become unconscious; “embodied history, internalised as second nature and so forgotten in history” (Bourdieu, 1990, p. 56). Put differently, we carry our history into the present. The ontological relation between habitus and field is complex: “On the one side it is a relation of *conditioning*: the field structures the habitus.

... On the other side, it is a relation of *cognitive construction*. Habitus contributes to constituting the field as a meaningful world” for persons (Bourdieu & Wacquant, 1992, p. 127).

The choices people make depend on the positions they occupy in the social field. Choices are dependent firstly on the options available to them, secondly their disposition (*habitus*) and thirdly their experiences in the field. Choices shape future possibilities by setting them on a particular path which shapes their understanding of themselves and their world (Maton, 2008).

Identity is thus viewed as the embodied set of dispositions that persons develop as they interact in fields. It is through this interaction that persons’ identities are formed. Identities are, in many respects, dependent on the positions persons occupy in the fields, the extent to which they know the internal logic of the field, and the capital they bring and accumulate in the field. While Bourdieu tries to develop a space for human agency, choices are ultimately limited by the *habitus*, capital resources and the experiences of persons in the field.

In applying the work of Bourdieu specifically to teacher identity and the expression thereof in teaching FP mathematics, teachers and their teaching practices are shaped by the social structures (e.g. insufficient resources) that condition their interactions in the relational field of power. It is in and through teachers’ interactions within the fields in which they operate, that their dispositions as teachers and toward teaching are formed. The *teaching habitus* is embodied through the multiple fields within which teachers operate and which confine the actions of teachers. In many respects, teachers are structured by teaching practices that pre-date them, practices that are not of their own making. They are thus positioned as more or less passive and compliant with those who have power in the field. They are viewed as implementers of pre-determined curriculum materials specifically and more broadly, education policies. Compliance leads to the reproduction of their positions in the field and ultimately the education and social systems. I elaborate on this in relation to my research in Chapter Five, Six and Seven. In so doing, I do not suggest that compliance is an indication of a passive agent.

Bourdieu views identity primarily as a product of society. In other words, he argues that people are socialised by social structures (e.g. institutions). Although Bourdieu attempts to develop a theory that mitigates an overemphasis on structure, he tends to reduce the significance of human agency to the reproduction of structures (Harrington, 2005). While Bourdieu recognises the role of agency by arguing that the internal is also externalised through social interaction in

the fields (Bourdieu, 1990), his theory has been criticised for being too deterministic, and as such leaving little room for agency (Birkett, 2011) and also for downplaying the role of consciousness in the formation of the habitus (Elder-Vass, 2007). Archer (2000) contends that Bourdieu's theory of identity formation implies that structure and agency are mutually inclusive, meaning that one cannot be separated from the other. The implication of this is that the influences of structure and agency on identity formation cannot be extracted, thus limiting social research that wishes to examine the interplay between structure and agency.

While Bourdieu includes the role of power in his theorisation of identity, his conception of power appears to imply ownership. In other words, persons *have* power by virtue of their capital. Power, in this sense, is viewed as a possession. This ostensibly narrow conception of power led me to a Foucauldian explanation of identity construction as he views power as distributed in and through discourses rather than being something one owns.

2.2.2 Foucault's theory of subjectification

Key terms in understanding subjectivity (loosely, identity) from a Foucauldian vantage point include: *subject*, *subjectification*, *subjectivity*, *discourse*, *power*, *resistance* and *technologies of self*.

Foucault (1977) does not refer to people as being socialised but rather suggests that they go through a process of *subjectification*. Subjectification is the process by which subjects¹¹ are produced and regulated in discursive contexts. For Foucault there are no pre-discursive contexts (McNay, 1994). Persons do not occupy given spaces within social structures (e.g. Bourdieu's fields) rather, they are constituted through discursive practices. *Discourse*, in this sense, is not only the words we say and speak (i.e. language and communication), but also the practices and rules of the practices that generate and allow ways of speaking and acting. Discourses constitute reality, knowledge, practices and self and are also constituted by them (Zembylas, 2005). The discourses that produce and/or operate within various contexts (e.g. the school) either enable or constrain agency. What the subject feels, does or experiences, in other words, their *subjectivity*, is both produced and negotiated through the discursive process. In this sense, the subject is an effect of discursive formations which seek to 'normalise' the

¹¹ For Foucault (1982), *subject* refers firstly, to processes that subordinate in order to control other persons (i.e. discourses); and secondly, to self-knowledge or conscience linked to identity (i.e. the effects of power). Implicit in both meanings of the term 'subject' is a technique of power that subjugates.

subject. The negotiation of subjectivity suggests that the subject is never fully formed but continuously constituted (Walls, 2009).

The effects of discourse are realised through the exercise of power relations. For Foucault, *power* is dispersed, exercised and manifest in discursive practices. Power exists when put into action; these actions have effects on other actions. According to Foucault (1982), power is thus

a total structure of actions brought to bear upon possible action, it incites, it induces, it seduces, it makes easier or more difficult, in the extreme it constrains or forbids absolutely; it is nevertheless always a way of acting upon an acting subject or acting subjects by virtue of their acting or being capable of action. A set of actions upon other actions. (p. 789)

In other words, power acts on the actions of persons. This technique of power is directed to everyday life through the manner in which persons are constituted as individuals. It “makes him [*sic*] by his own individuality, attaches him to his own identity, imposes a law of truth on him which he must recognise and which others have to recognise in him” (Foucault, 1982, p. 778). It is these relations of power that produce and constitute the *subject*. While Foucault (1978) in his vast *oeuvre* reveals relations of power that produce the subject, he is also interested in the subject’s struggles against subjugation, which he calls resistance. Subjectivity, for Foucault (1978), is thus understood through domination and resistance; “where there is power, there is resistance” (Foucault, 1978, p. 95). *Resistance* is understood as freedom to act in particular ways, in defiance of or opposition to domination.

The Foucauldian concept of *technologies of self* provides the conceptual lens to examine the role persons play in their own subjectification. Technologies of self “permit individuals to effect by their own means, or with the help of others, a certain number of operations on their own bodies and souls, thoughts, conduct, and way of being” (Foucault, 1978, p. 18). In this way, individuals play a part in their own self-regulation. Foucault thus opens up the possibilities for agency by making transparent the “discursive threads through which [person’s] experience of themselves as specific beings is woven” (Davies, 1993, p. 12). It is in the process of identifying and understanding how discourses produce and thereby effectively normalise the actions of persons that one can begin to react to these discourses in order to produce something new. The notion of technologies of self, further enables Foucault to develop his thesis of

resistance or what is referred to as ethics of self – “situated in the interstices of power relations, at the level of individuals’ daily practices” (McNay, 1994, location¹² 176).

Subjectivity is thus seen as a social and historical construct constituted through discourses. In the process of such interaction, we constitute ourselves and others. The Foucauldian subject is thus not a unified, rational self, but rather a fractured, fragmented and multiple constituted subject. Foucault (1978) suggests we should “actively work to accept, to remake or reject those constructions of ourselves where they do not serve us well” (p. 19). In this sense, he proposes that we should refuse to remain the same.

While Bourdieu suggests that teachers are socialised by social structures, Foucault emphasises the role of discursive practices in the subjectification of teachers. Teachers are constituted in and through these discursive contexts. In other words, teachers are an effect of discourses that normalise certain knowledge, behaviours and ways of acting in the classroom. These discourses are carried out through power relations that act on the actions of teachers. Their resistance can be realised once teachers recognise the processes of subjectification (i.e. how discourses normalise their interactions as teachers). It is only then that teachers are able to consider the possibilities of thinking and acting differently. Exploring the influences that have shaped ‘who they are’ and their teaching practices can prompt resistance and transformation of self and teaching. Put differently, for Foucault (1978), interaction between domination and resistance defines agency.

Critiques of Foucault’s work assert that it does not enable an adequate theorisation of agency. Hall (2000) suggests that in much of Foucault’s work there is little resistance proffered by subjects. Foucault’s understanding of agency, as domination and resistance, is inseparable from his understanding of discourses. Agency and discourse are thus mutually constitutive (Archer, 2000). Furthermore, according to Archer (1995), Foucault conflates *what is* (i.e. ontology) with knowledge claims about it (i.e. epistemology). In other words, *what is*, is a result of what we know. In relation to subjectivity (i.e. identity construction) he thus collapses a sense of self with the concept of self. Put differently, he elides knowledge of self with being (Archer, 2000). These criticisms led me to search for an account of identity construction that recognises the

¹² This term location refers to the location number of a piece of text in a Kindle book.

import of both structure (and/or discourses) and agency in a way that enables an adequate theorising of agency. I sought such an account in the work of Giddens.

2.2.3 Giddens's characterisation of identity-making: the reflexive project of self

Giddens (1984) attempts to overcome the structure and agency divide by proposing that they should not be viewed as a dualism. He argues that social structure and agency are interdependent to the extent that each constitutes the other, in and through practices. What initially resonated with me for my research was that Giddens gives more credence to agents by suggesting that their personal reflexivity enables them to redefine structures. This tallies with my experience as a teacher and teacher educator. Teachers are not simply persons to which things happen (i.e. they are not passive beings). Rather, it is through their capacity to engage reflexively about the situations in which they find themselves that their teacher identities are continually (re) constituted (Giddens, 1991; Archer, 2007a, 2012). Giddens (1991) suggests that without reflexivity there would be no society.

Central to understanding Giddens' conception of identity construction, is his theory of *structuration* which incorporates the notion of a *duality of structure, practical consciousness* and *reflexivity*. Like Bourdieu and Foucault, Giddens' structuration theory suggests that structure and agency are mutually inclusive. In 1984, he wrote: "The concept of structuration involves that of the *duality of structure* [italics added], which relates to the fundamentally recursive character of social life, and expresses the mutual dependence of structure and agency" (p. 69). In other words, social life (i.e. social practices) is viewed as a combination of structures and the actions of agents. Giddens thus challenges the Bourdieusian view that structures exist outside of persons but are internalised as they interact in fields. In so doing, he mediates the subject/object dualism by ascribing knowledgeability to persons in (re)producing society, yet acknowledging that this is done by invoking social structures in the process (Archer, 2010). This duality of structure and agency is a key principle of Giddens' (1979) structuration theory, which he describes as,

the essential recursiveness of social life, as constituted in social practices: structure is both medium and outcome of the reproduction of practices. Structure enters simultaneously into the constitution of the agent and social practices, and 'exists' in the generating moments of this constitution. (p. 5)

In other words, it is through social practices that structures frame both practices and agents, but are also reproduced through the practices of agents. This may appear similar to the argument of Bourdieu, however for Giddens, structures are only invoked through the practices of agents. In this way, social life is viewed as the ongoing practices of people that reproduce or change structures (Giddens & Pierson, 1998) and in turn are themselves reproduced or changed.

Structures are viewed as regularised rules and resources that people draw on when engaging in social practices. For example, a school is not a structure, it is a system that has structural properties (i.e. it has rules and resources) that are patterns of “social relations in time and space involving the reproduction of situated practices” (Giddens, 1984, p. 17). These rules and resources only enable or constrain the practices of agents when they are called into being through the interactions of agents. They exist as “memory traces, and are ‘instantiated’ in social practice” (Giddens, 1984, p. 25). As such, structuration is forever a process which does not convey durability or fixity. Rather, it presents as a malleable, changing social world (Archer, 2010).

The idea that structure is part of the constitution of the agent, means that in developing an understanding of Giddens’ conception of identity-making, this cannot be considered independently of structures as they mediate and (re)produce social practices. Agents draw on rules and resources to enact a social practice, while simultaneously reproducing the structures of the social practice. Persons are thus regarded as *purposive agents* with *knowledgeability* of how to reflect on their actions (Giddens, 1984, p. 25). This knowledgeability is “gaining and using knowledge about self” (Cheal, as cited in Baxen, 2006, p. 38) and is rooted in what Giddens refers to as “practical consciousness” (Giddens, 1984, p. xxii). *Practical consciousness* is being able, as persons, to “go on” with ontological security (Giddens, 1991, p. 36); it is knowledge about social practices that condition the actions of agents, but that cannot be described discursively. In other words, it is the taken-for-granted conditions, a “natural attitude” (Giddens, 1991, p. 36) or tacit knowledge, which anchor persons cognitively and emotionally, thus providing them with ontological security. It is through the social practices, rather than structures, that this ontological security is created.

For Giddens (1984), power is relational. Like Foucault, Giddens (1984) asserts that with power comes resistance. He argues that even those who are subordinate have the capacity to influence

the (inter)actions of those deemed superior. In other words, power is expressed through the (inter)actions of agents (Jones & Karsten, 2008).

Giddens (1991) argues that the concept of self-identity can no longer be viewed as “something that is just given” (p. 52). The self is not passive, conditioned by social structures or discourses. Rather, self-identity is continuously (re)made and sustained through “the reflexive activities of individuals” (Giddens, 1991, p. 52). The process of *reflexivity*, a characteristic of all persons which enables them to know what they are doing and why, is central to Giddens’ perspective of *self-identity* and identity-making. While agents do engage in routinised practices, they simultaneously have a theoretical understanding (i.e. knowledgeability) of why they perform such practices. All action is constituted at the intersection between consciousness and unconsciousness (i.e. between routinisation and practical and discursive consciousness). In this sense, persons are able to monitor both self and society (Giddens, 1984).

“To be a ‘person’ is not just to be a reflexive actor, but to have a concept of a person (as applied to both self and others)” (Giddens, 1991, p. 53). This concept of self is conceptually formed through narrative “*by the person in terms of his or her biography*” across space and time (Giddens, 1991, p. 53). Having a coherent concept of self-identity reflexively negotiated, gives persons a sense of biographical continuity, which they can communicate with and to others. Self-identity is not in persons’ behaviour, and is thus not necessarily observable, but rather it is in their ability to keep their biographical narrative going. In other words, persons integrate their interactions in the world into a continuous story of self (Giddens, 1991).

Giddens (1984) offers a description of structures as embodied in teachers. They exist ‘virtually’ and are invoked through the practices of teachers. Teachers thus, through their agency, call into being regulated rules and resources that both constrain and/or enable their practices. While teachers are able to draw on these resources and rules, they also condition the practices of teachers which, in turn, promote the durability of structures. Giddens’ theory thus gives far more attention to the agency of teachers, particularly in relation to reflexivity, and how they make sense of their daily lives and actions as teachers. This is particularly appealing for my research as it provides an account that foregrounds not only structure, but also agency, as I argue in this research that teachers are not simply products of the social, educational and schooling systems, but rather that they have the capacity to ‘act back’ by drawing on their agency. As noted in Chapter One, there is a critical need for change in the mathematics

education field in South Africa. Much of the current research within this field provides a systemic argument that views agency as a by-product of social and cultural systems. Missing from this research, is work that foregrounds the teacher and in particular the reflexive capacity of teachers, to consider the situations in which they find themselves and to develop appropriate plans of action, even though these plans may be fallible.

Criticisms of the work of Giddens focus on his seemingly insufficient theorisation of how social structures are formed, and his notion that the self is solely conceptually formed. In relation to the former, Giddens (1984) argues that structures exist as residue in the memories of agents and are only brought into being through the (inter)actions of agents. This position ignores the regulatory power of structures (and/or discourses) that form the agent in the first place. The latter criticism is central to my research. The focus on a duality of structure suggests that structure and agency are completely intertwined, which renders it seemingly impossible to research the extent to which structure and agency influence the emergence and expression of teachers' identities through the teaching of mathematics. I build on this critique in the final section of this chapter.

The three theorists discussed above each offer a different explanation of identity construction within social practices. For Bourdieu, persons are primarily socialised by social structures which frame both persons' dispositions and perceptions as they participate in fields. Foucault, on the other hand, argues that subjectivities are produced through discursive acts and practices. Bourdieu's theory of identity formation underplays the cognitive and reflexive processes, and the agency of Foucault's subjects seems limited to forms of resistance. Giddens by contrast, offers an explanation that foregrounds the knowledgeability and reflexive capabilities of agents. Common amongst all three theorists is the conflation of structure (or discourse) and agency. By that I mean they elide structure and agency, making research that wishes to examine the interplay between structure and agency, in the emergence and expression of teacher identities in the teaching of FP mathematics, practically impossible. I elaborate on this later in the chapter in relation to my rationale for drawing on Margaret Archer's social realism.

The above review of identity constructions with/in social practices, has equipped me with a broad understanding of identity construction from the perspectives of three substantial theorists. Each of these theorists provides explanatory tools that elucidate how identities are constructed and the roles that structure and agency play in this construction. I have considered

the ontological and epistemological assumptions that each makes and have found this particularly useful in understanding how researchers within the field of identity, teacher identity, and teacher identity within the field of mathematics education locate themselves and their work. As I suggest later in the chapter, the assumptions informing the work of Bourdieu, Foucault and Giddens, and the research on teacher identity are predominantly underpinned by a social constructionist orientation.

While each of the above social theories offers an explanation of identity and identity construction in and through social practices, my research herein focuses specifically on *teacher identity* within the context of the mathematics classroom. It is the conception of teacher identity within the field of mathematics education that I address next.

2.3 TEACHER IDENTITY (WITHIN THE FIELD OF MATHEMATICS EDUCATION RESEARCH)

As noted in Chapter One, an analysis of the literature on identity within the field of mathematics education tends to fall into four broad categories: research on learners (e.g. Sfard & Prusak, 2005; Grootenboer & Zevenbergen, 2008; Walls, 2008, 2009; Bishop, 2012); research on pre-service teachers (e.g. Brown & McNamara, 2005, 2011); research on in-service teachers (e.g. Drake et al., 2001; Graven, 2004; Drake & Sherin, 2006; Hodgen & Askew, 2007; Pausigere & Graven, 2014; Pausigere 2014a); and research on teacher educators' identities (e.g. Marsh, 2002). It is the research on in-service teacher identities that is of particular relevance for my research, since my study focuses on the teacher in the classroom.

I begin this section with an overview of the research on teacher identity, including research that examines teacher identity within the field of mathematics. Based on selective readings of this broad field, I have identified five perspectives of research on teacher identity. This includes work on a broad view of teacher identity and within mathematics education specifically and is presented below in an integrated manner.

Researchers who focus on teacher identity tend to use a multiplicity of terms to describe teacher identity. These include: professional identity, teacher identity, professional teacher identity, mathematics teacher identity, primary mathematics teacher identity and a sense of self. Furthermore, the concept of identity is often ill-defined (Beauchamp & Thomas, 2009; Birkett, 2011). That being said, much of the research on teacher identity seems to foreground teachers'

content knowledge, their teaching practices and their learning (Grootenboer & Zevenbergen, 2008).

Five perspectives appear to be evident in the teacher identity literature. The first perspective can be termed *identity as being recognised as a particular kind of person*. It posits that teacher identity is about performativity – how teachers interact in the classroom, school and community. It suggests that how teachers talk about themselves and name themselves, is characteristic of identity. In other words, what is recognised as identity, by self and others, is thus labelled identity (e.g. Gee, 2000 (USA); Beijaard, Verloop, & Vermunt, 2000 (NL); Grootenboer, 2010 (AUS); Pausigere, 2014a (SA)).

The second perspective, *identity as narrative*, also posits a view of identity as communication, involving both self-dialogue and communication with/by others. Identity, and the process of identifying, are the stories people tell about self and others. Put differently, words deemed significant by self and others, can shape a person's actions and identity (e.g. Drake et al., 2001 (USA); Sfard & Prusak, 2005 (Israel); Drake & Sherin, 2006 (USA); Graven, 2012 (SA)).

The third perspective, *identity as learning*, equates identity with learning, suggesting identities are constructed as persons participate in communities of practice (Lave & Wenger, 1991; Wenger, 1998). This perspective, within the realm of teacher education, is particularly evident in research that focuses on teacher learning in communities of practice and/or professional learning settings (e.g. Graven, 2004, 2012 (SA); Hodgen & Askew, 2007 (UK); Nel, 2012 (SA); Pausigere & Graven, 2012, 2013 (SA); Pausigere, 2014a (SA)).

The fourth perspective, *identity as discursive*, extends the above focus on the role of interaction in the construction of identity, by examining how discourses produce the person and what is perceived as normal and real. This discourse considers the interplay between knowledge and power in the production of subjectivities (e.g. Marsh, 2002 (USA); Zembylas, 2003, 2005 (Cyprus); Klein, 2007 (Aus); Walls, 2009 (Aus)).

The fifth perspective, *identity as pedagogically prescribed*, concentrates on policy documents with a view to analysing the official pedagogical identity promoted through policies. In the main, this research analyses curriculum documents, including assessment policies, in order to identify the envisaged teacher (Bernstein, 1996, 2000 (UK); Jansen, 2001 (SA); Woods &

Jeffrey, 2002 (UK); Naidoo & Parker, 2005 (SA); Jita & Vandeyar, 2006 (SA); Johansson, 2010 (Sweden); Pausigere & Graven, 2013 (SA); Pausigere, 2014a, 2014b (SA)). It is the last two perspectives that dominate teacher identity research within the field of mathematics education in South Africa.

What follows is an elaboration of each of these perspectives, in which I review some of the literature that draws on these perspectives, as a means to understanding and explaining teacher identity and teacher identity within the context of mathematics education.

2.3.1 Identity as being recognised as a particular kind of person

The notion of identity as being recognised as a particular person, is evident in both the research on teacher identity generally and within mathematics education specifically (e.g. Beijaard et al., 2000; Gee, 2000; Grootenboer & Ballantyne, 2010; Pausigere, 2014a). Drawing on the work of Gee (2000), Beijaard et al. (2000) view professional teacher identity as the ongoing identification of “what someone is, the various meanings people can attach to themselves, or meanings attributed by others” (Beijaard, as cited in Beijaard et al., 2000, p. 750). In other words, identity is described as “being a certain kind of person” (Gee, 2000, p. 99). Beijaard et al. (2000) found that experienced expert secondary school teachers recognise themselves as not only subject specialists, but also pedagogical and didactic experts. That said, they acknowledge that the particular subjects that the teachers teach, influence how they recognise themselves. Mathematics and science teachers, for instance, place more emphasis on their subject specialisation than language teachers. A limitation of this research is that a single data generation method, namely interviews, was utilised. This raises the concern that how teachers talk about themselves, and thus recognise themselves, may differ significantly from how they are recognised in the classroom.

Grootenboer, Smith and Lowrie (2006), writing particularly about teacher identity within the context of mathematics education, concur with the notion of identity as being recognised as a particular kind of person. They suggest “how individuals know and name themselves and how an individual is recognised and looked upon by others” (p. 612) reflects their identity. Elaborating on this, Grootenboer and Ballantyne (2010), like Beijaard et al. (2000), claim that both primary and secondary school mathematics teacher identity, refers to the manner in which teachers recognise themselves as both pedagogues and subject specialists. This includes their values, beliefs, emotions, practices and knowledge. Grootenboer and Ballantyne (2010) focus

their research on the relationship between teacher identities, both professional- and discipline-based, and their teaching practices. Their research supplemented interviews with observations of teachers' practices and document analysis. As in the case of the research of Beijaard et al. (2000), all the teachers in Grootenboer and Ballantyne's (2010) research were deemed to be expert teachers. While the pedagogic approaches and styles of these expert teachers differed, all identified themselves firstly as teachers and secondly as mathematics teachers. These teachers recognised themselves as professionals with a strong pedagogical identity (i.e. a strong sense of how children learn mathematics, an ethic of care). All teachers, while not recognising themselves as mathematicians, enjoyed mathematics and enacted appropriate mathematical values, beliefs and behaviours. In this way, they had a deep mathematical sense of self, and their teaching practice emerged from both their pedagogic- and discipline-based identities. Beijaard et.al (2000) and Grootenboer and Ballantyne (2010) thus claim that "good mathematics teachers" (p. 261) have mathematical identities arising from both their subject- and pedagogical-knowledge.

Pausigere's (2014a) research focuses exclusively on primary school teachers in South Africa, who teach mathematics. His research attempts to understand how communities of practice can enable learning and how learning promotes changing identities and particularly how teachers recognise themselves as primary mathematics teachers. Drawing on Bishop (2012), he suggests primary mathematics teacher identity is "*a way of talking about who primary maths¹³ teachers are and how they name themselves and how they are recognised by others with respect to the subject of mathematics and its corresponding activities*" (p. 6). Pausigere's (2014a) research explores the shifts in teacher identity over time, through participation in an in-service community of practice. He claims that how teachers recognise themselves, within the context of changing mathematics teacher identities, comprises a combination of factors, which include their participation in professional communities of practice, their personal mathematics histories, and the changing education and schooling contexts. In light of the third factor, Pausigere and Graven (2013) and Pausigere (2014a, 2014b) explore the influence of the official pedagogic identities as espoused through the Curriculum and Assessment Policy Statements (CAPS) and Annual National Assessments (ANA) in constituting primary teacher mathematics identities. This is elaborated further in relation to identity as pedagogically prescribed.

¹³ In South Africa, 'maths' is the shortened form for mathematics.

Missing however from the above research of Beijaard et al. (2000), Grootenboer and Ballantyne (2010), Graven (2003, 2004, 2005) and Pausigere (2014a, 2014b), is the interplay between teachers' subject- and pedagogical-identities, their personal identity and/or sense of self, as well as the interplay between their subject- and pedagogical-identities and their teaching practices in the classroom. Grootenboer and Zevenbergen (2008) elaborate on this by linking teachers' identities and their personal identities. They suggest that mathematics teachers should recognise mathematics as being central to their sense of self. According to Grootenboer and Zevenbergen (2008), well-developed mathematics identities include:

significant mathematical knowledge and skills, but also a positive attitude towards the subject, a sense of joy and satisfaction in undertaking mathematical practice. Furthermore they must see the mathematics as integral to their broader identity and something that has helped define their sense of self and vocation. (p. 246)

In this quote, Grootenboer and Zevenbergen (2008) attempt to delineate between teachers' mathematical identities and their sense of self and/or personal identities. This idea of linking teacher identity to teachers' personal identities and/or sense of self, suggests that 'who the teacher is' and 'how teachers name and recognise themselves' are inextricably linked to their sense of self and/or personal identity. I thus suggest that in researching teacher identity, researchers should consider broadening their view of what teacher identity entails to include personal identities and their sense of self. I elaborate on this in Chapter Three by drawing on the work of Margaret Archer (2000, 2007a).

Sfard and Prusak (2005) criticise the view of identity as "being a certain kind of person" (Gee, 2000, p. 99) for sounding timeless and agentless and suggesting that 'who we are' is independent of a person's actions. Put differently, this view seems to suggest that there is some elusive essence that characterises people and that remains unchanged. Perhaps a far more significant challenge to this perspective is the complexity in identifying 'who a particular person is'. In other words, how does a researcher operationalise such a view of identity (Sfard & Prusak, 2005)? Many researchers (e.g. Pausigere, 2014a) who argue that identity is being recognised by self and others as a particular kind of person, have thus turned to the work of a variety of theorists to assist them in operationalising identity, particularly the work of Lave and Wenger (1991), Bernstein (1996, 2000); Wenger (1998) and Sfard and Prusak (2005).

Notwithstanding the criticisms put forward by Sfard and Prusak (2005) and Sfard (2006), recognising and telling ‘who one is’ links identity to the process of communication which includes self-communication or thinking. Identity is thus seen by Sfard and Prusak (2005) as a communicational process. This view is extended by the perspective that conceptualises identity as narrative, which I elaborate on below. It provides a method for operationalising what it means to be recognised as “a certain kind of person” (Gee, 2000, p. 99). Thus Sfard and Prusak (2005) operationalise identity as the narratives people tell about themselves and others.

2.3.2 Identity as narrative

Identity as narrative is a prominent perspective at present. In my reading of research that I have categorised as representative of this perspective, there appear to be two standpoints. With the first, *narrative is a representation of identity* (e.g. Drake et al., 2001; Drake, 2006; Drake & Sherin, 2006) and with the second, *narrative is identity* (e.g. Sfard & Prusak, 2005, Sfard, 2006). Common within the teacher identity and mathematics teacher identity literature, is the work of Sfard and Prusak (2005) and Sfard (2006). Although their work is primarily focused on learners, they concur that within the broader perspective of identity as narrative, there is a distinction between the view that narratives are representations of identity and the view that narratives are identity.

Drake et al. (2001) view “teachers’ literacy stories and mathematics stories as representations of their identities” (p. 1). As with Drake (2006) and Drake and Sherin (2006), they use life histories, mathematics histories and observations to understand how teachers construct their personal and professional identities within the context of primary school (Grade 1-4) literacy and numeracy classrooms. Drake et al. (2001) found that content knowledge, even at primary school, is significant in the construction of teacher identity and that identity and efforts to change practices are inextricably linked. They define teacher identities as “their sense of self as well as their knowledge and beliefs, dispositions, interests and orientation towards work and change” (Spillane, as cited in Drake et al., 2001, p. 2). The view of identity as narrative offered by Drake et al. (2001) and Drake (2006), resonates with the view of identity being recognised as a particular kind of person.

Research by Drake (2006) and Drake and Sherin (2006) suggests that teachers’ stories of their prior and current mathematics experiences can assist in understanding their practices and their orientation to reform-based curricula. Based on data generated from mathematics history

interviews, field notes and observations with ten primary (Grade 1-4) school teachers, Drake (2006) suggests that teachers' stories could be a useful pedagogical opportunity for teachers to engage with teaching in different ways. He writes that "teachers' mathematics life stories help us to understand how and why teachers interpret and implement curriculum materials in a particular way" (p. 600). According to Drake et al. (2001) the difference between teachers' experiences and conceptions of mathematics and themselves as teachers of mathematics, makes it possible for researchers to develop distinct typologies. Teachers who are typologised in their research as turning point teachers (i.e. teachers who had negative early experiences, particularly in mathematics, but were transformed by later positive experiences) were more likely to use and adapt reform-based curricula and pedagogical practices. Drake et al. (2001) thus suggest that teacher education should ensure that teachers have such turning point experiences, in order to bring about changed practices.

While Grootenboer and Zevenbergen (2008) suggest teachers of mathematics should recognise mathematics as central to their sense of self, Drake et al. (2001) find that teachers' mathematics identities are shaped within classroom contexts and not by both classroom and out-of-school experiences as with literacy. In other words, they presuppose that teachers of mathematics are not mathematical beings beyond the classroom. In addition, Drake et al. (2001) find that teachers' literacy stories were fairly consistent across a group of ten primary school teachers, whereas the teachers' mathematical stories differed quite significantly from each other. While there was some commonality as they entered primary school as learners, this changed as they progressed through their primary schooling. While there may be some contention with regards to the extent to which teachers' identities are shaped by out-of-school mathematics experiences, missing from their research is how 'who we are' other than teachers of mathematics, plays out in the classroom. In other words, how are our personal identities and sense of self expressed in the classroom?

Sfard and Prusak (2005) offer a different view of identity *as* narrative. They state that "lengthy deliberations led us to the decision to equate identity with stories about persons. No, no mistake here: We did not say that identities were finding their expression in stories – we said they were stories" (p. 14). Sfard and Prusak (2005) advance a critique of identity research for its apparent limitation in providing explanatory and analytical tools for researching identity. Operationalising identity refers firstly to identifying what one should look for (in other words how will one know identity when one sees it), secondly, what one would exclude from this

process (i.e. what is not part of the ambit of identity), and thirdly a way of thus accumulating knowledge on identity-making (Blummer, as cited in Sfard & Prusak, 2005).

Sfard and Prusak's (2005) operationalisation of identity centres on student learning in mathematics classrooms. Although my research focuses specifically on teacher identity, it acknowledges the significance, like Drake (2006) and Drake and Sherin (2006), that teachers' identities are influenced not only by their current experiences as learners and teachers, but also by their past experiences as learners in schools and teacher training institutions. However, I also realise that as a researcher I need a framework that will assist me in operationalising identity. Not surprisingly, Sfard and Prusak's (2005) framework for operationalising identity has been utilised in research on teacher identity, particularly within the context of teacher-learning (e.g. Graven, 2012; Pausigere, 2014a). Graven (2012) reanalysed her earlier research on teacher learning using Sfard and Prusak's operationalised definition of identity. An explanation of this research on teacher-learning forms part of the *identity as learning* perspective.

The process of 'identifying' from an identity as narrative perspective is viewed as a discursive activity and the process of 'identity-making' as a "communicational practice" (which includes self-dialogue or thinking) (Sfard & Prusak, 2005, p. 16). As such, this perspective rejects any possibility of identity as extra-discursive. In other words, identities and identity-making do not occur outside of language. For Sfard and Prusak (2005) and Sfard (2006), discursive refers to 'linguistic constructs' or register. This notion of discourse differs significantly from that of Foucault and identity theorists who draw on poststructuralism such as the *identity as discursive* perspective which I explain below.

According to Sfard and Prusak (2005), identities are reifications, which are only possible through language, narrative activity and experience. The transition from action to a state of being is accomplished in the stories we tell about ourselves and that others tell about us. Sfard and Prusak (2005) identify two subsets of these "*reifying, endorsable, and significant*" stories (p. 16), namely current¹⁴ and designated identities. Narratives reflecting current and designated

¹⁴ Sfard and Prusak (2005) use the term 'actual identities' rather than 'current identities'. However the term 'actual' implies, in a sense, that identities are static. In personal correspondence between Mellony Graven and Anna Sfard in November 2008, Sfard suggested that the term 'actual' be replaced with the term 'current' as it was less declarative. An elaboration of this can be seen in Graven (2012).

identities signify the space between a present and a possible future identity (Sfard & Prusak, 2005).

Sfard and Prusak (2005) suggest that through the process of engaging with and reflecting on one's identity, a strong sense of agency can develop: "human beings are active agents who play a decisive role in determining the dynamics of social life and in shaping individual activities" (p. 15). In other words, through stories the dynamic and agentic aspects of identity can be realised. This expression of agency is particularly appealing in the South African context and for my research, as it challenges the deficit discourses about teachers (i.e. that teachers have poor subject knowledge and teaching practices). Teachers are not simply products of social structures or discourses (e.g. teacher education and schooling systems as noted in Chapter One), but are able to reflexively engage with their situations by drawing on their agency.

Sfard and Prusak's (2005) work on identity provides three insights that are particularly important here. Firstly they provide an explanation of identity that enables researchers to operationalise identity, the identifying process, and the identity-making process. Secondly, they foreground the temporal nature of identity through their explanation of current and designated identities, and offer an explanation that enables teachers and learners to begin to 'close the gap' between the current and designated identities. Thirdly, identity and identity-making are located within stories and discourses. This view of identity as narrative suggests that narratives hold multiple experiences of an individual together thereby giving the individual a sense of coherence.

Critiques of a narrativised view of identity focus on the dangers of researching voice, observing identity in the classroom, and the seeming reduction of identity to persons' experiences of participating in social practices. Lerman (2006) cautions against the danger of researching 'voice', or in this sense, the stories people tell about their experiences and thoughts, both current and future. He argues, seemingly drawing on a Foucauldian perspective, that the stories people tell about themselves and others are not neutral, but rather they are produced in and through discourses and researchers need to examine how these voices are produced. It is only once a researcher understands how voices (i.e. narratives) are produced that consideration can be given to changing them. In so doing, he proposes a more critical view of identity that explores the power relations that produce the subject and the narratives of the subject. This view is discussed later in this chapter and referred to as *identity as discursive*.

A further limitation of a narrative view of identity where identity is viewed as the stories we tell, is to ascertain how one sees identity as expressed in the extra-discursive actions of teachers in the classroom. In other words, the identity as narrative perspective ignores the actions of teachers that exist outside of ‘linguistic constructs’ and register. For my research, and concurring with Lerman (2006), a focus on narrative presents only a partial picture of identity as teachers’ identities are not only constituted in and through dialogue. Drawing on the philosopher Schatzki (2002), I posit that teachers’ identities are constituted through the full range of actions and practices that they perform or those that are performed towards them in their social life generally, and in the classroom in particular. As such, teacher identity in my research focuses on the full range of (inter)actions teachers perform and are expected to perform in teaching FP mathematics (Chapter Six and Seven). The view of identity and identity-making as located solely within language, is also critiqued by Collier (1998) who argues that language is only acquired with reference to *what is* (i.e. reality). Language thus derives its meaning with reference to reality. It follows then that prior to linguistic acquisition, there must be access to reality that is pre-linguistic (Archer, 2000).

For my research, I consider that while identity as stories is particularly useful in developing an understanding of teachers’ conceptions of self and others (e.g. teachers, learners, parents) and how they are perceived by others, this perspective is limiting as it does not engage with *how* these identities, current and designated, are constituted by and constitute teachers’ teaching practices. Since my research seeks to understand the conditions that give rise to teachers’ identities and the expression of their identities in teaching of FP mathematics, it requires an explanatory and analytic framework that enables me to move beyond the hermeneutic in order to reveal the structural, cultural and agential mechanisms giving rise to teachers’ identities and their teaching practices. I elaborate on this in Chapter Three when I elucidate on my theoretical framework.

2.3.3 Identity as learning

Research that concentrates on teacher learning seems to foreground the influence of professional learning communities on teacher identity. Identity as learning is viewed as embedded in a professional learning community which in most of the literature that I have read, is referred to as a community of practice. Learning in this context is described by Lave and Wenger (1991) as a process of participation in social practices rather than the individual

acquisition of knowledge. Engagement in social practices within communities of practice gives learning a context, and the learners, in the process, develop their social identities. In this sense, “learning and a sense of identity are inseparable: they are aspects of the same phenomenon” (Lave & Wenger, 1991, p. 115).

Learning is thus equated with identity and produced within communities of practice. These professional communities emphasise group coherence and collaboration and presuppose a group identity. This research suggests that teaching and learning within professional teacher communities are about belonging and becoming within a collective. This view, that has shaped professional teacher identity within teacher education, is emerging as a relatively widespread scholarship on teacher professional development, particularly in South Africa.

Primarily, this scholarship draws on the work of Lave and Wenger (Lave & Wenger, 1991; Lave, 1996; Wenger, 1998) as it seeks to explain teacher learning in mathematics professional communities of practice as a process of identity (re)construction (Graven, 2004, 2012; Lerman, 2012; Nel, 2012; Pausigere & Graven, 2012, 2013). Communities of practice, for Lave and Wenger (1991), are relational constructs between persons, actions and settings over the course of time (Lave & Wenger, 1991). This concept seems particularly useful in teacher professional development contexts, where teachers (inter)act in particular contexts about a shared concern, problem or project (e.g. mathematics education) as noted in the research studies represented below.

Research in South Africa situated in the communities of practice discourse, illuminates how participation in communities of practice can alter teachers’ sense of belonging and strengthen their professional teacher identities (Graven, 2003; Nel, 2012; Pausigere, 2014a). Drawing on Lave and Wenger (1991) they suggest that learning is the process of becoming a full participant and member of a community of practice. In other words, they propose that through the process of participation in communities of practice (e.g. an in-service programme) one becomes a certain kind of person.

Nel’s (2012) concern centres on whether the identities of teachers are commensurate with the official pedagogic identity advocated by the South African curriculum implemented at the time. She applies Wenger’s (1998) four components of learning, that is, identity, community, practice and meaning, to her data (interviews and official course documents) which she

gathered from seven teachers registered for an Advanced Certificate in Education in Mathematics Literacy. Her research illuminates how participating in a community of practice can change teachers' sense of belonging, which interconnects with changing identities. She argues that teacher education institutions should design programmes that explicitly promote the prescribed pedagogic identity.

Graven (2003, 2005¹⁵) appears less interested in teachers (re)authoring their pedagogic identities in accordance with a prescribed curriculum. She traces the emerging pedagogic identity of two teachers, Ivan (primary school) and Sam (secondary school), as they participate in a two-year INSET (in-service) programme that she coordinated for leader teachers in Senior Phase mathematics. Like Nel (2012), she draws on Wenger's (1998) four components of learning as the analytic framework to examine her data (interviews and questionnaires) and explain her findings. She reports on teachers' growing confidence as mathematical thinkers and recommends that confidence be considered as a fifth component in Wenger's conceptualisation of learning. Graven's (2003, 2005) papers suggest that participatory approaches to learning, coupled with an understanding of teachers as professionals, are crucial in strengthening teachers' identities. More recently Chauraya's (2013) study was based on a professional learning community of five teachers situated at one school. Using Wenger's three modes of belonging as his explanatory and analytic tool, he suggests that teacher identity is both a source of group cohesion and an opportunity for teachers to learn from one another. He proposes that the use of professional communities offers a sustainable model for continued professional development in schools.

Much of the research on professional learning communities in teacher education is based on small-scale studies with teachers. This research is conducted by academics and scholars as teachers engage in communities of practice connected to universities. While Chauraya (2013) argues that professional learning communities are a possible sustainable solution to in-service teacher learning, there is little research that engages with teachers after their in-service teacher education programmes.

In a more recent reflection on her research described above, Graven (2012) recognises possible limitations with the theory of Lave and Wenger. For Lave and Wenger (1991), learning is a

¹⁵ As I explain later in this section on identity as learning, Graven reauthored this research in 2012 using the work of Sfard and Prusak (2005).

process of identity (re)construction and being and becoming a different person in the world. Graven (2012) suggests that Lave and Wenger do not have a clear explanation of the process of identifying. She thus draws on Sfard and Prusak (2005) to assist in operationalising identity, where identity is viewed as the stories people tell about self and others. Graven's (2012) research recommends communities of practice as supportive contexts, providing space for persons to (re)author their identities. Drawing on her work as an in-service teacher educator, she tracks teachers' stories as they move from deficit teacher identities and actively construct and (re)author their identities as lifelong learners and critical partners, developed within the professional learning community of which they are a part.

While this research is useful in understanding how professional learning communities can bring about a change in identity, there are a number of critiques of the communities of practice discourse. Firstly, these examples of research on identity as learning, suggest that one cannot separate the person from the context, practice and community. Secondly, while equating identity with learning contributes to advancing research on teacher identity, particularly in relation to in-service teacher education, this research foregrounds the agency of the community rather than the agency of the person. Thirdly, the authors mentioned above tend to romanticise communities of practice and ignore the power relations both within and external to communities of practice (Tennant, 1997). Graven (2012) writes,

as teacher educator and participants, we would make sense of the curriculum together and through this partnership would become 'leader educators', able to support others in making sense of it and its implementation and able to critique and provide feedback to the curriculum review process. (p. 133)

However, there is little evidence in her writing or her analyses of the power dynamic between herself as teacher educator, project coordinator and lecturer, and the 'leader teachers'. I suggest that relations of power are not sufficiently addressed in the writing on professional learning communities. This idea of identity construction as a social phenomenon, constructed with/in our experiences and (inter)actions in communities of practice, disembedded from an understanding of relations of power within and external to 'communities', is a perspective challenged by post structural theories, as will be discussed in the section below. Finally, the research within the identity as learning perspective, as highlighted above, is hermeneutic in the sense that it does not move beyond the empirical. In other words, it is limited to that which can

be interpreted from the experiences and interactions of people. I explore the limitations of research that remains at the level of the empirical for my study, in Chapter Three and Four.

2.3.4 Identity as discursive

A post structural analysis of identity is about relations of power in the learning-teaching interaction. It is through discursive practices, rather than simply narratives that subjectivities (identities) are produced (Klein, 2007). Marsh (2002, p. 456) explains that discourses are,

frameworks of thought and action that groups of individuals draw upon in order to speak and interact with one another in meaningful ways ... [they] are historically, culturally, politically and socially generated patterns of thinking, speaking, acting and interacting that are sanctioned by a particular group of people ... individuals shape and are shaped by the discourses (Fairclough, 1989; Burman, 1994; Gee, 1996) that are made available to them.

Teachers' practices, Klein (2007) argues, are based on humanist assumptions that foreground the autonomous, rational individual. She contends that current dominant practices, such as Piaget's stage theory of child development, Vygotsky's social theory of mind, and Lave and Wenger's situated learning theory (i.e. learning within supported contexts) are all informed by the autonomous and rational learner (Klein, 2007) and teacher. Klein (2007) acknowledges that these theories provide a necessary and significant epistemological contribution, but to a large extent, they ignore "the ontological dimension of *how* [italics added] it is that so many young students get 'turned off' mathematics" in school (Willoughby, as cited in Klein, 2007, p. 314). In his defence, Wenger proposes in relation to schooling, that his theory "was not yet ready for prime time" as the focus in schools is generally the development of knowledge and skills rather than meaning-making (Graven, 2009, p. 71).

Poststructuralism tries to make "visible how the use of language ... produces what is taken to be real" (Weedon, as cited in Klein, 2007, p. 314). Klein (2007) explains that rather than the autonomous rational person, it

posits a contradictory, multiple, multi-layered self constituted [person]. ... Under poststructuralist assumptions ... competent and generative participation in a discourse is conditional on power relationships in the discursive practices of the particular learning environment. (p. 314)

Power, from a post structural perspective, is viewed as relational, continually constituted and constituting through the interactions of persons (Marsh, 2002). Data, within poststructural

research is not seen as descriptive of a ‘real world’ but rather it comprises information “that is implicit in the production of subjectivities and the reproduction of the taken-for-granted of teaching mathematics” (Klein, 2007, p. 215).

Zembylas (2005) in his research explores the production of teachers through emotional discourses and how teachers, in turn, resist these discourses. He posits that power is central to emotional discourses as relations of power determine what can and cannot be said with regards to self and emotion. For Zembylas, neither identity nor pedagogy are effects of experience. Rather, teachers’ subjectivities intercede, suggesting that the self is political. What is needed is to understand the meaning of the “emotional rules” (p. 936) and how they are used in the classroom within the context of school norms and structures. Zembylas’ Foucauldian analysis of teacher emotions and the rules that discipline teachers with regards to their emotions (e.g. school or curriculum policy), recognises the social and political dimensions and historical contingency, of teacher emotion. It is through the recognition and use of these ‘emotional rules’ that teachers can begin to resist and thereby construct their subjectivities. Zembylas’ (2005) perspective provides space for researchers to examine how emotional conduct is self-policed by teachers.

Both Klein (2007) and Walls (2008, 2009), whose work focus particularly on children as learners of mathematics, suggest that subjectivity involves the way in which children recognise themselves as mathematical subjects, but that the process of subjectivity (i.e. becoming a subject) occurs at the intersection between knowledge and power (Walls, 2009). In other words, people are “produced in action, in relationships, both active and acted upon, existing, and constituted in time and space” (Walls, 2009, p. 5).

Within this poststructural framework, Klein (2007) explores how teachers and learners through their interactions constitute both what it means to teach mathematics and what it means to learn mathematics. In other words, her research focuses on the process of subjectivity within the classroom. She demonstrates that as primary school teachers present themselves as nurturing and giving, they constitute their learners as ‘needy’. Within this perspective, teaching mathematics is about giving the children strategies to use in solving mathematics problems while learning mathematics is about “responding to the teachers’ directives” (Klein, 2007, p. 317) and responding to questions that the teacher poses. It is a process that involves being

dependent on the teacher. Furthermore, Klein (2007) shows that mathematics becomes more and more difficult for the learners as “the learning *process* is stolen from them” (p. 217) through such interactions between teachers and children. It is in these classroom interactions of what it means to be a teacher and learner that subject positions as givers and receivers of knowledge respectively emerge. These teacher positions existed prior to her research as they have already been constructed by others.

The discursive practices of mathematics education (e.g. whole class teaching, questioning) are an amalgam of the discourses of both mathematics and education. Miller Marsh (2002) suggests that there is a multiplicity of discourses that define the type of teacher or learner one is. Identity for her then, is viewed as a dynamic and continual process of becoming “rooted in social, cultural, historical, and political contexts in which schools are situated. ... These discourses of schooling shape what and who schools, teachers, children and families become” (p. 460). In other words, teachers’ identities are constructed in and through discourses. She suggests that in making the power relations in various discourses visible, teachers can begin to make choices with regards to their identities (personal and social) and teaching. This assumes teachers are able to identify, analyse and challenge the discourses that ‘normalise’ them and their teaching practices.

Thus far I have presented four perspectives on identity. These are: being recognised as a particular kind of person, identity as narrative, identity as learning, and identity as discursive. Like the explanations offered by Bourdieu, Foucault and Giddens all appear to conflate, in some form or another, structure (or discourse) and agency. In other words, they view structure and agency as inseparable. This makes research that seeks to examine the interplay between structure and agency practically impossible. I argue that the final of the five perspectives, identity as pedagogically prescribed, separates structure and agency ontologically. This perspective suggests that the official pedagogic identities (Bernstein, 1996) as articulated through curriculum policy documents, is part of the social system¹⁶. As such, it assumes that the official pedagogic identities conveyed through the curriculum are ontologically and temporally distinct to the (inter)actions of agents. These official pedagogic identities condition

¹⁶ I use the term social system here instead of cultural system simply for consistency, and in keeping with the theoretical positions described in this chapter. In Chapter Three, I elaborate on Archer’s (1995) position that the social system (i.e. social structures) is distinct from the cultural system (i.e. the realm of ideas). Her argument for this analytic distinction (which is methodological rather than a philosophical) is based on her critique of the “myth of cultural integration” (Archer, 1996, p. 1).

the identities of teachers and the expression thereof through the teaching of FP mathematics. I turn to this perspective now.

2.3.5 Identity as pedagogically prescribed

The focus of this section is research that explores the extent to which the official “pedagogic identities” (Bernstein, 2000, p.66) impact on teachers’ identities. A variety of explanatory and analytic tools are drawn on, in exploring the relationship between policy and practice. A number of researchers have explored official pedagogic identities particularly in relation to reform curricula (Jansen, 2001; Woods & Jeffrey, 2002; Naidoo & Parker, 2005; Jita & Vandeyar, 2006; Johansson, 2010; Pausigere & Graven, 2013). This research suggests that to deny the existence of the effects of policy on practice is problematic.

Woods and Jeffrey (2002) distinguish between self-concept (i.e. the overarching view persons have of themselves), personal identities (i.e. attributes and designations related to the self that are displayed through (inter)actions), and social identities (i.e. “appearance, behaviour, and the location and time of the action”) (p. 89). Drawing on Giddens (1991), they argue that identity in late modernity is a project of continual reflexivity, which requires teachers to constantly reconsider their beliefs, values and biographies in ways often not anticipated. Using a critical case study as the methodology, Woods and Jeffrey (2002) interviewed and observed mid-to late-career primary school teachers prior and post two Ofsted¹⁷ inspections (over a period of approximately six years). The aim was to ascertain the extent to which the Ofsted inspections challenges (and/or changes) teachers’ identities. According to Woods and Jeffrey (2002), the Ofsted inspection reports require a shift in teachers’ identities from trust to accountability. This coupled with the ‘new’ literacy and numeracy programmes, reduces teachers’ qualities of humanism and vocationalism to the implementation of a list of competencies. This brought about a crisis for many teachers as their unified self-identity was challenged, forcing them to reconsider and reconstruct their identities. Many teachers however have managed to retain the child-centred pedagogies of the Plowden Report¹⁸ despite the ‘new’ rationalist discourse. In many respects, there is a mismatch between teachers’ self-identities and their social identities. This results in significant intellectual and emotional energy being utilised to reconstruct more

¹⁷ Ofsted stands for the Office for Standards in Education. Their responsibility is to inspect and regulate the educational services received by children and young people (Woods & Jeffery, 2002).

¹⁸ The Plowden report of 1967 was a review of the education system that called for more child-orientated approaches to teaching in the UK (Woods & Jeffery, 2002).

policy-aligned identities and a personal identity which has become fragmented and designed to meet the accountability purposes of the Ofsted inspections (Woods & Jeffery, 2002).

In the South African context, and at a time of radical curriculum change, Jansen (2001) also highlights the problem between what policies envisage and the personal identities of the teacher. To deny the existence of the effects of policy on practice is naïve. Even if they do not necessarily change practice, they nevertheless “leave a trace in practice” (Buenfil Burgos, as cited in Jansen, 2001, p. 246). He draws on an explanation of teacher identity offered by Spillane (as cited in Drake et al., 2001). “By teachers’ identities we mean their sense of self as well as their knowledge and beliefs, dispositions and interests, and orientation towards work and change” (p. 2). This for Jansen (2001) includes how teachers feel about their work emotionally, politically and professionally. Within policy, teachers’ roles have shifted from the teacher as the authority in the classroom, to the teacher as disempowered facilitator or “officially recognised performer whose actions are not only identifiable but measurable against set standards or outcomes or performances determined by the state” (p. 244). As with Woods and Jeffrey (2002), Jansen suggests that there is a mismatch between the policy image of the teacher and teacher identities, as the change between curricula prior to 1994 and post 1994 was too radical. As a means of coping with this shift, teachers claim to be doing something different in their classrooms from what they actually do (Jansen, 2001).

Graven (2002a), Naidoo and Parker (2005) and Pausigere and Graven (2013), all focus attention on official pedagogic identities as advocated in the three curriculum iterations experienced in post-apartheid South Africa since 1997, by drawing on a Bernsteinian explanation. Jita and Vandeyar (2006) by contrast, also focus on official pedagogic identities, but unlike those that draw on Bernstein, their theoretical orientation is not explicit. The aim of these four studies (Graven, 2002a; Naidoo & Parker, 2005; Jita & Vandeyar, 2006; Pausigere & Graven, 2013) was to examine the implications of official pedagogic identities for teaching and learning by juxtaposing the envisioned teacher communicated through curriculum (and assessment) policies with mathematics teacher identities.

Naidoo and Parker (2005) focus on Mathematical Literacy, Mathematics and Mathematical Sciences (MLMMS) in Curriculum 2005 (C2005)¹⁹ and the Common Task Assessments (CTA) for Grade 9 learners. Jita and Vandeyar (2006) look at the official pedagogic identities of primary school teachers as reflected in C2005 and the Revised National Curriculum Statement for Mathematics (RNCS)²⁰. Graven (2002a) analyses different teacher roles provided in MLMMS in C2005. Pausigere and Graven (2013) explore the shift in official pedagogical identity in C2005 and the Curriculum and Assessment Statement (CAPS)²¹ for Mathematics – the latest version of the curriculum. Pausigere and Graven (2013) also include the ANA in their analysis. While Graven (2002a) and Naidoo and Parker (2005) review the Senior Phase documents (Grade 7-9), Pausigere and Graven (2013) review the FP documents (Grade R-3). Across the above research, the arguments suggest that a change in teachers' roles as prescribed in curriculum, changes their identities and that changing teachers' practices requires a change in their identities.

Graven (2002a), in her work as coordinator and researcher within an in-service programme titled 'Programme for Leader Educators in Senior Phase Mathematics Education' for Senior Phase teachers, sought to develop leader teachers in mathematics to 'work with' and 'engage with' the new C2005. In her analysis of C2005, Graven argues that this new curriculum requires substantial philosophical shifts on the part of both teachers and learners, which impact on both teacher development and their mathematics teacher identities. These shifts are evident in both the conceptions of mathematics promoted, and the roles related, to the mathematics teacher. She concludes, like Jansen (2001) and Woods and Jeffery (2002), that these shifts create tension for teachers.

Naidoo and Parker (2005) use Bernstein's three forms of identity – retrospective, decentred and prospective – to juxtapose the teachers' mathematics identities with the official pedagogical identities promoted through MLMMS in C2005 and the CTA for Grade 9. Mapped onto Bernstein's pedagogical identities is Ernest's (1991) absolutist and fallibilist philosophies of mathematics and the ideologies that underpin these philosophies (namely, utilitarian, purist and social change). Naidoo and Parker (2005) suggest that teachers' mathematics identities are

¹⁹ Curriculum 2005 was introduced in Grade 1, 4 and 7 in 1997, Grade 2, 5 and 8 in 1998, and Grade 3, 6, 9 in 1999.

²⁰ The Revised National Curriculum policy was implemented in schools in 2002.

²¹ The Curriculum and Assessment Policy Statements were implemented in schools from 2012.

predominantly retrospective, positioned towards the past and “favour a return to imaginary certainties of monoculture” (Bernstein, 1996, p. 75). These teachers identify with an absolutist philosophy and a purist ideology. In other words, teachers with purist orientations believe it is their responsibility to explain and transmit the structure of the discipline of mathematics. By contrast, identities based on fallibilist philosophies of mathematics promote a social change ideology. Naidoo and Parker (2005) suggest that it is necessary to “resocialise teachers into a new subject loyalty” (Bernstein, 1971, p. 56).

Jita and Vandeyar (2006) consider the connection between two Grade 4 teachers’ mathematics identities and the envisaged identities of the Revised National Curriculum policy developed in order to understand the slow pace of reform. The research draws on Jansen’s (2001) explanation of the slow pace of change in teachers’ practices and the mismatch between ‘policy images’ of the envisioned teacher and the identities of teachers. Mathematics identities are defined in accordance with Jansen (2001) as the “capacity to teach” (p. 242), which includes content knowledge, levels of training and qualifications, plus perceptions and beliefs about the nature of mathematics and of themselves as learners of mathematics. Through the use of observation, interviews and document analysis, Jita and Vandeyar (2006) construct images of their two teachers’ identities. Findings suggest that teachers’ mathematics identities are shaped by their previous experiences as learners at school and their first teaching posts. Key to overcoming deficit mathematics identities, is embracing a learner identity “to explore and experiment in [the] mathematics class” (Jita & Vandeyar, 2006, p. 49).

Pausigere and Graven (2013) extend Bernstein’s (2000) pedagogical identity positions, with Tyler’s elaboration of Bernstein’s knowledge coding properties of classification and framing, to analyse C2005, CAPS and ANA. Bernstein’s official pedagogic positions, namely conservative, neo-conservative, therapeutic and market, are used as descriptors in their research. Pausigere and Graven (2013) argue that C2005 promoted a therapeutic primary mathematics teacher identity, as a key responsibility of the teacher was the promotion of social values and norms fitting with South Africa’s new democracy, whereas the new CAPS and ANA tests are grounded in a market primary teacher identity. Identifying the identity positions of the various policies emerged through an application of Tyler’s knowledge codes. The integrated type of knowledge and knowing articulated in MLMMS in C2005, suggests weak classification. The changed relationship between teacher and pupil, to learner and facilitator, coupled with limited guidance on sequencing and pacing of curriculum content, suggest a

weakly framed C2005. Therapeutic identity positions are, according to Tyler's model, weakly classified and framed. By contrast, CAPS is strongly classified with its emphasis on conceptual understanding of mathematics knowledge. The framing of CAPS is less clear for Pausigere and Graven (2013). They suggest the framing is stronger than C2005, in that both learner and teacher-centred pedagogies are promoted, resulting in "mixed messages on the teaching approach advocated by this new curriculum" (Pausigere & Graven, 2013, p. 28). They propose that classification and framing be considered as fluid along a continuum, rather than as polar opposites. The authors bring their argument to a close by highlighting the implications of each identity position. Whereas the therapeutic identity position foregrounds the promotion of social values and norms in order to redress past inequalities and develop a critical and active citizenry, the market pedagogic identity focuses on mathematical knowledge, learner performance and the production through the ANA, of a "competitive output-product (students) with an exchange value in the market" (Pausigere & Graven, 2013, p. 24).

Within such a teacher identity perspective, the official pedagogic identities as discourses, have the potential to act on and produce teachers' identities, their teaching of mathematics, and the learners' experiences of this teaching, which in turn produces the way in which teachers and learners recognise themselves.

Missing from this research however, except for that by Woods and Jeffrey (2002), is an evaluation of the extent to which the official pedagogic identities as promoted in the curriculum and assessment policies, impact on teachers' identities and their teaching of mathematics. While Pausigere (2014b) claims the official pedagogic identities as expressed in post-1994 curricula documents (e.g. CAPS and ANA) have had a greater impact on teachers' identities, in my research, it is the pre-1994 curricula that appear to have had a greater impact on teachers' identities and the personification thereof in the classroom.

Bernstein's (1996) work on official pedagogical identities, makes a distinction between identities as endorsed and communicated through policy (i.e. market, therapeutic identities) and how teachers (inter)act with such policy (how teachers respond to these identities reflected through curricula). I suggest and explain in Chapter Three that this is an ontological and analytic distinction. In other words, official pedagogic identities exist as part of the social system (SS) (the realm of structures) while teachers' interactions with official pedagogic identities exists at the level of the social interaction (SI) (the level of the classroom). It is this

distinction between the SS and SI that explains to some extent why Bernstein's work has been taken up by social realist researchers such as Lisa Wheelahan (2007), and Karl Maton and Rob Moore (2010).

Being able to make this ontological distinction between structure, culture and agency is considered important in my research, as I seek to understand the emergence and expression of teachers' identities in teaching FP mathematics. As such, I want to ascertain the extent to which structure, culture and agency influences the emergence of the identities of the teachers who participated in my study. I elaborate on this perspective in Chapter Three.

2.4 CONCERNS WITH CURRENT RESEARCH ON IDENTITY

All of the above perspectives have contributed significantly to research on teacher identity within the field of mathematics education. These contributions provide perspectives on the interaction between teachers and their work. Identities are constructed at the intersection of the individual and social and thus fundamental to this is the relation between the individual and the social as mediated through interaction. Each perspective gives primacy to the role of discourse in the construction of teacher identity. By this I mean that language, for the most, is central to each of these perspectives. However, the view of discourse varies across each of the above perspectives and their accompanying research. Discourse in identity as being recognised as a certain kind of person, identity as narrative and identity as learning, is predominantly based on language and communication. All three perspectives however, do recognise the significance of context in the construction of identity. In other words, while these approaches acknowledge the importance of the social and historical in the construction of identity, people are constituted through their own narratives and those of others. Absent, seemingly, from these three perspectives is the way in which people are constructed within relations of power. This forms a basis for the next two perspectives.

Identity as a discursive act and to some extent *identity as pedagogically prescribed* offer a different perspective of identity as constructed in and through discourse, thus foregrounding relations of power. Discourses are regarded as more than narratives that are historically and socially situated. They include practices and the rules generating such practices, institutions, techniques and relationships. Discourses, from the vantage point of these two perspectives, are productive. In other words, they are replete with power relations which act on people,

producing a particular kind of subject. The teacher is thus produced through a multiplicity of discourses in a variety of contexts. Missing from research based on the latter two perspectives is an elaboration on the individual and *how they produce themselves*. Seemingly, teacher identities are viewed as products of official documents, teacher education programmes and so forth with limited agency.

While each of the five perspectives provides different explanations of identity and identity construction, there are two commonalities among them. Firstly, they all offer a view of teacher identity that is constructed through discourse. This means that discourse (e.g. language) is the most important tool in identity construction. Language is viewed as a form of social action, as it is through the interactions of people, which are based on *a priori* knowledge that has been internalised, that knowledge is produced and people construct their social world. In other words, peoples' social practices are constructions of their knowledge and experiences of that world produced through discourses. As Berger and Luckman (1966) and Burr (1995) contend, our knowledge of the world and self comes from people and not some 'objective' reality.

Secondly, each of the above perspectives is supported by a social constructionist orientation. Social constructionism proposes a view of knowledge that emphasises epistemology and assumes either a flat ontology (Bhaskar, 1978; Archer, 1995; Danermark et al., 2002; Alvesson & Sköldbberg, 2009) or a non-dualistic process ontology (Giddens, 1979; Sawyer, 2002). With the former – a flat ontology – researchers presuppose that reality (what exists) correlates with our perceptions and experiences of it. In other words, much social constructionist research tends to merge epistemology and ontology. Bhaskar (2008) refers to this as the “epistemic fallacy” (p. xvi), the privileging of questions of how we know something over *what is*.

A non-dualistic process ontology, particularly evident in the discourse of *identity as learning*, assumes that structure and agency are mutually constitutive (Sawyer, 2002). In other words, what is internal to the person cannot be separated from what is external to the person. Furthermore, this inseparability thesis asserts that only processes are real. Put differently, it suggests that what is real are the interactions that occur at a particular time and space. Structures, for example, have no existence of their own; they are virtual and called into being through the interactions of agents (Giddens, 1979). Social constructionism, from a process-orientated perspective, thus rejects the view that structures and agents give rise to social

phenomena. Rather, they posit that it is the practices or interactive processes that give rise to our constructions of phenomena (Burr, 1995).

Central to the social constructionist orientation is the *fallacy of conflation*, that is, the elision of structure and agency. To clarify, a social constructionist orientation elides the ‘parts’ (social and cultural systems) and the ‘people’ (agents) (Archer, 1995, p. 194). Notwithstanding the significance of the above theorising, a social constructionist orientation appears to restrict opportunities from a sociological standpoint to examine the structural, cultural and agential conditions that enable and/or constrain the emergence and expression of FP teacher identities, through the teaching of mathematics. These perceived limitations led me to search for novel frameworks and orientations in my research. Archer’s social realism and particularly the morphogenetic approach, seemed to provide the methodological tools to delink structure, culture and agency in order to investigate the interplay between them in understanding social practices and the construction of identity. I therefore expand on this in Chapter Three.

2.5 CONCLUDING REMARKS

The field of research on identity is vast. This chapter has traced key research on identity, teacher identity and teacher identity within the field of mathematics education. I have suggested that the research reviewed in this chapter elides structure (and culture) and agency either in a downwards direction or centrally. The former renders agency an epiphenomenon of structure, thereby downplaying the role of agents in the construction of their identities and social practices. The latter suggests that structure and agency are inseparable which makes it practically impossible to conduct research that seeks to examine the extent to which the material (social structures), the ideational (culture) and agency influence teachers’ identities. Such research requires alternative frameworks that allow for the separation, for methodological purposes, of structure and agency. I suggest that social realism presents an opportunity to examine this interplay and thus I elaborate on my choice of the theoretical and methodological framework of social realism in the next chapter.

CHAPTER THREE

SOCIAL REALIST THEORY AND THE IMPLICATIONS FOR MY RESEARCH

3.1 INTRODUCTION

As highlighted in Chapter Two, my research requires a theoretical and methodological framework that enables me to delink structure and agency in order to examine the extent to which each influences the emergence and expression of teachers' identities through the teaching of Foundation Phase (FP) mathematics. In this chapter, I establish that Margaret Archer's social realism provides me with the methodological purchase that I require for this research. While Bourdieu, Foucault and Giddens all offer explanatory tools that elucidate the construction of teacher identity within social practices (i.e. teaching mathematics), all three tend to conflate structure, culture and agency. In so doing, they render it difficult to research the interplay between structure, culture and agency, and the role each plays in the emergence and expression of teachers' identities.

This research seeks to understand the conditions that give rise to the identities (personal and social) of teachers and the expression thereof through their teaching and it attempts to gain insights into the implications that this has for learner underperformance. Therefore, it requires a theoretical and methodological framework that enables one to delink structure, culture and agency. In other words, I have required a methodological framework that separated the 'parts' from the 'people'. Furthermore, unlike social constructionist research, the questions I ask in this research are primarily ontological. To rephrase it, they are typically realist questions as they foreground being in the world rather than knowing; and they assume that there are structural, cultural and agential preconditions that have generated the emergence and expression of teachers' identities in teaching of FP mathematics. I argue in this chapter that social realism enables me to surface the structural, cultural and agential mechanisms conditioning teachers' identities and the expression of these identities in teaching of FP mathematics.

The theoretical and methodological expression of Archer's social realism is the morphogenetic approach. This approach provides the tools I require to understand the extent to which structure,

culture and agency influence FP teachers' identities. In addition, it assists me to explore the expression of these identities through the teaching of mathematics. I thus apply this approach in the rest of this thesis. While the morphogenesis of structure, culture and agency is central to this approach and my thesis, it is Archer's morphogenesis of agency that is particularly useful in my research. Archer's morphogenesis of *agency* enables me to foreground an understanding of teachers in a way that recognises the importance of 'who the teacher is' in the classroom. To clarify in relation to this research, I propose it is the identities of teachers, as agents, that enable them to reflect on, and engage with, the contexts they find themselves in and their roles as teachers. Archer provides me with an elaboration of agency that assists me in analysing and explaining the extent to which teachers 'act back' on the mechanisms that enable or constrain their identities and expression through the teaching of FP mathematics. I elaborate on this aspect later in the chapter.

Before I explain the theoretical and analytic framework informing my research, it is necessary to make explicit my assumptions about the nature of social science research. To do this, I draw on Bhaskar's (1978) critical realism as it is an underlabourer of social realism and particularly Archer's morphogenetic approach.

3.2 ASSUMPTIONS GUIDING MY RESEARCH: THE CENTRAL TENETS OF CRITICAL REALISM

Critical realism posits the existence of reality independent of our knowledge of it, while simultaneously recognising that our knowledge of the world is fallible and thus relative. That is to say, critical realism is ontologically realist and epistemologically relativist (Bhaskar, 1978; Archer, 1995, 1996, 2003; Benton & Craib, 2001; Shipway, 2011). This ontological and epistemological stance is one that I ascribe to across my teaching and research work as a teacher educator at Rhodes University.

This view is based on the belief in a transitive and intransitive dimension in the social sciences. While the objects of social science, like those in the natural sciences, reside in the intransitive dimension, knowledge of these objects resides in the transitive dimension (Bhaskar, 1978). The intransitive dimension consists of real social structures, mechanisms and powers (e.g. an education system, poverty, gender, curriculum) which "operate prior to and independently of their discovery" (Bhaskar, 2008, p. xvii). They are causally efficacious in the sense that they

have effects (Shipway, 2011). The transitive dimension that is the realm of knowledge (i.e. theories, beliefs and ideas that are culturally and historically located) is always open to review and contestation. Both Sayer (2000) and Bhaskar (as cited in Norrie, 1998) assert there is no tension in accepting the existence of objectively real worlds and understanding that our knowledge about them is always open to review. As Sayer (2000) writes,

When theories change (transitive dimension) it does not mean that what theories are about (intransitive dimension) necessarily changes too: there is no reason to believe that the shift from a flat earth theory to a round earth theory was accompanied by a change in shape of the earth itself. (p. 11)

This is not to suggest that Bhaskar (1997) contests that social science is a product of the social, shaped by a multiplicity of conditions (e.g. social, historical, political, and material).

Critical realism not only theorises that there is a reality independent of our knowledge of it, but also that this reality is stratified and differentiated. Reality is differentiated according to closed and open systems (Benton & Craib, 2001; Shipway, 2011). Closed systems are contrived usually in laboratories and through scientific experiments and mechanisms are artificially isolated in order to identify the causal mechanism for a particular event. Consistency is key because there can be no change in the source of causal powers and researchers seek constant conjunctions. ‘Constant conjunctions’ refer to when two events A and B are conjoined; when one occurs the other occurs too (Scott, 2005). This is different to open systems (i.e. the social world) where structures exist independently and are often temporally out of sync with the events generated, making it impossible to establish constant conjunctions (Bhaskar, 1978, 2008; Collier, 1998, Shipway, 2011). The objects in the social sciences do not necessarily function in consistent ways and the conditions giving rise to the causal mechanisms also change (Scott, 2005). For example, in an education system there are a multiplicity of mechanisms which coexist and interact with each other, but do not necessarily act in the same combination and ways. My intention in this research is to uncover the generative mechanisms and the combinations, which give rise to teachers’ identities and the expression thereof in the teaching of FP mathematics. In this respect, I presuppose a stratified view of reality.

According to Bhaskar (1978, 2008), Archer (2003) and Shipway (2011), reality is stratified in that it consists of levels that are irreducible to each other. The level of the *empirical* consists of persons’ subjective experiences and perceptions of what happens in the world, while the

level of the *actual* comprises the objective world of events whether we experience them or not. The level of the actual is broader than that of the empirical and is based on that which emerges independently of persons trying to observe them (Alvesson & Sköldberg, 2009). The *real* consists of our experiences, the events and the structures and mechanisms that exist in the world, irrespective of whether they generate events or not. This is depicted graphically in Table 3.1 below; more specifically the real is indicated by the ‘ticks’. It is the structural and cultural mechanisms at the level of the real that I explore in depth in this research.

Table 3.1: Diagram of Bhaskar's stratified reality
(Bhaskar, 2008, p. 2)

	Domain of real	Domain of actual	Domain of empirical
Mechanisms	✓		
Events	✓	✓	
Experiences	✓	✓	✓

The use of the nomenclature ‘real’, as noted in Table 3.1, does not suggest that the levels of events and experiences are not real, but rather that mechanisms and powers reside in the level of the real. These structures and mechanisms are always present whether they are triggered or not (Bhaskar, 2008; Shipway, 2011).

Despite not always being observable, these mechanisms exert influence when activated (Bhaskar, 1978, 2008; Birkett, 2011; Shipway, 2011). The level of the actual is evidenced when the powers in the real are triggered. For example, the capacity to teach with individual (agential) and extra-individual (structural) features from which it derives, occur at the level of the real, but the exercising of the capacity to teach is at the level of the actual. Our experiences and perceptions of the teaching then, are at the level of the empirical (example adapted from Sayer, 2000, p. 12).

The metaphor of levels suggests that critical realism is a depth ontology suited to research that wishes to understand the basic conditions of a phenomenon. It is this interest, amongst others, that drew my attention to critical realism as opposed to other research orientations, for example, social constructionism.

Critical realists, like Bhaskar (2008), take the argument of a stratified reality further by arguing that emergence typifies the world. Emergence refers to situations where two or more objects

give rise to a phenomenon that is not reducible to the parts of the original objects (Sayer, 2000). These new phenomena (objects of social science) have emergent powers. As I highlight in Chapters Six and Seven, when a teacher teaches, causal powers are activated. The effects of this teaching depend on a variety of conditions (e.g. knowledge, context, resources etc.) and not solely on the structure of the education system or the acceptance by both school and parents, of the validity of the professional qualifications of a teacher (example adapted from Sayer, 2000). I therefore seek to identify the conditions (and relations between them) at the level of the real that give rise to the expression of teachers' identities in teaching of FP mathematics. Of course, I acknowledge that the claims I make are fallible; critical realism cannot promise "a royal road to truth" (Sayer, 2000, p. 17). In Chapter Four I explain the critical realist method for making such claims, that is, the process of judgmental rationality.

For critical realists, causation gives rise to change and stasis (Fairclough, Jessop, & Sayer, 2001, p. 4). In other words, causation is not about the observation of constant conjunctions of cause and effect of events as with positivist research, but rather the *role* of causal mechanisms in bringing about change or stasis. Critical realist research thus seeks to identify causal mechanisms and explain how they work, in what combinations and under what conditions (Sayer, 2000, p. 14). In open systems, the same causal power can produce different effects (e.g. new knowledge on how children learn mathematics may have various outcomes depending, for example, on the kinds of resources available in the classroom) and different causal powers can produce the same effect (e.g. one can get good mathematics results in a class for different reasons). Identifying causal mechanisms is a complex process. In open systems, such as a classroom, where there are multiple structures and generative mechanisms interacting, it is possible to ascribe the structural effects to one mechanism when it should be ascribed to another (Sayer, 2000). Asking typically realist questions (i.e. transfactual questions) assists in identifying the causal mechanisms at work. The questions I asked relating to my data include:

- What are the preconditions for this teacher's identity or the expression thereof in her teaching of FP mathematics?
- What does the existence of this teacher's identity presume?
- What do these teacher identities presuppose?

These questions are not about regularity, rather they are about uncovering necessary and logical relations in the SS and CS. They have assisted me in differentiating between *what could be* and *what must be* (Sayer, 2000).

Critical realism is critical of the objects of study (which in my research is the emergence and expression of FP teachers' identities through the teaching of mathematics) and theories. It suggests that social practices, like teaching, are informed by theories, ideas, beliefs that may not be true. These will impact on what happens in the classroom (e.g. the belief that mathematics ability is innate has effects on children's success in mathematics at school). My interest in this research is to look beyond empirical and hermeneutic understandings of teachers' identities, and to develop insights into the generative mechanisms that have given rise to the emergence and expression of teachers' identities in teaching FP mathematics. I thus assume that structural, cultural and agential mechanisms are real, that they exist independently of, and prior to, the teachers in my study, and that they constrain or enable the (inter)actions of these teachers. With the tenets of critical realism and my adoption of these assumptions in my research made explicit, I now switch to explaining the substantive theory that I used in this research, which is Margaret Archer's social realism.

3.3 MARGARET ARCHER'S SOCIAL REALISM

Archer's social realism emerges from her concerns with accounts linking social structures and human agency. She argues that sociological theories privilege *either* structure or agency (Archer, 2010). The response to these perspectives that either render human agents an epiphenomena of structures or structures an epiphenomena of agents (Archer, 1995) has given rise to the development of two notable perspectives which have tried to link structure and agency. The two perspectives are Giddens' structuration theory (Chapter Two) and Archer's morphogenetic approach.

Both theories agree that 'structure' and 'agency' presuppose each other (Archer, 2010, p. 456) as,

structural patterning is inextricably grounded in practical interaction ... [and] social practice is ineluctably shaped by the unacknowledged conditions of action and generates unintended consequences which form the context for subsequent interaction.

Where these theories part, is *how* they theorise (re)structuring of social systems. The conflationary theorising of Giddens (1984) makes it practically impossible to conduct research that seeks to examine the interplay between structure, culture and agency in the emergence and expression of teachers' identities through the teaching of FP mathematics. Archer expands on key critical realist concepts which I explain in relation to her morphogenetic approach. It is her morphogenetic approach that provides the theoretical and analytic tools for my research. The tenets that I elucidate are the concepts of analytic dualism and temporality. In addition I extend the concept of emergence, specifically in relation to the morphogenetic approach, and I put forward Archer's concern with the conflation of structure and culture in social science research. I do so because analytic dualism suggests that the 'people' and 'parts'²² are ontologically distinct and have properties and powers that are irreducible to each other. Analytic dualism is not the same as philosophical or Cartesian dualism. It is employed solely for methodological purposes. It is through the separation of structure and agency, for methodological reasons, that I am able both to examine the interplay between the individual and the social and to explore the temporal difference of structure, culture and agency.

The concept of temporality is fundamental to the critical and social realist thesis. While the 'parts' and the 'people' are real, interdependent and interact with one another, structural properties are emergent from and dependent on the activities of agents and exercise their structural powers through agency (Archer, 1995, 2000; Zeuner, 1999; Benton & Craib, 2001). In other words, it is through the actions of agents that structures condition or enable projects. Like Archer (1995) I take structure, culture and agency as ontologically and temporally distinct and argue that each has its own properties and powers that impact on the other.

While Archer (1995, 1996) distinguishes between structure and agency, she further delineates between structure and culture. She argues that culture "occupies no clear place in sociological analysis" (p. 2). She ascribes this to the "Myth of Cultural Integration" which views culture as coherent and consistent (p. xvii). The net result of this enduring mythology, eliding the material (structure) with the ideational (culture), is the inability to investigate the interplay between them and the extent to which each constrains or enables the projects of agents. In other words, structure, culture and agency all have properties that are dependent on each other for their

²² I have referenced this to Margaret Archer (1995) in Chapter Two and will assume that the reader knows these were originally her words to describe the ontological distinction between social and cultural system and agency.

existence. Despite their being ontologically autonomous, a change in one can result in a change in another (Archer, 2000; Hartwig, 2007). It has been particularly useful in my research to delineate between the structural and cultural conditions that have given rise to the emergence and expression of teachers' identities.

As highlighted above in the discussion on the tenets of critical realism, Archer (1995, 1996) suggests that the world is characterised by emergence. For Archer (2003), there are three kinds of emergent properties: structural emergent properties (SEP), cultural emergent properties (CEP) and person emergent properties (PEP). These include positions, roles and institutions at the structural level, and theories, ideologies and discourses at the cultural level (Archer, 2003). It is only through relationships (i.e. when the agent has a specific concern or project in mind) that structural and cultural powers can constrain or enable such projects. Thus, SEP and CEP are dependent on PEP which define the projects of agents. The capacity of persons to engage reflexively enables agents to anticipate possible constraints to their projects and to strategically find ways around those constraints (Archer, 1995, 2003). The morphogenetic approach, which I have chosen to adopt in my study, provides a methodological framework for Archer's social realism. I therefore outline this approach in the next section.

3.4 THE MORPHOGENETIC APPROACH

The morphogenetic approach as proposed by Archer (1995, 1996, 2000) provides analytic and explanatory tools for surfacing the SEP, CEP and PEP and examining their interplay. This has been particularly useful for my research as shown in Chapter Five, Six and Seven.

Morphogenesis refers to the complex processes and interchanges that produce structural, cultural or agential elaboration (i.e. change in a systems structure or state). Morphostasis, on the other hand leads to structural, cultural or agential conditioning (Archer, 2010). The morphogenetic approach thus enables the researcher to examine the interplay between the 'parts' and 'people' over time; and explain how and why things have changed (elaborated) or remained the same (reproduced).

As suggested by Archer (1995), structure, culture and agency are temporally distinct as "(i) structure necessarily predates the action(s) that transform it, and, (ii) that structural elaboration

necessarily postdates those actions” (p. 168). In order to examine a morphogenetic cycle, as shown in Figure 3.1, it is necessary to understand:

- (i) The present conditions (Time 1 (T1) in the morphogenetic approach), which are always historically situated and conditioned. As persons we are born involuntarily into material and ideational contexts which are not of our doing, but rather the doings of our predecessors;
- (ii) How persons, individuals or groups, respond to the constraining or enabling structural and cultural contexts that they have inherited or find themselves in, is the focus of Time 2 (T2) to Time 3 (T3). If the effect of agential interaction is morphogenesis, then it is probable that this would result in an elaboration of the structural or cultural systems at Time 4 (T4) (Archer, 1995);
- (iii) Elaboration in open-systems, which are not predictable, is viewed primarily as an unintended consequence of agential interaction. In this way, T4 becomes the new T1 of the next morphogenetic cycle with its conditioning effect on further action (Archer, 1995).

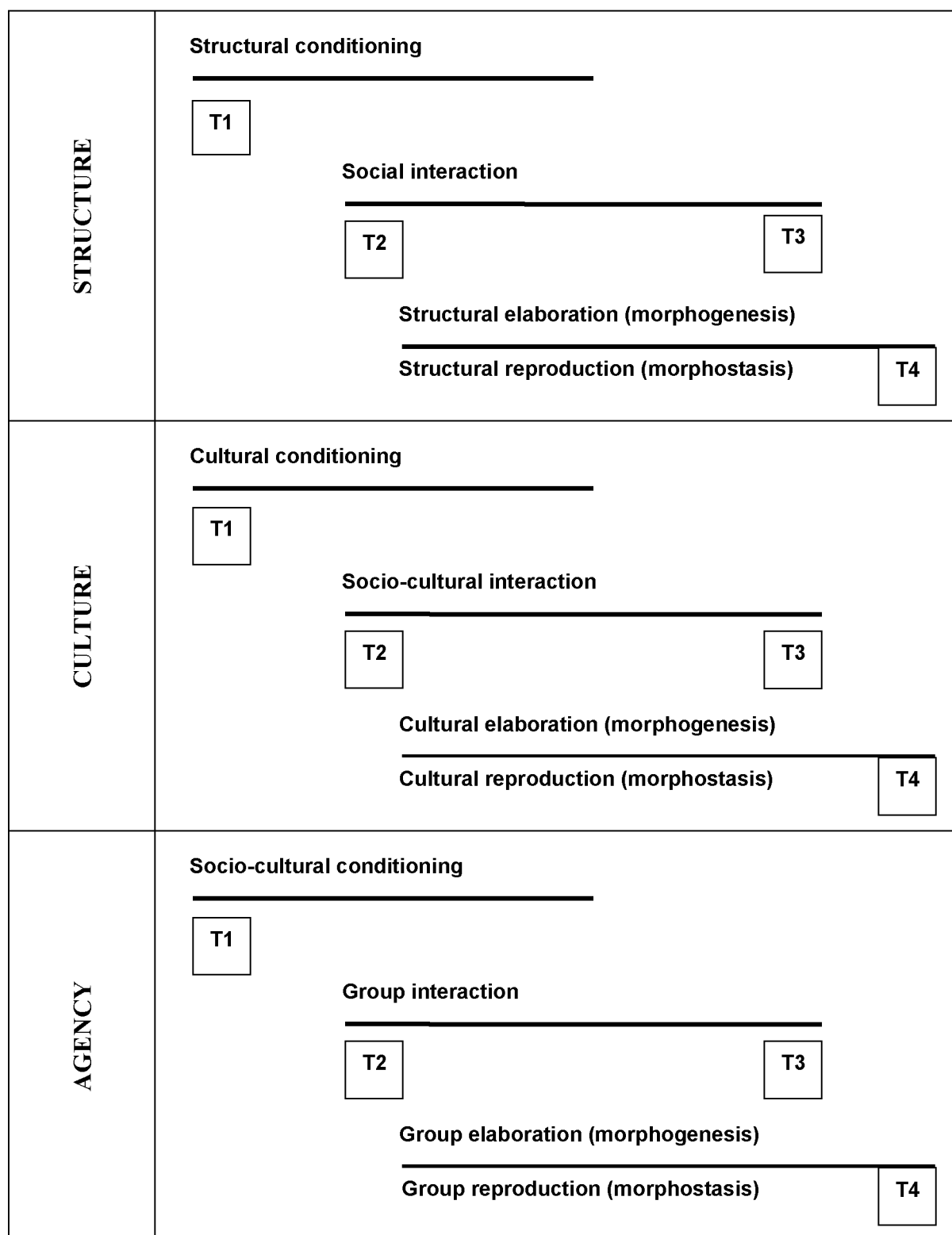


Figure 3.1: Archer's morphogenetic approach
 (Archer, 1995, p. 157; Archer, 2003, p. 3)

Archer's morphogenetic approach has enabled me to do three things. Firstly, it has assisted me to identify the structural and cultural mechanisms that have given rise to teachers' identities

and the expression thereof in teaching FP mathematics. Secondly, her approach provides the tools to illuminate how teachers reflect and ‘act back’ on these structural and cultural mechanisms. Thirdly, her approach facilitates an explanation of when change or reproduction (stasis) occurs, and the conditions under which each occurs (Archer, 1995). In so doing, she provides a framework for me to examine the interplay between structure, culture and agency at the intersection of the particular morphogenetic cycles in my research (Archer, 1996). I consider the morphogenetic approach at two different times (T1): firstly, at the time where each of the four participants in my research decided to become teachers; and secondly in 2012, when I met them and generated the data for my research. The former is the focus of Chapter Five and the latter the focus in Chapter Six and Seven.

The practical application of morphogenesis/morphostasis is premised on four propositions relating to structure and culture. I highlight here the elaboration of the four propositions in relation to culture, although these four premises also relate to structure. I have chosen to focus on culture first, as I agree with Archer’s (1996) argument that there is a paucity of work within sociology that offers an elaborated account of culture, as distinct from structure. This is also reflected in the work on identity presented in Chapter Two. The four propositions thus include:

- (i) There are logical relationships between components of the Cultural System (CS);
- (ii) There are causal influences exerted by the CS on the Socio-Cultural (S-C) level;
- (iii) There are causal relationships between groups and individuals at the S-C level;
- (iv) There is an elaboration of the CS due to the S-C level modifying current logical relationships and introducing new ones (Archer, 1996, p. 105).

By way of further explanation all four propositions rest on the principle of analytic dualism. Proposition (i) highlights the components of the CS that are independent of current agents. Propositions (ii) to (iv) represent the three phases of the morphogenetic/morphostatic approach as described above and as reflected in Figure 3.1. The result at (iv) becomes the new (i) thus starting the next cycle within the morphogenetic approach (Archer, 1996). The above propositions not only relate to culture and structure, but also to agency, which I elaborate on later in this chapter. Drawing on these four propositions, I now offer an expanded explanation of the practical application of cultural, structural and agential morphogenesis, as this has informed both the design and analysis of my study.

3.4.1 Cultural morphogenesis

According to Archer (1996, p. 104) the CS consists of:

the corpus of existing intelligiblia²³ – by all things capable of being grasped, deciphered, understood or known by someone. ... By definition the cultural intelligiblia form a system, for all items must be expressed in a common language (or be translatable in principle) since this is a precondition of their being intelligible.

Archer (1996) distinguishes between the Cultural System (CS) and Socio-Cultural interaction (S-C). Separating the CS from the S-C level does not imply that the two are mutually exclusive. This is an analytic separation for methodological purposes in order to examine the interplay between the CS and the S-C level. The former represents “the world of the *products* of thought processes” (p. 105) that stand in logical relationships. The assumption is that there are ‘intelligiblia’ that exist independent of our knowledge of them, and that these ‘intelligiblia’ exist in logical relations of contradiction or complementarity with each other.

The S-C level is “the world of *thought-processes*”. These various thought processes stand in *causal* relationships with each other (Archer, 1996, p. 105). Examining the interplay between the CS and S-C requires that one distinguishes logical relations from the causal ones (Archer, 1996). The logical relations at the CS level are either contradictory or complementary. While the CS is constructed by people, over time, it is capable of acting back on people (Archer, 1996). Examining the interplay between the CS and S-C requires a focus on how the contradictory and complementary relations in the CS (‘parts’) map onto relationships that are harmonious or conflictual at the S-C level (‘people’). It is this interplay that gives rise to stability (morphostasis) or change (morphogenesis) (Archer, 1995, 1996, 2000).

In this research I attempt to establish the logical relations in the CS that impinge upon the projects of teachers. In other words, I focus on identifying the ideas, theories, beliefs and values that condition the situations that the teachers, as agents, find themselves in. This requires that I ‘look back’ to examine the present (T1). As I explain in Chapter Four, the life history interviews, mathematics history interviews and my reading of South African history, and specifically the education system, enabled me to identify the SEP and CEP conditioning the emergence and expression of teachers’ identities through the teaching of mathematics.

²³ ‘Intelligiblia’ refers to all knowledge (i.e. that which is transitive).

Numerous theories, ideologies, beliefs and values were developed prior to the present (inter)action and these constrain or enable (inter)action at the S-C. My analysis, however, does not contain a fully itemised list of possible contradictions and complementarities in the CS, as this would be impossible. Rather, I begin the participants' narratives in Chapter Five with their respective decisions to become FP teachers and continue their narratives in Chapter Six and Seven with an analysis of teachers' identities.

Once I have identified the 'intelligibilia' at the CS level that impinge on the (inter)actions of teachers, my analysis shifts to consider the effects of subscribing to ideas, in particular, logical relations and the situational logics (broad contexts) teachers find themselves in. My focus thus moves to the S-C level and I examine the responses of the teachers to their situations. The life history, mathematics history, practices interviews and classroom observation that are explained in Chapter Four, are all useful in identifying how teachers respond to the SEP and CEP that condition their teacher identities and expression through the teaching of mathematics. These form the foci of Chapters Five, Six and Seven.

While teachers, as social actors, are conditioned by the CS, they also have the capacity ('cultural freedom') to 'act back', either reinforcing or resisting the influences of the CS. The extent to which the power and interests of social actors match with the situational logics they confront, influences the extent to which they support or resist the CS. In other words, it is at the intersection between the CS and S-C that cultural stability or instability is first identified, and where persons, individually and collectively, become aligned or separated from the CS (Archer, 1996). Despite the CS containing the beginnings of contestation, it is only the S-C action over time that leads to its development, whether that be morphogenesis or morphostasis.

Referring to the four propositions in relation to the morphogenetic cycle mentioned above, Archer (1996) argues that proposition (i) puts forward the conception of a stratified reality in the cultural domain between the CS and S-C levels by drawing on analytical dualism. The same applies to the structural domain where a distinction is made between the Social System (SS) and Social Interaction (SI). The propositions of (ii), (iii) and (iv) correspond in the structural and cultural domains and relate to each of the three morphogenetic cycles as noted in Figure 3.1. Propositions (ii), (iii) and (iv) are contingent however, on proposition (i). This makes up the explanatory and analytic morphogenetic framework for both culture and structure (Archer,

1996, p. 275) which I use in Chapter Five, Six and Seven. Next I provide an elaborated explanation of structural morphogenesis.

3.4.2 Structural morphogenesis

As explained above, Archer (1995) distinguishes between the social structures (SS), also referred to as the social system, and social interaction (SI). Drawing on the same four propositions which form the explanatory framework for morphogenesis of culture, Archer (1995) argues that there are relations between the mechanisms within SS (and between the SS and CS), which exert causal influences on SI. In addition, causal relationships exist between individuals and groups at the SI level, and it is the interaction at the SI level that leads to the conditioning or elaboration of SS (Archer, 1995).

All structural influences, in this case the generative mechanisms and powers of SEP, condition the contexts that people find themselves in. The SS is stratified according to three levels namely, institutional, roles and positional. These are hierarchical but nested. In other words, the higher levels (i.e. institutions) impact on the lower levels (i.e. positions). Structural emergent properties impinge on agents by shaping the contexts they encounter at many levels. In other words, contradictions at the institutional level will impact on the roles available and the roles available affect the position and life chances of people. Agential (inter)actions, in contradistinction to the downward effect of social structures, work upwards in an attempt to bring about change in each of these levels (Archer, 1995, 1996, 2000).

The *positional level* refers to the conditions people are born into (e.g. privileged or underprivileged). We begin life stratified and each generation has different interests and seeks to either maintain their advantage or improve their situation (Archer, 1995). *Roles* are internally and necessarily related to others roles (e.g. teacher/learner) and to material necessities (e.g. classrooms, schools, resources). Archer (1995) drawing on Bhaskar, differentiates between ‘systemic’ and ‘social’ roles, these being the difference between the role and the persons occupying that role. As I mentioned in Chapter Two, Bernstein’s (1996) work on official pedagogical identities similarly makes this distinction between the SS (e.g. official pedagogic identities) and SI (i.e. how teachers respond to these identities reflected through curricula). I elaborate on this in Chapter Six and Seven.

Roles have autonomy in the sense that they endow various occupants with different dispositions and personal characteristics. As a result, “different ‘performances’ of the same role ... leads both to role re-definition and personal development – through the process of double morphogenesis” (Archer, 1995, p. 186), that is morphogenesis of the role and the agent. In other words, as roles change, so the occupants themselves change. This requires that one differentiates between the properties of the role and those that pertain to the occupant. *Institutions* refer to “systems of established and embedded social rules” that either enable or constrain social interaction (Hodgon, 2006, p. 18).

Any account of structural and cultural conditioning that does not reify either structure or culture, requires an agent to mediate the process. The situations that condition the projects of agents are mediatory in that they either condition or enable the (inter)actions of agents. In other words, SS (and the CS) have tendential²⁴ powers, and it is only through the courses of action of agents, that these powers are activated. It is only when the agent has a particular project (goal) in mind that SEP and CEP and powers act as conditioning or enabling contexts, impinging upon the (inter)actions of agents. Agents are mediators of these tendential powers as they have their own PEP (e.g. reflexivity) and are able to respond to both structural and cultural constraints and enablements (Archer, 1995). The various aspects of this mediation process, operating on different timescales, are represented in the morphogenetic approach and particularly the morphogenesis of structure as highlighted in Figure 3.1. Propositions (ii), (iii) and (iv) in the morphogenetic approach represent each of those timescales.

There are numerous features of this mediation process that should be considered, particularly those that condition our situations, namely, our involuntary placement, vested interests, opportunity costs, degrees of interpretative freedom, and directional guidance. We are literally born into life chances that are not of our choosing (*involuntary placement*) at T1. These positions are conditioned by the *a priori* allocation of material resources. While persons are able to alter their situations and circumstances by T3, such confrontation carries costs. The involuntary placement of persons endows them with different vested interests. These *vested interests* are objective; “objective features of their situations which ... predispose them to different courses of action and even towards different life choices” (Archer, 1995, p. 203).

²⁴ Tendential, meaning that the structural (and cultural) mechanisms at the level of the real have a tendency to act.

In line with this, Porpora (1989) argued,

among the causal powers that are deposited in social positions are interests. Interests are built into a social position by the relationship of that position to other positions in the system. ... [Thus], capitalists have an interest in maximising profit because they are in a competitive zero-sum relationship with others occupying the position of capitalist. (p. 208)

Persons are thus motivated to act in accordance with their interests, which are aligned with their positions. While nothing suggests that agents advance vested interests, there are costs involved if they don't. *Opportunity costs* exert their influence upon the vested interests of agents in two ways: firstly, on the choice of projects available and secondly, on the extent that the project can be accomplished. Different opportunity costs are allocated to people differently situated for the same course of action and different courses of action are available to people depending on their life-chances and vested interests (Archer, 1995).

Acknowledging the mediatory process of structural (and cultural) conditioning, requires an understanding of the reflective powers of agency and the *degrees of interpretative freedom*. Agents make judgements about their courses of action in relation to the constraints, their vested interests and opportunity costs. These judgements are conditioned through their interpretations of the situation they find themselves in. In the same manner that agency generates structural and cultural elaboration or reproduction, so too, is social agency, itself, transformed or reproduced. This reflects a 'double morphogenesis', where agency is elaborated and, as such, generates structural and cultural elaboration too (Archer, 1995, 2000, 2015a). The morphogenesis of agency is of particular interest in my study, as it is through the projects of the teachers in my study, as accentuated in Chapter Five and Six, that their teacher identities and the expression thereof, through their teaching of mathematics, are reproduced or transformed. This next section elaborates on the morphogenesis of agency.

3.4.3 The morphogenesis of agency

Archer's theory of agency stems from a two-pronged critique of a social constructionist ontology. Firstly, she criticises social constructionism for its possible restraint in moving beyond the realm of the discursive. In adopting a realist social ontology, she suggests that human beings not only have discursive relations to the world, but also practical and embodied relations to reality. She thus makes a clear analytical distinction between the individual and the

social (Eteläpelto, Vähäsantanen, Hökkä, & Paloniemi, 2013) which is embedded in her account of the morphogenesis of agency.

Secondly, she criticises the flat ontology (Chapter Two) of social constructionism for proposing a one dimensional view of persons (Case, 2013). By contrast, social realism posits a stratified view of agency (person, agent and actor) which is based on a stratified view of persons (*self*, *personal identity* and *social identity*). Developing an understanding of agency and the morphogenesis of agency from a social realist perspective presupposes a particular understanding of identity. I subscribe to this view of identity in this thesis. It is the emergence of identity from a social realist perspective that I now turn to, before providing an account of the elaboration of agency.

3.4.3.1 A stratified view of persons: self, personal identity and social identity

Archer (2000, 2006, 2007a) critiques both ‘oversocialised’ and ‘undersocialised’ conceptions of identity, prevalent in social theory, for suggesting that persons are the products of society or the makers of society respectively. She proposes a view of people that accords “(i) temporal priority; (ii) relative autonomy; and (iii) causal efficacy” (Archer, 2006, p. 262). She posits a stratified view of persons each with their own properties and powers emerging from each of the four levels, that is, the self (a continuous sense of self), the person (personal identity), and the agent and actor (social identity). Each of these aforementioned aspects of persons develop as they engage in the three orders of reality – the natural, practical and social worlds. These three orders relate to Archer’s stratified view of reality. As persons we engage with all three orders of reality. We engage with organic relationships in the natural order, work relationships in the practical, and social relationships in the social order (Archer, 2007a). Underpinning the social realist explanation of identity and agency, is the recognition of a continuous sense of self (Case, 2013). Social identities are contingent on a continuous sense of self and co-dependent on personal identity. The personal identity assists in balancing, through the internal conversation (i.e. reflexivity), the social concerns with those embedded in the other two orders of reality (natural and practical orders). The development of personal and social identity is in many respects dialectical.

3.4.3.2 Continuous sense of self

Archer (2000, 2007a) suggests that as adults we are persons, agents and actors. Although not stable, this sense of self provides capacity for persons to know themselves over time. It is

developed in and through practice, as opposed to a concept of self which is social and discursive (Archer, 2000, 2007a, 2015a) and makes us all different agents and actors.

Like Bourdieu, Foucault and Giddens as highlighted in Chapter Two, Archer (2000, 2007a, 2015a) contends that identities emerge as we engage in social life. Departing from theorists who privilege discourse in the construction of identity, Archer places social practice as central in the development of self. As an explanation, ontologically we do things with objects (e.g. sitting on a chair), we differentiate them from ourselves, and assign them identity and transfactual²⁵ powers before we are able to name them or make an association between the name and the power of the object. Even with abstract ideas, as noted by Thomson (as cited in Collier, 1998), such as,

rest, dependence, expectation, obedience, virtue, wicked, heavy, round, bear on the face of them the marks of their concrete origin: to rest is to resist movement, to depend is to hang on, to expect is to watch out for, to obey is to listen to, virtue is manliness [*sic*], wicked is bewitched, heavy is hard to lift, round is wheel-like. (p. 50)

In this sense, it is through practice that language is acquired. The acquisition of language, however, initiates a new form of practice namely speech acts. Speech acts are regarded by both Bhaskar (1978, 2008) and Archer (2000) as deeds with causal power impacting on things in the world. Language is thus a causally efficacious practice because it is an emergent property. I consider the role of language in conditioning the expression of teachers' identities through the teaching of FP mathematics in Chapter Six.

Through our actions with the three orders of reality, identities of self and other(s) become specified. What this signals is that "language is not the 'great divide', for there is a genuine primacy of practice which yields reasoned knowledge non-discursively and which also underlies practical proficiency in the linguistic domain" (Archer, 2000, p. 151). The sense of self thus refers to a pre-linguistic 'self-consciousness'. This does not mean that the sense of self is unconceptual; it is conceptually formed, but "the theoretical work involved is performed and recorded in ways which are non-linguistic. The modality is practice and the medium of inscription is the body" (Archer, 2000, p. 124). In this sense the self is embodied practical 'know-how'.

²⁵ Transfactual powers refers to powers that are enduring and not transitive.

The argument for the centrality of practice implies that central to humanity are ‘doings’ as opposed to ‘meanings’. This is the challenge to theoretical positions that reify language, making epistemology prior to ontology (Archer 2000, p. 189) as seen in Chapter Two. Our crucial PEP, self-consciousness, self-reflexivity and ‘know-how’ about the world, emerge from the practical order. It is in and through practice that our potentials are realised. Explanations of being human cannot thus be distilled to ‘molecules’ (natural order) and ‘meanings’ (social order) but emerge from between the two. “The human being is both logically and ontologically prior to the social being” (Archer, 2000, p. 190).

What Archer (2000) has proposed is the development of a sense of self which makes us all unique. This is not the same as our personal identity. The emergence of personal identity from self is also developed in and through practice, but depends on our constellation of concerns with and about the world, in all three orders of reality, in which none takes automatic precedence. In establishing our ultimate concerns we define our personal identities, and this depends upon the activity of reflexivity, that is the ability of persons to ruminate about relationships between themselves and their social context (Williams, 2012).

The next section thus focuses on the development of our personal identities which I suggest in Chapter Five relates to the decision by the participants in my research to become FP teachers. As mentioned in Chapter Two, there appear to be numerous studies on teacher identity broadly and within the field of mathematics that focus on teacher identities specifically, but little credence is given to teachers’ personal identities and how each of these influence the other. Furthermore, Archer’s explanation of identity emergence foregrounds reflexivity, and it is this role on identity that I give prominence to in my research. In other words, I seek to expand on research on teacher identities by exploring the relationship between the personal and social identities of teachers, and the role of reflexivity in the emergence of teachers’ personal and social identities. This forms the basis of Chapter Five (personal identities) and Chapters Six and Seven (social identities).

3.4.3.3 Personal identity

As with the emergence of self, personal identities emerge through practice as persons engage with a stratified world (natural, physical and social). However, personal identities are based on what people care about (i.e. their concerns) in the world. From each of the three orders of the world, a distinct concern emerges: physical well-being (natural order), performative

competence (practical order) and self-worth (social order) (Archer, 2007b). Linked to this (inter)action with the world and the emergence of identity, is emotionality and emotional development. Archer (2007b) argues that our emotional development is part of identity emergence because emotions express that which is important to us. Quoting Elster, Archer (2000) suggests that “emotions matter because if we did not have them nothing else would matter. Creatures without emotion would have no reason for living nor, for that matter, committing suicide. Emotions are the stuff of life” (p. 194). Put differently, emotions are commentaries related to our concerns in the world. In this sense, they are both real and relational to our concerns, which give them their emergent character. They are central to what we care about, and how we act in relation to what we care about. The PEP of reflexivity, the internal conversation, enables persons to reconsider, express, examine and transform their emotional commentaries, thereby constituting personal identity (Archer, 2000, 2007a, 2012, 2015a). For my research, this view is particularly appealing because it is the emotional commentaries of the teachers, as mediated through their reflexivity, which assists them in identifying their concerns in the world, in the profession and in teaching.

The role of reflexivity is thus central to understanding identity. As people, we have to distinguish our ultimate concerns from subordinate ones, as it is possible and likely to have concerns emanating from our emotions in each of the three orders of reality (natural, practical and self-worth). The possibility also exists that these concerns are not compatible. Decisions of this nature (identifying ultimate concerns from subordinate ones) require us to evaluate each in relation to the consequences for self through our internal conversations (i.e. weighing up the positive and negative opportunity costs to be endured).

Delineating our ultimate concerns involves the DDD scheme (discernment, deliberation and dedication), representing T2-T3 of the morphogenesis of the person. *Discernment* involves a preliminary review of the projects that are deemed worthwhile pursuing, which in turn involves both a judgement of worth and of emotional attraction (Archer, 2000, 2015b). Discernment is a dialogue, an internal conversation that compares the things we do, with what we have done and what we wish to do in the three orders of reality. In other words, it is the process of ‘registering’ our concerns for consideration. *Deliberation* is the actual process of review; it is a period of question and answer exchanges and negotiation by the person. During this process, the relative worth of our concerns emerge, but the self still has to decide whether it has the emotional energy to see these projects through. This is where the process of dedication comes

to the fore. *Dedication* is the process of making decisions which the person can live with. It requires prioritisation and ascertaining our ultimate concerns, and thus, the costs of relegating other concerns have to be carefully considered. These decisions are inherently fallible meaning that they may not actually be suitable decisions (Archer, 2000).

This reflexive process of discernment, deliberation and dedication is the process of developing personal identity. Archer (2000, p. 241) explains that as the consecutive moments of the conversation end we,

have constituted ourselves by identifying the self as being-with-these-concerns. The self and its reflexive awareness have been continuous throughout the conversation, but on its completion *the self has attained a strict personal identity through its unique pattern of commitments*.

Thus the process of developing personal identity requires knowledge about self, the world and the relations between the two. It is this conception of personal identity that I use in guiding my study and in the analysis of the data in Chapter Five.

In identifying our ultimate concerns, we develop specific courses of action “so that concerns lead to projects, and projects lead to stable practices” (Kahn, 2009, p. 263). It is in pursuit of projects that people confront structural and cultural enablements and/or constraints, in relation to their projects. Projects are then adjusted in accordance with these constraints and enablements (Archer, 1995).

In summary and relating to my research, my consideration of the emergence of the personal identities of the teachers in my study begins with their unavoidable involvement as persons in the three orders of reality. This research thus explores and details how the teachers in my study establish their concerns in the world. In Chapter Five, I elaborate on how their concern to improve their economic disadvantage and find professional employment, informed their ultimate decision to become FP teachers. In both processes of personal and social identity emergence, “the internal conversation is never stifled: we remain active subjects in our own lives and do not become passive objects to which things happen – this is our human power of personal integrity” (Archer, 2000, p. 249). As I show in Chapter Five through my empirical data, the process of deciding one’s ultimate concern is not simply one of free-will. We do not make our personal identities under circumstances of our own choosing, for we are embedded

within the three orders of reality and our placement within these orders is involuntary (Archer, 2000). However, it is through the PEP of reflexivity that we, as agents, are able to ‘act back’ on the context in which we find ourselves.

The next section expands on the concept of social identity that I draw on in this study.

3.4.3.4 Social identity: the elaboration of agency

What makes the social realist approach to the development of social identity distinct from that of other theorists, as explained in Chapter Two, and of particular appeal for my research, is the granting of emergent properties and powers to structure, culture and agency. The PEP of the self and personal identity, on which SEP and CEP act, leads to the elaboration of ‘agents’ and ‘actors’ (our social identity) (Archer, 2000, 2015a, 2015b). “Archer inserts the person with all their personal emergent properties and powers into the social and cultural context whose constraints they mediate and navigate” (Case, 2013, p. 60). The development of social identity involves a *double morphogenesis* where agency, while leading to structural and cultural elaboration (or reproduction), is itself elaborated (or reproduced). In other words, the same event that brings about structural and cultural change, also brings about systematic change of ‘agency’. The emergence of social identity thus occurs at the intersection of structure, culture and agency (Archer, 2000, 2015a, 2015b).

Emerging from this interface are the concepts of *agent* and *actor*, both accounting for our social identities. The expression of our concerns in our social roles and the manner in which we do this, refers to our social identity (Archer, 2007b, 2015a, 2015b). The social identity acts back on the personal identity, reflecting the interplay between the two. *Primary agents* and *corporate agents* emerge. Archer (2000) suggests that both of these agents are plural/group identities. In understanding the emergence of social identity which takes place over time, it is necessary to explore the phases involved. These are summarised as follows:

- (i) The development of primary agency on the human self by society;
- (ii) The development of corporate agency; which is the collective transformation of primary agents in order to transform society; and
- (iii) The development of actors through the social roles available (Archer, 1995, 2000, 2015a).

Everyone is a primary agent, defined as “*collectives* sharing the same *life chances*” [italics added] and the result of the involuntary placement of persons in the distribution of society’s resources as ‘privileged’ or ‘underprivileged’ (Archer, 2000, p. 261). Corporate agency, meaning an organised group (Williams, 2012), is the result of the collective action of people attempting to bring about social change (e.g. a teachers’ union). Here, the influence of primary agents on society extends beyond “a mere aggregate impact, and through planned, strategic, joint action serve to elaborate society” (Williams, 2012, p. 309). While both primary and corporate agency have the potential to bring about structural and/or cultural morphogenesis, primary agency is mostly passive while corporate agency is active and coordinated action (Case, 2013). Corporate agents influence the context for all agents, whether all want it or not and the (re)actions of primary agents change the situations for corporate agents (Williams, 2012). Not all primary agents automatically become corporate agents. Added to this account is the dialectical relationship between social and personal identities. It is this interplay that assists people in monitoring their concerns, commitments and doings within society (Archer, 2000, 2015a, 2015b).

“Actors ... acquire their social identity in the way in which they personify the roles they choose to occupy” (Archer, 2000, p. 261). In other words, for my purposes, how teachers express their roles as teachers *is* their social identity. It is worth noting that these choices are always conditioned by the situation one is involuntarily placed in. Personification of a particular social role (e.g. teacher as mediator, teacher as carer) involves “finding a role(s) in which they feel they can invest themselves, such that the accompanying social identity is expressive of who they are as persons in society” (Archer, 2007a, p. 17). While roles are identified and emerge through our deliberations about our ultimate concerns (personal identity), “we experiment with personifying the role and reflexively evaluate by attending to the emotional commentary on our concerns” (Williams, 2012, p. 316). In other words, becoming a teacher (a social actor) means occupying various systemic roles and how teachers choose to personify those roles relates to the choices they make in relation to their (inter)action with the three orders of reality. The development of the social actor requires a *triple morphogenesis* (Archer, 2000). In this case, the morphogenesis of agency is coupled with both the morphogenesis of structure and culture plus the morphogenesis of the actor.

Thus, the emergence of personal and social identity – cognitive and affective – takes place through continuous internal conversations (i.e. the capacity to deliberate reflexively about our

commitments and concerns). Reflexivity enables persons “to consider themselves in relation to their (social) contexts and vice versa” (Archer, 2007a, p. 3). These deliberations, although fallible, enable people to evaluate their situations and determine their concerns and future actions. In relation to the morphogenetic cycle, structural and cultural mechanisms condition agency at T1, but agency has its own properties and powers (PEP) and it is through the (inter)actions of agents at T2-T3 that structural and cultural reproduction or elaboration can result at T4. In so doing, agency can also be transformed. Agential reflexive deliberations play a mediatory role between structure and agency because it is only through the projects of people, based on their ultimate concerns, that structural and cultural enablements and constraints are activated. Although all people show concern for each of the orders of reality, we each prioritise differently (Archer, 2012).

Understanding the relationship between SEP, CEP and PEP and the extent to which they constrain or enable the actions of teachers, is paramount in my research because my research seeks firstly to examine the roles that structure, culture and agency play in the emergence of teachers’ personal identities (Chapter Five). Secondly, my research considers the structural, cultural and agential mechanisms that condition the expression of teachers’ identities (the expression of their roles as teachers) in the teaching of FP mathematics (Chapters Six and Seven). The mediatory process of reflexivity enables the four teachers in my research to react to the contexts in which they find themselves. In addition it influences the different ways in which they navigate their way in the world (Archer, 2000). It is also through this process, which is always fallible, that they hope to control, in some respects, their own lives and become something they wish to become within the array of roles available to them in their social contexts. This will become evident in Chapter Five when I elaborate on the SEP and CEP that gave rise to the career choices available to the participants in my study and how their deliberations (PEP) with regards to these choices led them to become FP teachers.

The PEP of reflexivity, which I elaborate on below, is important in my study as it enables the teachers to deliberate about their concerns in order to ascertain their ultimate concerns and to ‘act back’ on the SEP and CEP that condition their personal and social identities, and the expression thereof in the mathematics classroom.

3.4.4 Reflexivity in the morphogenesis of agency

Reflexivity is central to the emergence of both personal and social identity and of the social actor (Williams, 2012). For Archer (2007a) reflexivity is “the regular exercise of the mental ability, shared by all normal people, to consider themselves in relation to their (social) contexts and vice versa” (p. 4).

According to Archer (2003, 2007a, 2012, 2015a, 2015b) the internal conversation, our ability to deliberate about our concerns in the world, mediates the effects of social structure on agency. However, this mediation is dependent on agents and their ability to exert their personal properties and powers to formulate personal projects and to monitor both self and society in their quest to implement these projects. Archer (2003) notes that what is interesting about people is how they *relate* to structural and cultural constraints and enablements through the projects they develop, the monitoring of their concerns, and the practices they establish.

The mediation of social structure and the cultural system is a three stage process:

- (i) Structural and cultural properties and powers shape the contexts that agents find themselves in;
- (ii) These structural and cultural properties and powers have the potential to enable or constrain the projects of agents. They are activated or remain unexercised depending on agents’ subjective projects;
- (iii) Agents, through the process of internal conversations (re)define and (re)configure their projects in relation to the situations they confront (Archer, 2003).

Archer (2003) argues that everyone is a reflexive being and that we are able to deliberate about the situation we find ourselves in, in relation to our concerns, thereby developing courses of action or projects. The internal conversation is the mechanism for these deliberations. While everyone is reflexive, the manner in which we exercise our reflexivity differs from person to person. A persons’ internal conversations relate to different modes of deliberation and to their ultimate concerns in the world. The four modes of deliberation identified through research conducted by Archer (2003, 2007a, 2012) include: *communicative reflexive*, *autonomous reflexive*, *meta-reflexive* and *fractured*. These modes of reflexivity are not reducible to the psychological because of the structured nature of the contexts that people find themselves in (Archer, 2007a). Importantly, Archer (2003) emphasises that people can move from one mode

of reflexivity to another and thus the reflexives are not fixed personality types. The extent of persons' contextual continuity or discontinuity influences their modes of reflexivity and the concerns they prioritise (Kahn, 2009). I draw on these modes of reflexivity in my research (Chapters Five and Seven) and therefore elaborate on them in detail below.

3.5 MODES OF REFLEXIVITY

While the internal dialogues of *communicative reflexives* are initiated in their own minds, people do not always trust their internal deliberations and depend on others close to them to complete their conversations for them. Their pattern "is one of 'thought and talk'" (Archer, 2003, p. 167). All communicative reflexives share three common features: firstly, 'contextual continuity' (e.g. geographic, stable group of interlocutors, occupational) which they tend to replicate; secondly, success with dovetailing of concerns by foregrounding the social order (i.e. family and friends); and thirdly, contentment with their decisions. The projects that communicative reflexives envisage, within the context of their involuntary placement, do not trigger social constraints. An effect of communicative reflexivity is the fostering of social immobility, reproduction and morphostasis. Social immobility is not the result of passive agents, but rather considered deliberation which is dependent on active agents (Archer, 2003, 2007a, 2012). For Archer (2007a) "'staying put' has to be worked at by an active agent" (p. 158).

Autonomous reflexives are the antithesis of communicative reflexives. Initial 'contextual discontinuity', whether forced on people or of their own making, fosters self-reliance and the view that they should make their own way in the world. The genesis of autonomous reflexives provides conditions for an individual with faith in his/her own standards and a certainty in relation to knowing what is 'right from wrong' based on a moral pragmatism gained through his/her own experiences. Generally, autonomous reflexives distance themselves from social normativity, as they are not particularly interested in participating in society other than economically (Archer, 2007a). By that I mean they are not likely to participate in socio-political structures.

Three key features of autonomous reflexives are firstly, their readiness to move away from their natal context, secondly, their unproblematic dovetailing of their concerns although they tend to change their ultimate concern as they learn about themselves and the world, and thirdly,

their individualism (Archer, 2003). Autonomous reflexives envisage their projects which are primarily related to their career and work. These projects often bring about contextual discontinuity as people move between career options. At the same time they foster social mobility and morphogenesis. As individualists (in their personal and political lives), they are independent and self-sufficient and are inclined to keep their reflexive deliberations to themselves (Archer, 2003).

Meta-reflexives engage with their own reflexivity; they are not only solely concerned with the propositions of the internal conversation, but also with *why* the propositions are ‘uttered’. In this sense, they constantly self-monitor. Three key features of the meta-reflexives are firstly, they experience discontinuity of their natal context (as with the autonomous reflexives), secondly, they experience difficulty dovetailing their concerns, and thirdly, they wish that others could share their ultimate concern. Meta-reflexives have difficulty completing the “concerns – projects – practices” sequence to their satisfaction (Archer, 2007a, p. 88). They are social critics and idealists and have difficulty establishing projects that will enable them to live up to their ideals. In a sense, they value above all else values, as they attach a value commitment to the three orders of reality. Trying to fit ‘who they seek to be’ with the social environment proves a challenge in developing sustainable and satisfying projects related to their ultimate concern (Archer, 2003, 2007a). No structural context ever matches their cultural ideal and thus their internal conversation is perpetually focused on self and society. Meta-reflexives “are therefore practical dialecticians, people who practice the dialectics of objectivity and subjectivity, which is why there is no lasting set of established practices for them – no final *modus vivendi*” (Archer, 2003, p. 288).

While the stance adopted by communicative reflexives is ‘*evasive*’ and autonomous reflexives ‘*strategic*’, the stance adopted by meta-reflexives is that of ‘*strong evaluators*’, which I would term ‘critics’, as they continually evaluate (inter)actions in relation to their ideals, through their internal conversations (Archer, 2003).

Fractured reflexives refer to people whose reflexive PEP have been temporarily suspended and who are no longer able to deal with the objective environment that they confront. They are both ‘displaced’ and ‘impeded’; unable at a particular moment in time to hold a conversation with themselves about their circumstances. While they are still capable of internal conversations,

this self-talk is unable to provide them with guidance about what to do in practice. Archer (2003) contends that ‘fractured reflexives’ are passive agents because,

their subjectivity makes no difference to the play of objective circumstances upon them. Their mental activities (whose existence is not denied) perform no mediatory role for them; they permit no intentional relationship between self and society. In short, they make no difference. (pp. 299-300)

The first three modes of reflexivity have agents who are able to take a *stance* towards society. In other words, they can direct their PEP towards society in a systematic manner that facilitates the achievement of their ultimate concerns. However, this is not possible for fractured reflexives.

Archer (2012), like Giddens, suggests that late-modernity has foregrounded the imperative for reflexivity. Contemporary society is perpetually in a state of flux and the social contexts that persons find themselves in, differ from those in which persons started their lives. She argues that the increase in geographic mobility, greater cultural diversity and increased levels of education, all work against contextual continuity and the emergence of communicative reflexives. The social guidelines of the past are no longer suitable in assisting people in making choices and defining their projects (Caetano, 2014). Archer (2012) contends that the rise of contextual incongruence and discontinuity have produced conditions that are favourable for the emergence of autonomous reflexives and meta-reflexives. Furthermore, “the reflexive imperative accentuates the fallibility of personal projects which increases the number of individuals who are unable, even if only temporarily, to guide their actions reflexively, revealing a fractured reflexivity” (Caetano, 2014, p. 63).

These four modes of reflexivity provide an analytic framework for analysing teacher identities. In this respect, the analysis of the lives of the teachers in my study suggests that their modes of reflexivity are either communicative or autonomous. I suggest that this could be a result of the particular context within which they grew up; a context of economic, social and political injustices and inequality. This forms the focus of Chapters Five and Seven.

3.6 THE INTERPLAY BETWEEN STRUCTURE, CULTURE AND AGENCY

In this section, I summarise the concepts discussed above and in particular their relation to my research. I draw on social realism generally and specifically on Archer's morphogenetic approach to identify the emergence and expression of teachers' identities (personal and social) in teaching FP mathematics. The conceptual tools informing my research are based on those implicit in both a critical and social realist position.

The first key notion is emergence; this is the idea that there are preconditions that have generated teachers' identities and the expression thereof. I show in Chapter Five and Six that these preconditions are generated at the intersection of structure, culture and agency. The second notion is that of analytic dualism. This notion enables me to separate the structural, cultural and agential emergent properties, in order to ascertain the extent to which each gives rise to teachers' identities and the expression of these identities in teaching FP mathematics in the context of Grade 3 classrooms in Lwandle in the Eastern Cape.

Ascertaining the emergence and expression of teachers' identities in and through the teaching of mathematics, assists me to undertake a historical analysis of the teachers' (life and mathematical) histories. Further, it enables me to identify mechanisms (SEP, CEP and PEP) that have given rise to the four teachers' identities. Interviews coupled with observations in the classroom provided me the opportunity to examine the expression of teachers' identities in the mathematics classroom and how the SEP, CEP and PEP condition their teaching.

In Archer's (1995) words,

the kind of explanation which the morphogenetic approach proffers takes the form of analytical histories of emergence for the practical issue under investigation. It does so by examining the interplay within and between the three cycles ... [it is] a tool for examining the dynamics by which the 'parts' and the 'people' shape and re-shape one another through their reciprocal interaction over time. (p. 194)

While I recognise that objectivity and subjectivity, structure and agency, and identity and teaching are intertwined, the morphogenetic approach enables me to ultimately tell a single story (Archer, 1995).

My decision to situate my research within a social realist orientation in general and Archer's morphogenetic approach in particular, has not been without its challenges. While I elaborate on this in the conclusion, it is necessary to provide an indication of some of these challenges in this next section.

3.7 LIMITATIONS AND RELEVANCE OF ARCHER'S SOCIAL REALISM TO THIS STUDY

Archer has been criticised for her rejection of Bourdieu's concept of habitus. She argues that habitus offers a deterministic account of the development of self and ignores the role of reflexivity in the emergence of identity (Sayer, 2009). She contends that in late modernity the notion of habitus has limited value. Society is in a constant state of flux which does not allow for the settling of unconscious embodied dispositions (Archer, 2012). Bourdieu (2010) does minimise the role of reflexivity in the formation of the habitus, suggesting that it is a process of unconscious adaptation. As with Sayer (2009) and Elder-Vass (2007, 2010) I contend that dispositions can become internalised by the person through repetitive actions and practices. Despite Archer's claim against Bourdieu's concept of the habituation of practices, it does not necessitate that one ignore the internal conversations of actors and the role reflexivity plays in mediating the structural and cultural mechanisms that constrain or enable the practices of agents. Like Elder-Vass (2007, 2010) I posit that the two are not mutually exclusive. I provide further justification for this below.

Archer's empirical work, in which she focuses on the role of reflexivity in enabling persons to deliberate about themselves in relation to their social context, is extensive. However, it was all conducted with young adults in higher education contexts. She explains that personal identity emerges with maturity (Archer, 2012). If this is so, then one could surely argue that young people embody dispositions that is a habitus developed during their early years and their schooling. Numerous academic scholars have suggested that Archer's theory and Bourdieu's notion of habitus in analysing social practices, could be seen as complementary (Elder-Vass, 2007, 2010; Sayer, 2009; Caetano, 2014).

Furthermore, Archer (2012) argues that the life histories of the parents of current young adults are markedly different from the experiences of young adults today:

Correspondingly, and especially over the last quarter of a century, socialisation has been decreasingly able to 'prepare' for occupational and lifestyle opportunities that had not existed for the parental generation: for social skills that could not become embodied (stock-market trading or computer programming), needed continuous upgrading, and readiness to re-locate, re-train and re-evaluate shifting *modi vivendi*. (p. 136)

As I demonstrate in the presentation of the empirical work in Chapter Five, Six and Seven, despite the change in South Africa with the election of the first democratic government in 1994, and the reforms that ensued, two of the teachers' lives in this study are still predominantly one's of contextual, geographic and occupational continuity.

One of Archer's most significant contributions to the field of social science research, is the role that she assigns to reflexivity in mediating between structure, culture and agency. However, she has been criticised for privileging the internal conversations and seemingly ignoring the role that external conversations between people in different social contexts play, in relation to defining and negotiating personal concerns and the projects emerging from those concerns (Caetano, 2014). Archer does acknowledge the role of external conversations, particularly with significant others (i.e. people who the communicative reflexive feels they can trust and share their deliberations with) in defining the projects of communicative reflexives, as communicative reflexives are reliant on persons who they trust to assist them in deliberating their concerns and related projects.

One of the challenges I have experienced in drawing on Margaret Archer's morphogenetic approach as the theoretical framework for this study, has been the paucity of examples of research that have used her morphogenetic approach, particularly within the field of education. Although Archer's own Doctorate in Philosophy (PhD) focuses on the education system in France, and there are subsequent studies drawing on Archer's work in higher education, there is a dearth of research that uses her framework to understand micro-level contexts such as a FP classroom. It seems that the potential of Archer's framework for empirical research, particularly at the micro-level, has thus still not been realised (Carter & New, 2004). In this respect, my research contributes to understanding both the opportunities and constraints for understanding teachers' identities when considered in the classroom or other micro-level contexts.

I am aware that relying heavily on one significant theorist could be considered as a “one-dimensional approach to research” (May, 2001, p. 29), as it is unlikely that a single theoretical lens is able to explain the phenomenon fully. However, my intention has been to ascertain what new insights can be illuminated by drawing on a novel explanatory and analytic framework. I have drawn on a number of substantial theorists in Chapter Two and on previous research on teacher identity generally, and within the field of mathematics in particular. Furthermore, as I will explain in Chapter Four, the thought processes that I used in analysing my data involved the process of abduction which is the practice of redescribing a phenomenon in a different way. Archer’s social realism has enabled me to do just that.

3.8 CONCLUDING REMARKS

This chapter provides the theoretical and analytical guidelines for my research. This social realist framework, namely Archer’s morphogenetic approach, is underlaboured by a critical realist philosophy. Drawing on Archer’s morphogenetic approach, the chapter explores the interaction between structure, culture and agency as a tool for analysing and theorising. The morphogenetic approach provides the explanatory and analytic tools that enables me to do three things:

- (i) Identify the structural and cultural properties that condition the lives, identities and expression of these identities, through the teaching of mathematics at T1;
- (ii) examine the process of mediation of these structural and cultural properties and powers, and the interactions between individuals and groups when teachers’ (inter)act in the world and express their identities as teachers of FP mathematics at T2-T3; and
- (iii) explore the extent to which this (inter)action leads to morphogenesis or morphostasis of the social and cultural systems and the person at T4.

Three key and necessary conceptual tools underpinning this are temporality, analytic dualism and emergence. These form part of Chapter Five, Six and Seven in this thesis, where the empirical data is presented and analysed.

The next chapter focuses on the methodology informing my research which emerges from the critical and social realist stance that I have chosen to adopt in my study.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 INTRODUCTION

Ensuring the quality of the research process was key to my research. In this regard, I made sure that the research questions, ontology, epistemology and methodology cohered. While Danermark et al. (2002) suggest that critical social scientists embrace “critical methodological pluralism” (p. 152) as “there is no such thing as the method of critical realism” (p. 73), it was necessary for me to ensure that the methodology I chose would be well suited to the phenomenon I studied.

Uncovering the causal mechanisms *giving rise to teachers’ identities* and their expression through the teaching of Foundation Phase (FP) mathematics, required a deep understanding of the context of teachers’ lives beyond the confines of the classroom and the school. It was this emphasis of *context* that drew me to a case study as a method suited to in-depth, small-scale research where an exploration of context is seminal to the research process.

In generating a hermeneutic understanding of the research questions initially, I drew on the data collection tools of interviews and observation. Observation of teachers’ teaching mathematics *in the classroom* was vital in my research as I chose to examine the expression of FP teachers’ identities in teaching FP mathematics. I argued in Chapter Two that it is the use of observation in the classroom that is absent in much of the research on teacher identity.

As with all social realist research, my research attempts to move beyond description and interpretation, typical of hermeneutic research. It “explicitly addresses, the theoretical constructions that the researcher brings to, or develops during, the study” (Maxwell, 2012, p. 140). Analysing and inferring from the data involved the thought processes of abduction and retrodution. These are typical thought processes employed by critical and social realist researchers. I was able to (re)describe and (re)contextualise the phenomenon that I studied through the process of abduction. The phenomenon is (re)described through a social realist lens. Retrodution, specifically by the asking of transfactual questions, enabled me to identify

the structural, cultural and agential mechanisms that conditioned the emergence and expression of teachers' identities in teaching FP mathematics.

These thought processes assisted me in generating explanations of the intransitive dimension, which consists of the structural and cultural mechanisms at the level of the real. It is these mechanisms that give rise to events and experiences in the world and the transitive dimension, which consists of my explanations of the real. The explanations that I produced to explain the intransitive dimension are always open to review and contestation. I thus drew on the process of judgemental rationality to assist me in making "truth-claims" (Easton, 2010, p. 118).

In ensuring the quality of my data and data generation processes, I reflect towards the end of this chapter on issues of validity, generalisability, ethics and positionality. Before doing this however, I describe the method chosen for my research, namely the case study.

4.2 CASE STUDY RESEARCH

Case study research is useful in understanding "complexities connecting ordinary practice in natural habitats to abstractions and concerns of diverse academic disciplines" (Stake, 2010, p. 142). This reference to case studies, points to my intention to identify the structural emergent properties (SEP), cultural emergent properties (CEP) and personal emergent properties (PEP) giving rise to teachers' identities and their expression through the teaching of FP mathematics.

Case study research is described as "a research method that involves investigating one or a small number of social entities or situations about which data are collected using multiple sources of data and developing a holistic description through an iterative research process" (Easton, 2010, p. 119). Put differently, it focuses on complex 'bounded systems' (Easton, 2010; Stake, 2010), as studying a single phenomenon in-depth supports the generation of 'rich data'. The single phenomenon I studied was teacher identity as expressed while teaching, therefore I spent an extended time on site, observing teachers and learning about their life and mathematics histories. In addition, I conducted interviews in which they reflected on their teaching. Based on these data generation methods, and by asking transfactual questions I was able to identify the structural, cultural and agential preconditions giving rise to the teachers' identities and the expression of their identities through the teaching of mathematics.

I chose the case study methodology for my research as it is particularly useful in studying a complex phenomenon such as teaching. It enabled me to examine the phenomenon of teacher identities in teaching FP mathematics in context (geographical, social, economic, political, local, national and global) with all the complexity that that entailed (Baxter & Jack, 2008; Easton, 2010). Two key perspectives on case study research I drew on, were those of Robert Stake (2010) and Robert Yin (2003). Both Stake and Yin base their case study methodology on a constructionist orientation. In other words, they argue that persons' understanding of the world and their experiences in the world are constructed. They thus give importance to human subjective experiences and meanings. However, neither of the two authors propose a complete rejection of objectivity, as radical constructivists do, rather, they embrace pluralism, with its "focus on the circular dynamic tension of subject and object" as opposed to relativism (Baxter & Jack, 2008, p. 545). Stake (2010) and Yin's (2003) view of the case study appears to be well suited to interpretive research, which is research underpinned by a constructionist orientation. My initial analysis of the data was interpretive and based on the level of the empirical, namely, that which can be perceived and observed. However, this was not sufficient for identifying the SEP, CEP and PEP at the level of the real (Chapter Three). I thus turned to the work of Easton (2010) who examines the use of the case study from a critical and social realist position.

For Easton (2010), the case study is also well suited to critical and social realist research as it provides an opportunity to study a phenomenon in-depth and comprehensively, in order to ascertain "*why things are as they are*" (p. 119). The intensive nature of case study research has enabled me to tease out complex relationships during the process of my research. The research was thus an iterative process which "implies a continuous moving back and forth between the diverse stages of the research project" (Verschuren, as cited in Easton, 2010, p. 119). I refer to the challenges I experienced with this later in the chapter, both in terms of the benefits and limitations related to the enactment of this iterative process in my research.

Social realist research thus attempts to move beyond description and interpretation typical of hermeneutic research. It "explicitly addresses the theoretical constructions that the researcher brings to, or develops during, the study" (Maxwell, 2012, p. 140). However, this research goes beyond describing concepts and theories, be they academic or every day, and sought to provide explanations of the events in the research. Social realist explanations generally include "meaning, behaviour, social structure and the interactions amongst these in a specific context"

(Maxwell, 2012, p. 182). The social science researcher has to move between abstract theorising and empirical work related to a concrete reality.

Flyvbjerg (2011) suggests that case study methodology foregrounds temporality as cases develop over time. In this research, the concept of temporality was particularly significant, as structure, culture and agency are viewed as temporally distinct, in that the structural and cultural systems predate the social and cultural (inter)actions of actors and that elaboration or reproduction of structures, culture and agents postdates the (inter)actions of actors (Archer, 1995). Likewise, as mentioned in Chapter Three, my research worked across two distinct time periods. In Chapter Five I focus on the deliberations of the research participants to become teachers, and in Chapter Six I focus on the participants as teachers.

The phenomenon of study in my research was the emergence and expression of FP teachers' identities through their mathematics teaching. The research recognised that this phenomenon was located within the context of the classroom, the school, the local environment, the education system, and the social and cultural systems. In other words, context impacted on the emergence of teachers' identities and what happened in the classroom.

Stake (2010) suggests that this research is an *instrumental case study* as it serves to provide insights into something other than the case itself (Stake, 2010). For me, the main interest was the surfacing of the SEP, CEP and PEP that had given rise to the case. The reason I chose four participants was to identify mechanisms that pertained to all four cases that could possibly lead to better theorising and be generalised across the four. The possibilities of generalising from case studies, despite their low representativeness, is explained later in the chapter. Although the research context was four Grade 3 classrooms in two schools, signalling some difference in the micro context, the overall context remained the same, as both schools were situated in Lwandle Township, an area characterised by extreme poverty. This specific research context, which impacted on the unit of analysis, is described later in this chapter and in detail in Chapter Six.

4.3 THE SITE

My research formed part of a larger project, referred to as the *European Union: Strengthening Foundation Phase Teaching and Teacher Education* (EU:SFTE). Together with the Education Faculties at Walter Sisulu University, Nelson Mandela Metropolitan University and the University of the Western Cape, Rhodes University formed a consortium, known as the Cape Consortium, with the goal of understanding *Quality Teaching and Teacher Education in the Foundation Phase* in the Eastern and Western Cape Provinces. As I will elaborate on later, the consortium negotiated access to 70 schools (10 in the Western Cape and 60 in the Eastern Cape). These schools had been purposively selected through a rigorous process designed by statistician Elize Koch and with the help of fellow researcher Yvonne Nsubugu in 2012. Purposive sampling involved the “strategic selection of where, when and from whom the data will be collected based on the objectives of the study” (Palys, as cited in Maxwell, 2012, p. 94) and in this instance, based on the aims of the project. The overarching project required the selection of a specialised group of schools; schools that most represented schools in the Eastern Cape. In this sense, the schools were in a specific context that could be studied in-depth by a range of researchers registered for Masters in Education (MEd) or Doctorate in Philosophy (PhD) qualifications.

Criteria for the selection of schools in the EU:SFTE project, included the language of learning and teaching (LoLT), geographical location (region and educational district), historical context, site of school, type of school and Quintile. From these schools, I chose for my study two schools that were regarded as low social-economic status (SES), and where the LoLT in the FP was isiXhosa. Chapters One and Six provide insight into the contexts of these schools. Education quality in these schools was deemed to be poor and learners were underperforming in all areas of the curriculum, including mathematics. As highlighted in Chapter One, teachers were viewed as having insufficient content knowledge and poor pedagogical practices. In many respects this gave rise to my research which sought to examine questions which are typically realist (i.e. ontological questions), questions that focused on *what is* and *how it emerged*.

4.4 THE SAMPLE

The sample in my research consisted of four isiXhosa Grade 3 FP teachers who lived and taught in Lwandle Township in the Eastern Cape. I have used pseudonyms for the teachers and the

schools and also for the area in which they lived and worked, as these schools and teachers are known to the District Office of the Department of Basic Education (DBE). I provide an explanation as to why this is the case, later in this Chapter, when I explore some of the ethical issues emerging during the research process.

These teachers were purposefully and conveniently selected from the initial EU:SFTE list of 60 schools located in the Eastern Cape Province. I choose to focus on Grade 3 teachers in these schools as they were teaching in the final grade of the FP. One of the dominant explanations for learner underperformance asserted at the start of this research process was teachers' poor content knowledge. As noted in Chapter One, the SACMEQ III data suggests that the majority of Grade 6 teachers do not have the required content knowledge²⁶ to teach Grade 6 (Venkat & Spaul, 2014; Van der Berg et al., 2016). Despite no local equivalent research, to my knowledge, having been conducted with FP teachers on their content knowledge, this explanation appears to be generally accepted. My own opinion is that this dominant explanation is problematic as it does not provide a nuanced understanding of underperformance in the FP. I thus purposefully chose to research Grade 3 teachers as I hypothesised there was a greater possibility that mathematics content knowledge would play a role in that grade than the earlier grades in the FP.

Convenient sampling involved selecting a setting and participants who were accessible. The sample was convenient in that geographic location played a role in selection. During the sampling process I realised that there was a township with three primary schools located geographically close to my place of work and residence. Knowing that I would spend up to four months in schools with the teachers, meant that selecting schools close to where I stayed and worked would significantly reduce the cost of my research in terms of travel time and expense. Although case study research is not explicitly about making generalisations, I further considered that choosing these three schools would enable me to make some claims about Grade 3 teachers in Lwandle Township.

²⁶ It should be noted that I refer in this section to 'mathematics content knowledge' in its narrow form, that is as the products of the discipline of mathematics, rather than, what Young (2011) refers to as "powerful knowledge" (p. 150). Powerful mathematics knowledge is the knowledge that generates the products of the discipline of mathematics (e.g. generalisation, proof, reasoning). My reason for adopting this narrow conception of 'mathematics content knowledge' here is that this is what Spaul (2013a) refers to when he suggests that a nation-wide proficiency would assess teachers' content knowledge and thus their capacity to teach mathematics. It is this narrow conception of content that I critique here.

While convenient sampling has been criticised because it interferes with finding settings and participants who can best assist in achieving the aims of the research study, purposive sampling is in itself not an exact science (Maxwell, 2012). In this research, the setting and participants were chosen to meet both the purposes of the project and my pragmatic needs for managing the research process. Fortunately, within the broader sampling, there were three ‘typical schools’ conveniently located for my research in Lwandle Township.

The intention was to work in all three primary schools in the area with two teachers at each school. However, given constraints related to the time required to be spent in each school and a variety of unexpected circumstances which I discuss later in this chapter, it was not possible to work in all three schools. As a result, apart from the pilot study, I worked in two of the three schools with four teachers (two teachers per school). The two schools were Sontonga Public School and Phambili Public School. Nokhaya and Veliswa taught at Sontonga Primary School while Beauty and Nomsa taught at Phambili Primary School. Chapter Six contextualises the research site and Chapter Five introduces each of the four teachers.

4.5 METHODS OF DATA GENERATION

Case study research usually involves the use of multiple sources of data; using more than one data generation method or using a data generation method multiple times (e.g. interviewing a participant multiple times each in a slightly different way or ensuring multiple occasions for observations) (Stake, 2010). Easton (2010) contends “it is only possible to understand social phenomena by recording and analysing the associated events that take place as a result of actors acting” (p. 123). In doing so, the data generation methods used in my research included interviews, observation and field notes as I explain below.

4.5.1 Individual interviews

Kvale and Brinkman (2009) suggest that the “qualitative research interview attempts to understand the world from the subject’s point of view, to unfold the meaning of their experiences, to uncover their lived world prior to scientific explanations” (p. xvii). In other words, interviews focus primarily on persons’ experiences of events. Furthermore, it enables the researcher to ascertain information on the phenomena studied that is not observable (Stake, 2010).

Multiple interviews were conducted in this research each with a different purpose. Life history (Appendix 1) and mathematics history interviews (Appendix 2) were conducted to understand the emergence and expression of teachers' identities in teaching FP mathematics. Interviews, which I refer to as practices interviews (Appendix 3), were conducted primarily to understand the mathematics teaching practices of the four FP teachers who participated in my research. Given that I had multiple interviews with each of the participating teachers, I was able to space them over the period of time I spent in each teachers' class. This meant I had time to ask follow-up questions after reviewing interview transcripts, especially if I was not sure what a teacher meant, or if I required further elaboration, or perceived a response as possibly contradictory.

All interviews in this research process were semi-structured. However, even though they were semi-structured, the questions were not asked necessarily in the same order, as it was necessary to probe in certain instances or continue with the flow of the interview as it emerged during the interview. Given that the four teachers were all first language isiXhosa speakers, they were at a disadvantage when responding to questions asked in English. Had they been able to communicate more fluently in English or if I was fluent in isiXhosa, I would have probably obtained richer data with more stories about them. I had considered asking a colleague who is a first language isiXhosa speaker to join me to assist with translations during the interviews. While I was concerned about bringing an 'outsider' into the conversations, I realised after the pilot that that would not be necessary as the English proficiency of the teachers would be sufficient. All four teachers had completed their in-service teacher education courses in English. That being said, the respective teachers' proficiency in English varied quite substantially and the teacher who I worked with in the pilot was relatively fluent in English, despite isiXhosa being her first language.

One of my practices interviews conducted with all four teachers included a video-elicited interview or stimulated recall. It entailed the use of video material to elicit teachers' reflections relating to their teaching of mathematics. Video-elicited data is regarded as "enhancing collaboration, building a rapport and trust between the researcher and participants, and supporting the richness of the data captured" during the research process (Ruto-Korir & Lubbe-De Beer, 2012, p. 404). My experiences with video-elicited interviews were of limited success. Firstly, none of my teachers had had an opportunity to observe themselves teaching before. For all of them this was a new experience and they were excited by the opportunity to observe themselves in action. Other teachers were called into the classroom, where the interview took

place, to observe them teaching. On two occasions I was asked to show the children the videos. The excitement of the moment resulted in relatively superficial engagement with the observed lessons. Secondly, all of the lessons were in isiXhosa and had not yet been transcribed and translated. This meant that the process of translation in the interview became the focus rather than reflexive engagement with the lesson. These video-elicited interviews did however add to the empirical data, especially in relation to the expression of teachers' identities in teaching FP mathematics.

4.5.2 Observation

I endeavoured during the course of my time in each of the four teachers' classrooms to capture an 'insider's perspective' and not contaminate that perspective with external knowledge, categories or views (Henning, Van Rensburg, & Smit, 2004). I sought emic categories, that is categories emerging from the data generated through my observations, rather than etic categories, that is, categories developed through theory and applied to the data (Henning et al., 2004; Maxwell, 2012). In a bid to develop emic categories, I made extensive field notes during the observations and also video-recorded some of the lessons. These were essential for developing categories inductively from the data. That being said, this approach of 'letting the data speak to me' was idealistic, as I came into the classroom with a significant knowledge base about teaching, learning and mathematics education. I have substantial experience in FP teaching. However, my experiences as a FP teacher had been in well-resourced state schools. Additionally, my current designation is teacher educator, focusing on both Foundation and Intermediate Phases. This experience, as teacher educator, tends to promote a research-informed 'ideal' of teaching, learning and the classroom. Furthermore, as a teacher educator my time spent in classrooms involves critiquing and supporting student teachers. Before conducting my research I thus had to 'make the familiar strange' so as not to judge and impose my conceptions of what the teaching of mathematics should look like, while observing teachers in the classroom.

Observer bias was thus a concern of mine prior to going into the classrooms. In an attempt to counter that, I spent time in two different classrooms prior to the research, observing FP teachers teaching mathematics, making field notes and reflecting on those field notes. The intention was to learn to observe in new ways that were not judgmental and try to report what I observed in a way that paid attention to aspects perhaps overlooked in my role as teacher educator and mentor to my students. In countering the possible tendency of judging, I found

the practices interviews particularly useful. They provided a space that enabled me to check my interpretations of the events and experiences observed in the classroom with the teachers concerned.

The main purpose for including observation in my research process was to study the Grade 3 teachers' mathematics teaching as it unfolded in context, rather than relying on a narrated representation of their teaching. Observation provides direct access to classroom life and is typically used in conjunction with other data generation techniques to garner 'rich data' (Simpson & Tuson, 2003). As I mentioned in Chapter One and Two however, there is often a disjuncture between what teachers say they do and what they actually do in the classroom. Henning et al. (2004), writing about observation in ethnographic research, claim "the purpose of much of this research is to debunk the myth that interviews tell all and that what people do in everyday settings is needed to provide a variety of data, making the texture of the artefact of *bricolage* stronger and more reliable" (p. 84). Besides, I was interested in the expression of FP teachers' identities through their mathematics teaching, which necessitated the use of observation as a data generation method.

The goal of observation, not restricted by a pre-generated format, is to provide 'rich data' (Maxwell, 2012) that is, data that enables a researcher to render a narrative of the events "filled with discussion and analysis, and rich in explanation and argument" (Henning et al., 2004, p. 85). Rather than viewing participant observer and non-participant observer as discrete categories, having conducted my research, I now consider there to be a continuum between these categories. I moved between being a participant observer and non-participant observer depending on the wishes of the teachers. Being closer to what would be described as a participant observer, meant that I assisted the teachers at their request by performing some of their routine actions in the classroom. I assisted teachers in ways that would support them. Ethically for my research, this meant that at times I had to suppress my way of being with children in the classroom, in order to follow the teachers' lead. I give one example below relating to the marking of children's work.

I had to be very careful with the marking the teachers requested that I do to ensure that I implemented this task in the same way that they do. This meant, for example, in Nokhaya's class that I walked around and marked the children's work as they completed each calculation as this was the practice in Nokhaya's class. By contrast, in Nomsa's class I sat at the table and

the children came up to the table once they had completed all their work. The process of marking thus varied across the classrooms. This was evident not only in terms of how teachers positioned themselves in the classroom when marking children's work, but also in the nature of the feedback they gave. I found it difficult to emulate the assessment practices of the two teachers at Phambili Public School as I would have preferred interacting with the children about their work rather than simply giving a 'tick' for a correct answer and a 'cross' for an incorrect answer.

Observing in classrooms is an active process that involves constantly making decisions with regards to what to observe and note. Prior to going into classrooms, I had decided that my focus would be the teacher. Even though the children are inextricably involved in the teaching process, I knew that being the sole observer and researcher in the classroom, meant I had to limit my focus in order to develop deeper insight into the teachers' mathematics teaching. The observation notes, which were transcribed immediately after the observation, were a chronological account of the teaching of mathematics in each of the classrooms, mixed in with, what Henning et al. (2004) refer to as soft notes. I elaborate on recording my observations below.

Observation is a time-consuming data generation method. Furthermore, there were a number of unanticipated events which prevented me from observing several lessons (e.g. closure of a school due to floods). Therefore the process took far longer than I had initially expected. I reflect on the unexpected events later in this chapter. Fortunately, I was able to spend up to four months in the schools due to a sabbatical. Appendix 4 provides an overview of the research opportunities and time spent with each of the four teachers in my research.

4.5.3 Field notes

Field notes are central to ethnographic research (Wolfinger, 2002). While this research was not strictly ethnographic, on average I spent a total of four weeks in each class. Wolfinger (2002) and Mulhall (2003) express concern that field notes lack historical interest and theorising. Field notes were written every day that I observed, even when lessons were video-recorded.

The field notes focused on the respective teacher's classroom practice, especially with regard to mathematics teaching. In addition, my soft notes (Henning et al., 2004) included reflections on issues that I wished to explore in future lessons, personal experiences of what I observed in

the classroom, and questions that I wished to ask of the teacher. While I wrote my notes in a note book, each day's observations were immediately typed and saved once I returned home. The notes written while in the field were abbreviated and it was necessary for me to expand my notes, confirm the translation of phrases I had written in isiXhosa, and include comments teachers made during their lessons that I may not have captured sufficiently. Wolfinger (2002) maintains that there are three aspects to writing field notes, namely, onsite notes, which are usually an outline of what is observed, (re)interpreting the on-site notes in order to write coherent descriptions of what took place in the field, and reflections on the influences that note-taking has on the research story. In typing up my field notes, I kept to the sequence of the lesson. If there was a worksheet or activity that the children had completed as part of their independent work, I uploaded a photo of the activity from my camera or, in the case of the national workbooks, from the internet. Based on the field notes, I made notes of points of interest and possible emerging codes and themes. The field notes were useful in providing an overall sense of the teachers' mathematics teaching, but they lacked the depth of data generated through the video-recorded lessons.

To establish trust and allow the teachers to see the non-judgmental nature of my notes, I always ensured that I left my notebook open for the teachers to see. After having read my notes, Beauty commented to Nomsa that she didn't know that I could speak and write isiXhosa. Nomsa told me "You know what, Beauty was so impressed by you. She said 'Lise can understand isiXhosa and she can write what the children are saying'" (Nomsa, P11, t.142)²⁷. This was based on the fact that I sometimes found it easier to write what the teachers and children were saying in isiXhosa.

4.6 DATA ANALYSIS PROCESSES

Data analysis occurred on many levels. Firstly, since all lessons were conducted in isiXhosa, all the data was transcribed and then translated. Secondly, the research was analysed through coding and developing categories and themes. The purpose of this was to identify that which was common to the four teachers and that which differed. Despite its importance for this research, the limitation of this, in the context of the meta-and substantive theories informing this research, was that analysis remained hermeneutic as it was an interpretation of the events

²⁷ I explain my referencing conventions later in this chapter.

and experiences. The third part of the data analysis involved the processes of abduction and retroduction. Briefly, abduction involves redescribing *what is* into something new, and retroduction is the process of asking transfactual questions (Chapter Three) to establish the SEP, CEP and PEP. I worked with these thought processes in an iterative manner rather than as representative of fixed stages. I explain this below.

4.6.1 The process of transcribing and translating the data

Coffrey and Atkinson (as cited in Maxwell, 2008) maintain that data analysis ought to occur in tandem with data generation as the researcher is able to assess emerging themes while still in the field. A table summarising the research opportunities with each teacher is provided in Appendix 4. Transcriptions of each of the interviews (i.e. life history, mathematics history and practices) was completed on the day of the interview. I realised that with the number of interviews that I was doing, plus the daily word-processing of my field notes, I had to keep up with the process if the data generation and initial analysis were to be iterative. During the processes of transcribing the interviews and word-processing my field notes, I added soft notes of my thoughts, ideas, and possible connections in the data.

The transcription of the video-recorded lessons was less efficient as I was not able to control the process. Given that teaching and learning in these classrooms was in isiXhosa, and that I have limited proficiency in the language, I was reliant on a colleague to transcribe and translate. This was a slow process. Further complications arose when the colleague left the institution we were working in and was no longer available to transcribe and translate. One of the data capturers in the EU:SFTE project took over this role, but she had limited experience with transcription and translation, and no experience in teaching. Her transcriptions and translations were erratic and there were significant linguistic differences in her style from that of the original translator. I considered that the process of translation posed a ‘validity threat’ to the study and therefore sought a solution. A full two years after the data had been collected, I resolved the quandary by employing an experienced ex-Post Graduate Certificate in Education (Intermediate Phase) student to review all the transcriptions. This student had done transcription work before and had isiXhosa (Mother Tongue) 2 in his undergraduate degree. He watched all the videos while reading the transcriptions and attempted to ensure they were stylistically the same. In many instances, he had to re-transcribe and re-translate the videos because the translations were unreliable.

I read each interview and lesson observation transcript while listening to and observing the audio and video recordings. With the lesson observation transcripts, I first engaged with the isiXhosa transcription before reading the English translation. I have included an excerpt (Exemplar transcript 4.1) from one of my transcripts below to show the manner in which the two languages are presented. While watching the video-recorded lesson I worked with the isiXhosa transcriptions first. It was only by reading the transcriptions in isiXhosa while watching the video-recorded lessons that I was able to add in any actions or gestures of the teacher. These are in English in square brackets in the example provided below. I then transposed these onto the English translations. Fortunately I can read and understand basic isiXhosa, so I was able to follow what the teacher and children were saying.

Exemplar 4.1: Excerpt of a transcript of Veliswa's second video-recorded lesson
(Veliswa, VRL 2, tt.95-97)

95.	Veliswa	Heke! Phaya siphawula ukuba la manani xa uhamba nje, ngolu hlobo atheni? [The teacher is looking at the chart as she speaks. She points to the first row of numbers at the top of the chart.] Kuwe ashiyana ngoozingaphi? Ashiyana ngoozingaphi? [She points to a child to answer]	Very well! There we note that these numbers, when you move this way what happens? [The teacher is looking at the chart as she speaks. She points to the first row of numbers at the top of the chart.] What is the difference between the numbers? What is it? [She points to a child to answer]
96.	L	Ngoo-zintlanu.	They are 5s.
97.	Veliswa	[The teacher is positioned in the class near the board facing the two rows of learners closest to the door.] Ngoo-zintlanu onke! Ithi loo nto la manani onke enza amaqela ka-zintlanu ne? Ukuba ngaba (na) sinokuthi siwohlula-hlule sofumanisa ukuba onke akhonto iza kusala xa uwahlula-hlule ngamaqela ka-zintlanu, ne?	[The teacher is positioned in the class near the board facing the two rows of learners closest to the door.] All of them are 5s. This means all these numbers are in groups of 5, not so? If we could divide (arrange) them we'd find that there will be no remainder; if you divide (arrange) them in groups of 5, not so?

I elaborate on the referencing conventions that I have used in my thesis later in the chapter.

4.6.2 Initial coding of the data

I began coding and categorising my interview data before I had the video-recorded lesson transcripts. I initially worked with each teacher's data set separately to obtain a detailed understanding of each teacher's life history and mathematics history. I coded each interview in

accordance with the questions asked during the interview. Bogdan and Biklen (as quoted in Maxwell, 2012) view coding as a “means of sorting the descriptive data you have collected ... so that the material bearing a given logic can be physically separated from other data” (p. 111).

Two analytic strategies were used: categorising and connecting strategies (Maxwell, 2012). I was concerned that the process of categorising the data through coding, would result in a decontextualized account of the teachers’ identities and teaching practices, as it fractures the data. After initially having worked with the data from each teacher individually, I later shifted to working across the transcribed interviews and observations of the four teachers in a bid to identify commonalities and differences. I worked, for example, with all the maths history transcripts, looking for themes, patterns and differences. I made tables, as shown below, where I could write the category and enter all the information from the interview data of all four teachers that pertained to each category. To illustrate this, I provide an extract relating to the mathematics history interviews. In this extract, the code is ‘influence of the teacher’ and concerns the influence the mathematics teachers had on the participants in my study when they were children at school.

Exemplar 4.2: Excerpts from mathematics history interview

Sontonga Public School		Phambili Public School	
Nokhaya	Veliswa	Beauty	Nomsa
INFLUENCE OF THE TEACHER			
[High school teacher] I didn't like it much. There was a lot to be done and our teacher was not quite clear about maths because he was not a maths teacher, but he was told to teach maths so I didn't get it the way I wanted (t.20). Because I liked it I was hoping that the teacher would be different from the one who taught me in those lower classes. (t.36). I think the teacher who taught me in primary school, made me to like maths because although it was difficult in high school I never stopped liking it (t.60). [Primary teachers] Maths is about concrete. I think because they used mostly concrete that made me understand it much easier (t.64). No but if the foundation is good, you always cope (t.66).	[Veliswa had a close relationship with Mrs Booï who taught maths at the farm school. In Alice, she gets a new maths teacher] Yes she did teach maths cause she had to teach Std 3 up to Std 6 at the farm (t.26). [But at Alice] No she didn't teach everything because there were other teachers there (t.30). [In Alice] We did have a specific maths teacher, Mr Gwahla. He was a principal (t.34). He was a very strict teacher. He didn't tolerate lateness; he didn't tolerate learners that did not know maths. He wanted all of us to be good in maths so he used the switch (meaning, corporal punishment) (t.38). I used to be late at school because we had to clean the house first. Get water before we went to school so I was late at school so (laughs with a hiding action) (t.48). [Mr Gwahla] It's just that the person who taught us that maths, didn't explain thoroughly how it was done and because I was scared, I didn't understand it clearly.	It was positive from the other grades (before Grade 12). The teacher that was teaching us in Grade 12, Mr, I forgot who he was, he was not clear when he was teaching us (t.22). He taught like he was lecturing. Lot of work. He doesn't care whether you've got it or not. He just pas you, you just moved on (t.24). We did ask questions, but he didn't have patience (t.28).	[At college level] Yes I did maths didactics. There was a very good teacher in Algoa, Mrs Jones (t.42). (A big sigh), she was teaching us very clearly and if you didn't understand she was willing to assist (t.44). (Groan) I think in my high school years, teachers were so negative sometimes in maths. Like they would shout at you if you didn't know something and would not be able to explain to you (t.68). Yes and that year, most of us failed maths (t.70). [What would she change about her maths history] I think if in high school I'd been taught by the same teacher up to Grade 12, I think I would have had great results in Grade 12. The changing of teachers has an impact (t.80) [Signals importance of knowing teachers] Because you have to know this teacher first. I don't know why (t.86). Otherwise, in tertiary, I didn't have a problem with my maths teachers (t.88).

Later I transposed all the data onto an excel spreadsheet as coding and developing categories proved far easier in excel than in word. As I moved the data from word to excel I recoded all the data ‘from scratch’ and reviewed it against my initial coding. Henning et al. (2004) maintain that the first coding of data develops from a position of naïve realism in that it is premised on the belief that “the world is as it appears in gathered information positivistically related to the ‘real world’” (p. 101).

Having stripped the data of context, I worked with my categories to develop themes and (re)construct an explanation based on the identified themes. The explanations that I had constructed on each teacher’s life and mathematics history assisted me in drawing the contexts back into the research data, shifting the process away from one rooted in naïve realism and so maintaining coherence and connectivity. Connecting strategies focus on relationships “organised temporally in terms of the context of their occurrence” (Maxwell, 2012, p. 110). Time and space is important in connecting strategies as the focus is contiguity. The researcher reflects a “consciousness of similarity and differences but also an attempt to look for unexpected relationships, antecedents, and consequences within the flow of items” (Smith, as quoted in Maxwell, 2012, p. 110). These connecting strategies are evident in Chapters Five, Six and Seven where a coherent story drawing on the data is presented.

In Chapter Five I introduce each of the teachers and explore the structural, cultural and agential conditions that gave rise to their decisions to become teachers, that is, their personal identities. Chapters Six and Seven focus on the social identities of the teachers. In other words, I examine the manner in which they express their roles as teachers of FP mathematics. In so doing, I draw predominantly from the mathematics history interviews, the practices interviews and my observation. In this chapter, I also examine the structural, cultural and agential mechanisms that have given rise to the mathematics teaching practices of each of the teachers in my research.

Inductive reasoning, that is the generalisation of codes and categories from what had been expressed in the interviews and observed in the classrooms, although necessary, has its limitations. Specifically, it could not assist me to identify possible structural and cultural mechanisms that had given rise to teachers’ identities and their expression in teaching FP mathematics. Structures and discourses are not immediately observable through events (i.e. the teaching of mathematics) nor experiences of events (i.e. what is observed and perceived during

the teaching of mathematics). This became apparent after I transcribed a mathematics lesson during my pilot. I thus drew on the typical critical realist modes of inference abduction and retroduction to assist in analysing my data and constructing the new narratives (i.e. narratives that went beyond the hermeneutic).

4.6.3 Forms of reasoning used

The objects of study in the social sciences consist of individual features (i.e. features pertaining to persons) and extra-individual features (i.e. features pertaining to social structures and culture) (Schatzki, 2002; Kemmis, 2008). The structural and cultural mechanisms are relatively enduring in that they are “more general, universal, but not unchangeable dimensions of social reality” (Danermark et al., 2002, p. 88). Drawing on the propositions related to Archer’s morphogenetic approach, the extra-individual features, the structural and cultural mechanisms are part of the social system (SS) and cultural system (CS) and condition the projects and actions of agents at T2-T3. The individual features are part of the social interaction (SI) and socio-cultural interaction (S-C) at T2-T3.

Trying to identify the structural and cultural mechanisms that are not necessarily observable, requires modes of inference that enable one to identify the basic conditions for the phenomena being studied. In the case of this project, I required modes of inference to enable me to ascertain, in the first instance, *what made the teachers’ identities possible*. Neither inductive nor deductive reasoning would serve this endeavour.

The processes of *abduction* and *retroduction* assisted me in inferring from the data. Unlike deduction and induction, which are logically valid modes of inference, abduction and retroduction are thought operations. Abduction is the process that enables a researcher to formulate “new ideas about the interconnection of phenomena” (i.e. the emergence and expression of FP teachers’ identities through their mathematics teaching) (Danermark et al., 2002, p. 93). Using the empirical data (i.e. the transcriptions and observation notes) my study required that I “move from a conception of something to a different, possibly more developed or deeper conception of it. This happens through placing and interpreting the original ideas about the phenomenon in the frame of a new set of ideas” (Danermark et al., 2002, p. 91). The frame in this research is social realism, and in particular, Archer’s morphogenetic approach (Chapter Three). The phenomenon of study was thus *recontextualised* (described, interpreted and explained) in a new context. This is the process of abduction which Pierce (as cited in

Danermark et al., 2002) refers to as reasoning and arguing; it is a creative process requiring that the researcher “discern relations and connections not evident or obvious – to formulate new ideas about the interconnection of phenomena, to think about something in a different context, an ability to ‘see something as something else’” (Danermark et al., 2002, p. 93). Chapter Two and Three outlined the recontextualising that this study offers in a manner that, to my knowledge, has not been done before. Identifying the limitations of current theorising in the field for my research and applying a novel methodological and theoretical lens to South African teachers’ identities, contributes not only a new language of description, but also a new way to analyse and explain the data.

Recontextualising the phenomenon of study using social realism however does not assist in the analytic process of identifying the structural and cultural mechanisms in the SS and CS. While Archer (1995) maintains that her morphogenetic approach provides both explanatory and analytic tools, I still needed a mode of inference that would enable me to identify the structural and cultural mechanisms from the empirical data. Retroduction assisted in ascertaining the basic conditions of the phenomenon I researched. According to Benton and Craib (2001), it is

a form of inferential argument which starts with some phenomenon, or pattern, and poses the question: ‘What sort of process, mechanism, agency, and so on, if it existed, would have this phenomenon as its consequence?’ The conclusions are not logically necessary, but it offers a rational process for devising candid explanations. (p. 185)

Retroductive reasoning enabled me to move beyond that which is observable empirically and to ask transfactual questions in order to develop insight into the structural, cultural and agential mechanism for the events and phenomenon that form the focus of this study. “Retroduction is about advancing one thing (empirical observations of events) and arriving at something different (a conceptualisation of transfactual conditions)” (Danermark et al., 2002, p. 96).

Transfactual (or transcendental) questioning and argumentation is thus key in identifying the basic conditions or “circumstances without which something can’t exist” (Danermark et al., 2002, p. 96). Asking transfactual questions while reading my research data enabled me to identify possible structural, cultural and agential mechanisms giving rise to teachers’ identities and their expression in the teaching of mathematics. These transfactual questions required ‘looking back’.

The transfactual questions I asked included:

- What does the existence of these teachers' identities presume?
- What else must be present for these teachers' identities to exist?
- What is it about teachers' identities and their expression in the classroom that makes them such?

Asking transfactual questions enabled me to develop an understanding of the conditions that give rise to teachers' identities and their expression in teaching mathematics. One of the strategies I found useful in doing this was counterfactual thinking (Danermark et al., 2002). This is the method of trying to understand something in relation to what it is not, by drawing on one's own experience, knowledge of social realism (Chapter Three), and existing conceptualisations of the phenomenon being studied (Chapter Two).

When there are numerous mechanisms that exist, I had to try to identify those that were *necessary* in giving rise to the participant teachers' identities (Sayer, 2000; Danermark et al., 2002). Sayer (2000) and Easton (2010) suggest that in complex systems such as education, it is easy to misattribute a causal mechanism because a different causal mechanism can produce the same event and the same causal mechanism can produce different events. Judgemental rationality enables critical and social realist researchers to draw on conceptual, theoretical and methodological frameworks and tools to discern the extent to which existing theories are able to inform us about an external reality (Danermark et al., 2002).

While the process of retroduction has been useful in assisting me in identifying the mechanisms enabling or constraining teachers' identities and their expression in teaching mathematics, it does not provide the truth, as new descriptions are always fallible. However, it is possible through the process of judgemental rationality to ascertain the validity of a particular recontextualisation (Danermark et al., 2002).

Judgemental rationality, for Archer, Collier and Porpora (2004),

means that we can publically discuss our claims about reality as we think it is, and marshal better or worse arguments on behalf of those claims. By comparatively evaluating existing arguments, we can arrive at reasoned, though provisional, judgements about what reality is objectively like; about what belongs to that reality and what does not. (p. 2)

Exploring the current literature on identity, teacher identity and teacher identity within the field of mathematics education, and identifying its limitations for my research, led to the search for a novel framework, that being social realism and Archer's morphogenetic approach. Constantly reviewing the data in the light of the existing explanations has enabled provisional judgements about how teachers' identities emerge and how they are expressed through the teaching of mathematics.

In analysing the research data, I had to ensure both the quality of the research process and the production of this thesis. This forms the focus of the next section of this chapter.

4.7 ENSURING RESEARCH QUALITY

Key issues relating to the quality of this research included validity, generalisability and ethics.

4.7.1 Validity

The challenge for research underlaboured by critical realism (and this challenge can be extended generally to realist research) is how one makes validity judgements that engage with real phenomenon, given the fallibility of our constructions of actual phenomena (Maxwell, 2012). In other words, the validity of the knowledge claims researchers make, is always subject to their intersubjective judgements, choices and decisions (Danermark et al., 2002).

Shadish, Cook and Campbell (as cited in Maxwell, 2012) suggest "validity is a property of inferences. It is *not* a property of designs or methods, for the same designs may contribute to more or less valid inferences under different circumstances. ... No method guarantees the validity of an inference" (p. 130). Although rooted in work on experimental and quasi-experimental research, this suggestion is typically realist. In this view, validity is relational in that it is not found in methods or procedures, but rather in the relationship between context, purpose and method. Put differently, assessing the validity of research is not simply a case of establishing if specific procedures and methods have been used rigorously, but reflecting on the *conclusions* emanating from these procedures and in relation to the specific context of the research (Maxwell, 2012). Danermark et al. (2002) suggest that the object of study, rationale and method should be considered concurrently and in relation to each other, in order to inform the decisions made in terms of data generation and analysis. This view of validity "pertains to

the accounts or conclusions reached by using a particular method in a particular context for a particular purpose, not to the method itself” (Maxwell, 2012, p. 130).

There is thus no set list of characteristics, methods or procedures for ensuring validity in realist research. What I considered therefore was the relationship between purpose, methods and context and the extent to which I addressed possible validity threats to the conclusions in my study. Seale (1999, as cited in Maxwell, 2012) has three criteria for judging the validity of realist research. The first focuses on the relationship between the different elements of the research (e.g. is there coherence between the research questions, the methodology, and the methods for generating data). During the various stages of this research, from proposal development to concluding the writing of the PhD, alignment has always been a priority in my work. Embarking on a study that uses a methodological framework which has had limited prior application in education in general and mathematics education in particular, I had to ensure that the questions I posed were typically realist questions. These are questions that foreground ontology rather than epistemology. I presented my rationale for these questions in Chapter One.

I had to provide a convincing and sustained argument for the use of a novel framework. In Chapter Two I examined the limitations of current research in the field for my research. This research emphasises *what we know* rather than *what is*, and conflates structure and agency. These two limitations provided an opportunity for me to search for a novel framework. In addition, I had to ensure alignment between my social realist framework, the data generation methods and analysis of the data. In analysing the data, I utilised the thought processes of abduction and retroduction. Abduction enabled me to redescribe the phenomenon (i.e. the emergence and expression of teachers’ identities in teaching FP mathematics) by drawing on critical realist ontology and the methodological framework of Archer’s social realism, namely the morphogenetic approach. The process of retroduction provided the opportunity to analyse the data and explain *what is*, by asking transfactual questions (i.e. questions about the mechanisms at the level of the real). By means of an example in Chapter Five, I sought to ascertain the mechanisms that had given rise to teachers’ identities. As highlighted above, the questions asked enabled me to discern the various mechanisms that conditioned the emergence of teachers’ identities. I asked similar questions in relation to the expression of teachers’ identities through the teaching of mathematics. Asking transfactual questions also required that I focus on developing a deeper understanding of the context of the research.

The second criterion, as illuminated by Seale (as cited in Maxwell, 2012) concerns the research context. If expressed as a question, this could be posed as: are the events being studied located within their social, economic and political context? Exploring the preconditions that gave rise to these teachers' identities and their expression through the teaching of mathematics required that I constantly looked back historically in order to identify the basic conditions. In Chapter Five I suggest that the unionisation of South Africa in 1910 (the moment when the South African nation state was constituted) was a key moment in history. The effects of that moment have impacted on teachers' identities.

The third concern, as elaborated by Seale (as cited in Maxwell, 2012), relates to how the evidence is used to generate conclusions. In other words, the key question is: do the findings emerge directly from the data? This account of validity focuses more on the explanations, findings, conclusions and inferences rather than on the techniques and methods used to generate the data. In considering the conclusions of research, it is necessary to consider how these could be incorrect, by reflecting on the potential validity threats. A number of validity threats were identified earlier in this chapter. These were presented together with comments about how I managed the threats. Some of the potential validity threats included language, transcription, challenge with the stimulated recall interviews, observer bias, positionality and working with a meta-theory and methodological frameworks that have not been used much in research on teacher identity and mathematics education. I have highlighted each of these possible validity threats except for positionality. I expand on the issue of positionality later in the chapter as this requires further explanation.

In support of Seale's (1999, as cited in Maxwell, 2012) criterion for validity, Brinberg and McGrath (as cited in Maxwell, 2012) state that "validity is not a commodity that can be purchased with techniques. ... Rather validity is like integrity, character and quality, to be assessed relative to purposes and circumstances" (pp. 280-281). However, there were a number of techniques employed to ensure the validity of the data and conclusions. These included amongst others, techniques employed in positivist and interpretive research, triangulation, spending a sustained period in the field, peer review, member checking, and keeping an "audit trail"²⁸ (Bassey, 1999, p.75).

²⁸ All my empirical data, that is interviews and observations, have been kept both as raw data, coded data, and data formatted specifically for use in the text of this thesis and in the appendices. All video- and tape-recordings

Triangulation of data was implemented through the use of three different data generating methods (i.e. interview, observation and field notes) and through the use of multiple interview formats. In addition to the day-to-day conversations I had with teachers when I was in the field with them, there were four to five scheduled interviews conducted with each teacher. While the nature of the interviews differed (life history, mathematics history and practices) I used these to probe further, clarify misunderstandings and verify my interpretations of the data and the emerging themes.

Verifying the transcriptions and translations was complex. While I provided each teacher with copies of the transcripts of all the interviews and requested that they confirm whether the transcriptions represented what they had said, none of the teachers provided me with any feedback despite my asking numerous times.

During the research process, I had regular meetings with peers, colleagues and my first supervisor to assess my progress. As explained earlier I was part of a broader research project, the EU:SFTE; this provided many opportunities for ‘peer debriefing’ (Carspecken, 1996) and peer review where fellow researchers were able to interrogate methods and interpretations. However, both member checking and peer debriefing are not without their problems. For Maxwell (2012) these include firstly, the extent to which the participants and peers are interested in the actual study, secondly, the challenge of “juxtaposing their own understanding to that of the researcher” (p. 259), and thirdly, managing one’s own research trajectories and interests.

In this research, I transcribed all the interviews verbatim directly after each interview. I (re)listened to the audio recordings of the interviews while reading the transcripts to ensure that I had produced as accurate an account as possible. Wolcott (2009) emphasises “description provides the foundation upon which qualitative research rests” (p. 27). In my field notes, there were phrases written directly in isiXhosa so as to ensure the accuracy of the recording. I used these particularly when I was not sure of the translation.

have been stored on various research-related hard-drives. I have also kept copies of the various translations of the transcriptions of the various video-recorded lessons.

In this section I have explained how I addressed observer bias, particularly in relation to my previous and current designations, and how I sought to overcome such bias. However, observer bias is intertwined with positionality more broadly, and this is a potential ‘validity threat’ that I address further, later in this chapter. Furthermore, I attempted throughout the research thesis to ensure that my philosophical assumptions (Chapter Three), role as researcher (Chapter Four) and findings (Chapter Five, Six and Seven) were surfaced, explicitly stated and interrogated.

4.7.2 Generalisability

One of the criticisms of case study research is the perceived inability to generalise out of research that is singular, context-dependent and context-specific. Flyvbjerg (2011) in his seminal critique of common misunderstandings of case study research, suggests

one can often generalise on the basis of a single case, and the case study may be central to scientific development as generalisation as supplement or alternative to other methods. But formal generalisation is overvalued as a source of scientific development whereas ‘the force of example’ and transferability are underestimated. (p. 305)

Danermark et al. (2002) concur and drawing on the work of Ervin Goffman, suggest that there are numerous examples of researchers generalising out of qualitative research and even qualitative research framed by a case study methodology. Flyvbjerg (2011) builds his argument based on the nature of the case and in particular, how the case is chosen; suggesting that some cases lend themselves to generalising and others not. My case was chosen both for convenience but also for its representivity of the original sample.

Bhaskar (1978) claims “scientifically significant generality does not lie on the face of the world, but in the hidden essence of things” (p. 227). In other words, he argues that it is by surfacing structural and cultural mechanisms at the level of the real that researchers are able to make claims of generality. Generalisation in this sense is built on transfactual conditions (i.e. conditions that enable something to be so, rather than something different) and the constituent mechanisms and properties of social structures and cultural systems. These mechanisms (i.e. the transfactual conditions and fundamental structures) are attained through transfactual arguments, that is, arguments that are based on retroductive inference. Generalisation in realist research is thus different from generalisation in empirical research which focuses on regularities (i.e. constant conjunctions) as opposed to transfactual conditions (Chapter 3). Flyvbjerg (2011) further suggests that case studies can be utilised both to test hypotheses and

theories, and to undertake “detailed explorations of hypothesised causal mechanisms” (p. 306). In this research, my case tested the use of social realism in researching the emergence and expression of teachers’ identities in teaching FP mathematics. In particular, my research uncovered the structural, cultural and agential mechanisms that condition teachers’ identities and the expression thereof in the classroom.

4.7.3 Ethics

My ethical deliberations can be described in two broad categories. The first concerned procedural ethics, which is the ethics of obtaining consent to conduct research. The second is referred to as process ethics. This is about the ethical decisions made during the research process. In many respects, it is more complicated than procedural ethics because it requires thinking on one’s feet in some instances (Guillemin & Gillam, 2004).

Before explaining how I addressed these different dimensions of ethics in my research process, it is necessary to acknowledge the power relations that existed in my research. There was an unequal relationship between the research participants and myself. As I will discuss in the next section, my privilege – particularly in relation to race, class and language – has and still does, position me in certain ways, even long after the ‘end’ of apartheid and the advent of democracy in South Africa. However, as Foucault (1978) suggests, where there is power, there is also resistance. This was evident in my research. For example, I had to continually negotiate access with one of the teachers. On numerous occasions she asked me to remind her what the purpose of the research was. On two other occasions, when I arrived at the school, she informed me that she would not be teaching mathematics that day, yet the next day I saw mathematics work that the children had completed in their jotters the previous day.

Oakley (as cited in Sayer, 1992) states:

Like any activity, research is a social process; and adopting the traditional academic conception does not render the research process innocent or ethically neutral: on the contrary, the belief that it does may permit insensitivity and political naivety. While these general warnings about ethical problems must be heeded, actual decisions must be made in the light of an evaluation of the particular politics (including one’s own ‘personal politics’) of the situation under study, with all its conflicting interests and imbalances of power. (p. 256)

Central to Oakley’s words, for me, is the importance of relationship building and recognition that this process continues throughout the research and beyond. In addition, acting ethically in

the context of research requires that the researcher make explicit one's assumptions in relation to the research. In this thesis, I have endeavoured to make my theoretical and methodological perspective transparent, to problematise my assumptions, to provide detail of the ethical deliberations that occurred in negotiating access to the research sites and during the research process in schools, and to share my ethical decisions during the write-up of this PhD.

4.7.3.1 Procedural ethics

Ethical clearance for this PhD research was obtained through a variety of mechanisms and in different ways:

- The Education Higher Degrees Committee validated my PhD proposal with the institutional ethical permission granted in May 2012;
- Permission from the Provincial Department of Education (Eastern Cape) was obtained through the broader research project (EU:SFTE) for working in schools in May in 2012 (Appendix 5) and from the District Office in June in 2012;
- A meeting with all the school principals, organised through the District Office, to address them about the research and request permission to work in the schools was held in June 2012 at the District Office;
- Meetings were organised with all the FP teachers in the three schools in Lwandle Township. These meeting were to address the teachers about the project and to ascertain initial willingness to be participants in the research. There were three PhD scholars working in Lwandle Township simultaneously, hence we decided to meet with all the FP teachers in the schools in Lwandle Township first. This meeting took place on Tuesday the 13th of June 2012.

Towards the end of June and in August 2012, I met with the teachers of the three schools individually to obtain permission for my PhD research. In these meetings, I further explained the purpose of my study, the research process, and my expectations of the participants in my research. The teachers were encouraged to think about their willingness to be involved in this research, and given time in this regard, before being requested to sign consent forms (Appendix 6). Teachers were told that they could withdraw from the research at any stage of the research process.

Informed consent was thus obtained at various levels within the education system. Once the formal ethical procedures had been finalised and the teachers had given me their respective consent to spend time with them in their classrooms, the ethical concerns shifted to immediate issues that emerged during the research process in the field. I found that it was during the research process, “ethics in practice”, that competence in recognising and dealing with ethical dilemmas was required (Guillemin & Gillam, 2004, p. 262).

4.7.3.2 Ethics in process

Two issues emerged from the assumption that informed consent would ensure participation; firstly, a realisation that access to the classrooms and teachers would have to be continuously negotiated, and secondly, a quandary about the extent to which the teachers who participated in this research were research participants or subjects.

As highlighted at the beginning of this section, negotiating access to classrooms in the Eastern Cape Province is a multi-layered and on-going process. Having negotiated access with all the necessary authorities prior to approaching the teachers, there were times that I doubted the extent to which the teachers in this study believed they actually had a choice in the decision to participate. I experienced discomfort at these times. The education system in South Africa, like in other parts of the world, is hierarchical. I began thinking that because I had obtained permission from the national, provincial and district structures before meeting with the teachers, I had reduced their discretion about participating in my research. To mitigate this, I worked hard to build relationships and trust.

Negotiating access to the classrooms of the Grade 3 teachers at both schools was an on-going process. There were a number of events that restricted access to the classrooms:

- Getting teachers to agree to participate in interviews after hours, as opposed to during school, had to be continually negotiated;
- The Annual National Assessments (ANA) written in September took a week and during this time no teaching occurred. Prior to the ANA, the learners were given an exemplar to complete and post-ANA a few days were spent revising errors children had made;
- Unexpected events took various forms:
 - a natural disaster (viz. flooding) resulted in road closures and I was not able to access the schools;

- an unanticipated arrival of DBE officials to check that the teachers were using the national workbooks;
- a farewell to Grade 7 learners resulted in no teaching for a day, as the teachers were required to cook for the farewell, and
- principals and district officials requiring the teachers in my study to perform tasks that took them out of the classroom (e.g. writing up an agenda for a staff meeting, photocopying or attending a mini-cricket workshop).

Such disruptions to the data generation process are part and parcel of research in South Africa (Vithal, 1998).

The second issue that I grappled with in this research, related to *respect for persons* (Bassey, 1999, p. 15), particularly the distinction between research participants and research subjects. The research process began with an ethical tension for me. As the researcher, I asked the teachers to consent to my research interest and research process. None of the teachers had sought me out. Furthermore, as this research attempted to expose the social, cultural and agential mechanisms that had given rise to teachers' identities and their expression through the teaching of mathematics, this was not a research project that was of immediate benefit or value to the teachers I was researching. For me, the question was how could I enact *respect for persons* in this situation? Guillemin and Gillam (2004) suggest that this tension can be resolved if the teachers 'take up' the research project and process as their own, but this was not likely to occur in my research study. I thus chose to deal with the enactment of informed consent and respect for persons primarily through establishing collegial relationships with the research participants, by being respectful to the teachers, interested in them as persons and their practices, and considerate when they intimated that they did not want me in their classrooms. I was sensitive to body language and asked if it was convenient for me to spend time with them in the class each day and always indicated my willingness to return on another day should they wish. I also committed myself to assisting teachers in other ways, for example, marking the children's work and doing their photocopying. However, I was not able to escape the fact that these teachers saw me as an authority on mathematics education due to my position as university lecturer and researcher; someone who 'knows more' and who could 'authorise' their work. The teachers constantly sought confirmation from me in relation to their teaching of mathematics.

No schools or teachers are mentioned by name in this work; pseudonyms have been used throughout. In the research consent form, I indicated that the video-recordings of lessons would be viewed by a translator and possibly my supervisor, otherwise the data would not be available for public viewing. Where a transcript was deemed to be of value for teacher education programmes (one of the EU:SFTE funded projects) usage of this material was negotiated with the teacher²⁹.

While the ethics in process was more complicated than the procedural ethics, I found engaging reflexively with the issues as they emerged to be useful, not only in thinking about the validity and rigor of the research process, but also in thinking about what makes this research ethical. Reflexivity involves an alertness and sensitivity to ethical tensions as they arise. Reflexivity links procedural ethics with “ethics in practice”; it sensitises the researcher thus enabling research that is ethical within complexity (Guillemin & Gillam, 2004, p. 262).

Finally, I turn to the ethical issue related to my positionality in the field. This is presented as a separate section as it is, in the context of a violent and disruptive South African history, necessary to reflexively engage with my own identity as a researcher. As with Adler (1996) and Graven (2002b), it was necessary for me in this research process, as a white South African researcher, to ask ‘who am I?’

4.8 ROLE OF THE RESEARCHER

Central to this research and my role as a researcher is my position of privilege. Growing up as a white person in an apartheid South Africa characterised by violence, subjugation and oppression, it was necessary for me to interrogate my race in a research context where I would be working with black teachers. My privilege was not only linked to race but also class and education, which are complex and intertwined.

As Archer (1995) proposes, persons are born into positions not of their choosing, but the self and one’s personal and social identities are continually generated within these contexts. Privilege is thus the “unearned assets” (McIntosh, 1998, p. 31) and advantages systematically

²⁹ I have had one instance thus far where I sent one of Nokhaya’s lesson transcripts to her to obtain permission to use it in a teacher education manual on developmentally-appropriate learning that is an open source text for teacher educators.

acquired by virtue of one's position in overlapping social groups. McIntosh (1998) suggests that privilege is an "invisible knapsack" (p. 31), which can never be removed. The knapsack is not empty; rather, it contains the tools necessary to deal with a range of challenging situations. These tools in this research included my race, my class, my first language and my education. Not only did the above-mentioned privileges provide me with tools, they also influenced my perceptions and the teachers' perceptions of me. I had to work really hard in building relationships with the teachers, and continually problematise my privilege, in order to put the social (i.e. my relationships with the participants in this study) above the personal (i.e. my PhD study). At certain times I was more aware of this than at other times. For example, when Beauty called me "Ma'am"³⁰ in an interview or when Veliswa repeatedly asked me "Am I doing it right?", or when I had to negotiate access into Nomsa's classroom from time-to-time, my privilege was forefront in my mind. I suggest that unless, as white South Africans, we engage with our privilege, it will leave an indelible mark on our research. While I make no claims to having dealt with my privilege sufficiently, I was conscious of it and tried, where possible, to understand the role it played in this research and to actively counteract this. I did this in various ways, such as checking on arrival that it suited the teachers to have me in their class, asking them to call me 'Lise', and always ensuring that anything I wrote in my field notes was available for the teachers to read.

4.9 LIMITATIONS OF THE STUDY

Various limitations of the research have already been highlighted throughout this chapter. I refer here especially to the primary limitations that impacted on my research process. Transcription and translation of the video-recorded data were time-consuming processes, and since I needed help with these I had limited control over them. The delay in this regard meant that I only received the final copies of my transcribed and translated video-recorded data in December 2014, two years after having been in the classrooms. The potential benefit of the iterative process of data generation and video-recorded data sets was therefore not fully realised. Working through the translated and transcribed video-recorded lessons with the

³⁰ This term could have meant different things. The first is that in South Africa, during the apartheid era, white women were referred to as 'Madam'. The second possibility is that this is a term used by children to address their teachers, and in some instances, it is used between teachers. Thirdly it is used as a sign of respect. I felt uncomfortable with the use of this term even though I was aware that Beauty would mostly call me 'Lise'.

teachers would have provided an opportunity to learn more about the teachers' teaching of mathematics.

During my research I was acutely aware that my limited ability to communicate in isiXhosa was a barrier in this research process. As an English first language speaker, schooled during a time in this country when Afrikaans³¹ was the compulsory second language, I only began learning to speak isiXhosa post-school. I participated in two conversational isiXhosa programmes (Level 1 and Level 2) designed for staff at Rhodes University in the years prior to my research. This was helpful in terms of communicating with the children and being respectful to the teachers, but it was not sufficient to prepare me for researching in contexts where the Language of Learning and Teaching (LoLT) was isiXhosa. As I observed the four Grade 3 teachers teaching mathematics, my notes focused predominantly on the 'set-ups' (arrangements) and actions of the teachers and less on the interactions. Below, I exemplify the limitations of my field notes in comparison to a transcription of a video-recorded lesson. I use an example from Nokhaya. The relevant section in the transcribed and translated version of the lesson is turns (tt.) 1-65 (Appendix 7). Missing from my field notes is the richness of the interaction. My notes do not give the researcher or reader a sense of how Nokhaya got the children to participate, who volunteered and who she asked to participate. In addition, I noted the use of the phrase 'ngamashumi asixhenxe awananto' which is translated into 'seven tens with nothing'. This features in the extract from my field notes below as '70'. I would have missed the significance of 'with nothing' had I not had transcriptions of her lesson.

Exemplar 4.3: Extract from my field notes of a mathematics lesson in Nokhaya's class
(Nokhaya, FN, pp. 6-7)

The lesson starts with the children counting in 1s in isiXhosa. They stand in between the desks at the front in a semi-circle facing the board.

The teacher writes '28' on the board and asked someone to read the number. A girl reads the number in isiXhosa. The class repeats what she said. This continues for the numbers '130' and '170'. After the class has repeated the number in isiXhosa, the teacher underlines the '1' in '130' (and afterwards, the '7' in '170'). Children come to the board and write '100' ('70') on the board. The class then says '100' ('70') in isiXhosa. They repeat the number name for '100' ('70') twice.

The teacher gives a number in isiXhosa and a child writes it on the board: '215'. She then writes '401' on the board and asks someone how they would say it in isiXhosa. A boy gets it wrong and the class is asked to assist him.

³¹ Afrikaans is an official language of Dutch origins. During the apartheid era, it was regarded as the language of the oppressors.

The teacher says another number name in isiXhosa and a child writes it on the board: '256'. The children repeat the number name. The teacher does this again. This time the boy that she selected (he had his hand up) gets to the board and tells her he has forgotten the number. She gets another child to tell him what the number is and he writes '192' on the board. The class repeats the number name. The teacher then underlines the '2' in '192' and asks its value. A boy comes up and writes '200'. She asks the class if he is correct. The class say 'no'. Another child comes to the board and writes the number '2'. The class claps.

It is my contention that one needs some linguistic fluency to grasp the (inter)actions of people involved in a practice in order to establish how these (inter)actions compose the practices. My limited fluency with isiXhosa which caused a delay in working with transcripts, was for me one of the primary limitations confronted in this study.

4.10 REFERENCING CONVENTIONS

I use the following referencing conventions when referring to my empirical data: the name of the teacher; the particular interview format; and the number assigned to the turn(s) in the interview. I use 't.' for a single turn and 'tt.' for more than one turn.

Interview formats and the referencing thereof	
Nokhaya, LHI1, tt.36-37	In this instance I am referring to turns 36-37 in the transcription of Nokhaya's life history interview (LHI1).
Veliswa, MHI, t.20	Turn 20 in Veliswa's mathematics history interview (MHI).
Beauty, PI1, t.65	Turn 65 in Beauty's first practices interview (PI1) (i.e. an interview about her teaching of mathematics).
Nomsa, PI2, tt.1-6	Turn 1-6 in Nomsa's second practices interview (PI2).

I use the same conventions as indicated above for referencing the video-recorded lessons.

Referencing of video-recorded lessons	
Nokhaya, VRL1, tt.36-37	In this instance I am referring to turns 36-37 in Nokhaya's first video-recorded lesson (VRL1).

I video-recorded three lessons in Nokhaya, Beauty and Nomsa's classes, and two in Veliswa's. I refer to each of the video-recorded lessons as VRL1 (i.e. the first video-recorded lesson for each teacher), VRL2 (second video-recorded lesson) and VRL3 (third video recorded lesson).

Other conventions in the video-recorded lessons include:

Video-recorded lesson conventions	
Veliswa	I use the pseudonym of the teacher in the transcripts to indicate that the teacher is speaking.
L	A single student
LL	More than one student
[]	What the teacher was doing at the time.
...	Thinking
(...)	Elapsed time

Field notes are referred to as FN. In referencing field notes, I give the name of the teacher and the page number of my field notes. For example: Beauty, FN, p. 6 refers to Beauty's class, my field notes and the instance being referred to is on page 6.

4.11 CONCLUDING REMARKS

In this chapter I have provided an account of the methodology, data generation and data analysis processes that were implemented and consistent with a social realist ontology as expressed through Archer's morphogenetic approach. The data, generated from a variety of interview formats and observation of the four teachers' teaching mathematics, supports the analysis of the teachers' identities and their expression through the teaching of mathematics at an empirical level. In other words, the data supports a hermeneutic understanding of the research questions. It was through the thought process of retroduction and the asking of transfactual questions, that I was able to identify the structural and cultural mechanisms at the level of the real and the extent to which the teachers, by drawing on their PEP were able to 'act back' on these conditions. The thought process of abduction enabled me to recontextualise and redescribe that data within a novel framework, namely social realism. This is the focus of Chapters Five, Six and Seven.

In the following chapters I use Archer's morphogenetic approach to analyse the empirical data. In Chapter Five I delineate the four FP teachers' identities and the conditions giving rise to their identities. In Chapter Six I present the expression of the teachers' identities through the teaching of mathematics and the mechanisms conditioning and/or enabling the expression of the teachers' roles as FP teachers of mathematics. In Chapter Seven I examine how teachers 'act back' on these mechanisms by drawing on their modes of reflexivity. The reason for this is to respond to the sub-questions in this research.

Chapter Five examines:

- How have these FP teachers' identities emerged?
- What are the structural, cultural and agential mechanisms that have led to their emergence?

Chapter Six analyses:

- How are the identities of FP teachers expressed in the teaching of mathematics?
- What are the structural and cultural that condition the expression of their identities in the process of teaching mathematics?

Chapter Seven considers:

- What are the structural, cultural and agential mechanisms that condition the expression of their identities in the process of teaching mathematics?

Chapter Five thus introduces the four FP teachers and considers the structural, cultural and agential conditions that have given rise to personal identities (i.e. the decision to become teachers) while Chapters Six and Seven focus on the four FP teachers' social identities, which is the expression of their roles in teaching mathematics.

A PRELUDE TO THE THREE DATA CHAPTERS

This prelude is a guide to the three chapters which present my analysis of the empirical data. Using Archer's morphogenetic approach (Chapter 3), I show how the structural and cultural mechanisms (T1) impact on the (inter)actions of teachers (T2-T3) leading to either morphogenesis or morphostasis of the structural and cultural system, and the agent (T4). The morphogenetic approach, represented in the three figures below has provided the analytic and explanatory tools to examine the emergence and expression of teachers' identities in teaching Foundation Phase (FP) mathematics. Drawing on Archer (2000, 2003, 2015) I maintain that teacher identity is the manner in which teachers' express the roles of teachers. I examine this in the context of FP mathematics classrooms.

Chapter Five is the first in this sequence of three chapters. In it my attention is placed on the deliberative process giving rise to the decision of the participants in my study to become teachers. I analyse the teachers' respective deliberations (i.e. the DDD process (Chapter 3)) and the cultural and structural mechanisms conditioning their deliberations and decisions. The chapter ends with an analysis of their modes of reflexivity, that is their personal property and power (PEP), and the role that this played in their deliberative process. This chapter is represented in the figure below.

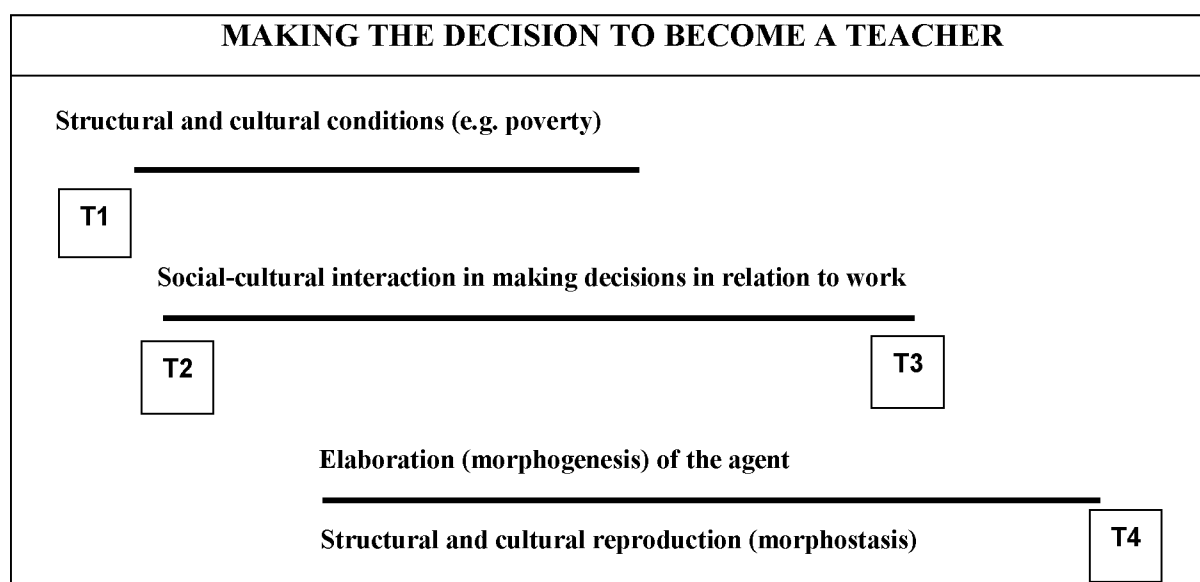


Figure P1: Chapter 5: The morphogenetic cycle as analytic and explanatory tool for the process deciding to become a teacher

Chapter Six deals with a different time period, one that follows after the participants respective decisions to enter the teaching profession. The chapter investigates their varied expressions of teacher roles (i.e. teacher identity). I identify the dominant roles of teachers expressed in teaching FP mathematics (T2-T3) by drawing on the various interview and observation data in the classroom. Having identified the dominant roles, I analyse the mechanisms that have given rise to these roles (T1) through the process of asking transfactual questions. The data in this chapter and my analysis thereof attests to the morphostasis of teachers' roles in the classroom and the resultant structural and cultural reproduction of teacher roles. I depict this in the figure below.

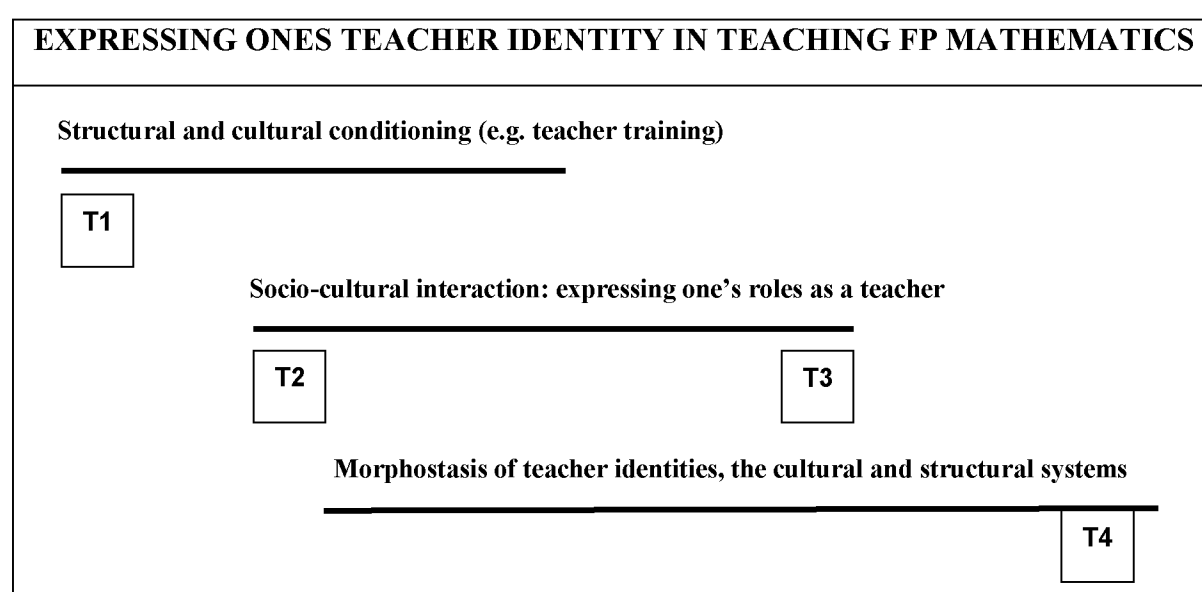


Figure P2: Chapter 6: The morphogenetic approach in relation to the expression of teachers' identities in teaching foundation phase mathematics

Given that understanding teacher identity and agency are important in my research, I move beyond the broadly structuralist arguments of Chapter Six to consider teacher agency in Chapter Seven. I start this chapter with an account of the prescribed roles of teachers as stipulated in various post-1994 policy documents. Specifically, I use these as a reference point to highlight the differences between roles enacted by the participants in my research on the one hand and post-1994 prescribed roles on the other hand. I then move on to a two-pronged consideration of agency. Firstly, I refer back to Chapter Five and elaborate on each teacher's mode of reflexivity, noting shifts that have occurred and what this means for their identities. Secondly, I draw on Archer's explanation of agency to argue why the participants in my

research sustain an unchanged set of teacher roles (morphostasis). This chapter is represented in the morphogenetic cycle below.

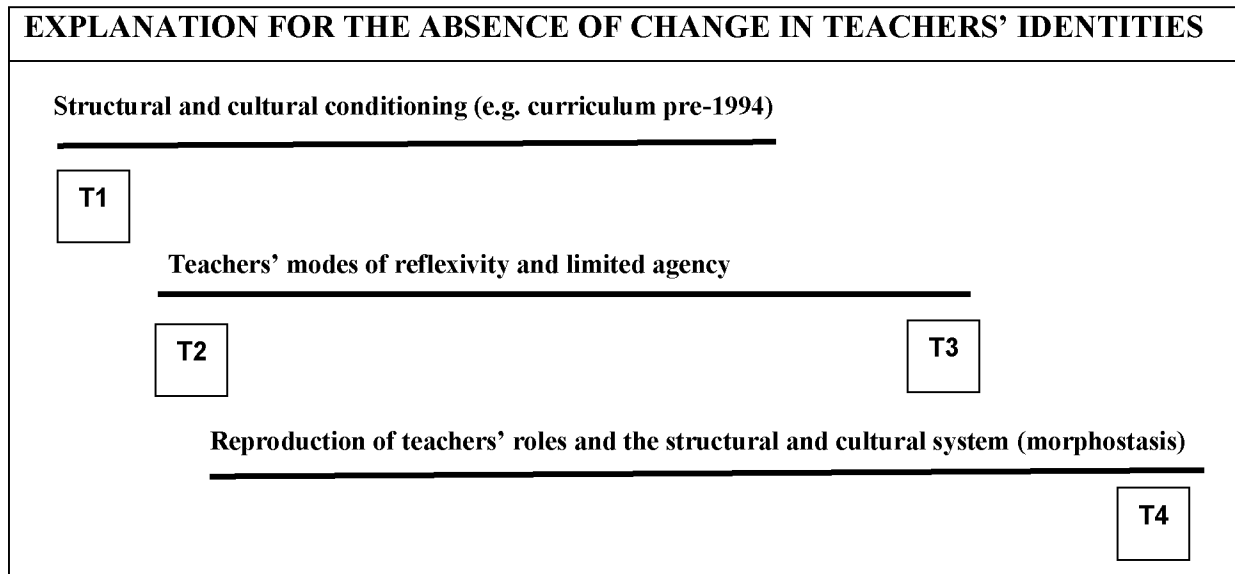


Figure P3: Chapter 7: Using the morphogenetic approach to examine teacher agency

Having provided a brief summary of the data chapters, I now move to the first morphogenetic cycle in Chapter Five.

CHAPTER FIVE

THE EMERGENCE OF TEACHER IDENTITIES: DEFINING A PROJECT

[People] make their own history, but they do not make it as they please; they do not make it under self-selected circumstances, but under circumstance existing already, given and transmitted from the past. The tradition of all dead generations weighs like a nightmare on the brains of the living.

(Marx, 1852, p. 1)

5.1 INTRODUCTION

This quote from Marx emphasises the role that the past has on conditioning social life. It is the (inter)actions of past agents that give rise to the structural and cultural mechanisms that condition the projects of agents in the present. This is significant in relation to my research, as it is the situations in which the teachers who participated in my research find themselves, that conditioned their decision to become teachers. In this chapter, I draw on the empirical data to begin the process of considering *who the teachers who participated in this research are*. As such, it is a question about identity, specifically teacher identity. In so doing, I focus, in this chapter, on sub-questions 1 and 2 of the research: (1) *How have Foundation Phase teachers' identities emerged?* (2) *What are the structural, cultural and agential mechanisms that have led to their emergence?* Both these sub-questions are typical realist questions, as they foreground ontology – that is, being in the world and emergence. In other words, they assume that there are structural, cultural and agential mechanisms that give rise to teacher identities. This chapter thus seeks to examine the emergence of the four participant teachers' personal (and social³²) identities. For consistency throughout I refer to the teachers as participants, as this chapter examines their deliberations *before* they became FP teachers, and hence my reluctance to call them teachers in this chapter.

To account fully for the emergence of the participating teachers' personal identities, I consider each of the participants' decisions, as they engaged in the world, to become teachers. Personal identity, achieved mostly during late adolescence and young adulthood, emerges out of our

³² I accept that personal and social identities are relational, with each informing the other. However, for the purposes of this chapter, I focus primarily on teachers' personal identities, as my interest is how they made the decision to become teachers.

reflexive engagement, that is, our internal conversations, over what we care about in the world. Delineating our ultimate concern, which persons decide to invest their time and energy into, leads to the formation of projects. The *project* that forms the focus of this chapter is *the decision and processes involved in deciding to become a teacher* and so the process of developing a personal identity.

While Archer (1996) suggests that researchers first establish the logical relations in the cultural system (CS) and social system (SS) that impinge upon the agent at T1 in the morphogenetic approach, I have chosen to begin with T2-T3 in the morphogenetic approach, as it is out of this that the cultural and structural mechanisms that conditioned and enabled the decisions of the participants to become teachers, emerged. In other words, it was during the life history interviews with each of the participants that the structural and cultural conditions that shaped their decisions to become teachers surfaced. The life history interviews, and the narrative at T2-T3 provided me with the opportunity to ‘look back’ in order to examine the present, and identify the mechanisms that constrained and enabled the teachers’ identities. Having identified the structural and cultural properties and powers that gave rise to the emergence of the participants’ personal identities, I explore each of their modes of reflexivity. Reflexivity, as noted in Chapter Three, is a distinctly human property and power that enables persons to weigh up what they care about in the world and develop projects in relation to their concerns.

In terms of the organisation of this chapter, I start with the overarching question guiding the life history interviews (Chapter Four) – *why did you choose to become a Foundation Phase teacher?* It is this question that generated responses that provided insight into the discern-deliberate-dedicate (DDD) process (T2-T3), that led to the emergence of the four participants’ personal (and social) identities; and also provided a starting point (T1) for ‘looking back’ and identifying the SEP, CEP, and PEP, most notably the mode of reflexivity, that shaped the choices that the participants made. This is important for trying to answer the overarching question of my study: *What are the conditions that enable or constrain the emergence and expression of Foundation Phase teachers’ identities through the teaching of mathematics?*

Before narrating the process by which the four participants in my research decided to make teaching their ultimate concern, I briefly introduce the four teachers.

5.2 INTRODUCING THE FOUR TEACHERS

Four teachers participated in my study: Nokhaya, Veliswa, Beauty and Nomsa. Nokhaya and Veliswa, the two oldest participants, were teaching Grade 3 at Sontonga Primary School while Beauty and Nomsa were teaching Grade 3 at Phambili Public School. Both schools are situated in Lwandle Township³³ and represent two of the three primary schools in the township. Tables 5.1, 5.2 and 5.3 provide general information relating to each of the four teachers.

Table 5.1: General information on the four teachers

Schools	Names	Age (in 2012)	Gender	Home Language
Sontonga Public School	Nokhaya	55 years	Female	isiXhosa
	Veliswa	52 years	Female	isiXhosa
Phambili Public School	Beauty	50 years	Female	isiXhosa
	Nomsa	39 years	Female	isiXhosa

Nokhaya was the oldest at 55 years of age, followed by Veliswa who was 52 and Beauty who was 50. Nomsa, the youngest of the four teachers, was 39 years old when I met her in 2012. In some respects these four teachers are representative, in age, of the South African teaching population. While the average age of the labour force in South Africa is decreasing, the average age of teachers has been increasing (Crouch, 2003) with the majority of teachers are between the ages of 40-49 (CDE, 2015). Furthermore, the feminised nature of the profession, particularly in the FP, is a stark reality in South Africa, with about 20% more women than men employed in the sector in general (Crouch, 2003). In the late 1980s when Veliswa started teaching, 75% of primary school teachers were female (Kotecha, 1994). It is thus not surprising that all four teachers are women. isiXhosa is the first language of all four of the teachers and the language in which they teach.

³³ I provide a sense of the context of Lwandle Township in Chapter Six when I explore the structural emergent properties (SEP) conditioning the manner in which teachers express their roles as teachers (i.e. their teacher identities).

Table 5.2 refers to the teachers' qualifications. While Nokhaya completed a two year Primary Teachers' Certificate (PTC)³⁴ in 1978, she upgraded³⁵ her qualification to a four year Bachelor of Education (BEd) at the University of Fort Hare from 2000 to 2003. Veliswa's initial teacher's qualification was a Junior Primary Teachers' Diploma (JPTD) which she did at Cape College. She upgraded her qualification to an Advanced Certificate in Education (Foundation and Intermediate Phase) (ACE) in 2008 and 2009, which according to the National Qualifications Framework was on the same level as the BEd. Nomsa's highest qualification is the same as Veliswa's. She also completed an ACE in 2009, but hers focused on the FP. Her initial qualification was a National Professional Diploma in Education (NPDE) which she obtained at Algoa College in 1999. Beauty's initial qualification was a Junior Primary Teachers' Diploma (JPTD) which, like Veliswa, she completed at Cape College in 1992. Later she upgraded her qualification with a Further Diploma in Education (FDE) in Leadership and Management, which was equivalent in level to the ACE that Veliswa and Nomsa completed.

Table 5.2: Qualifications of the teachers

Schools	Names	Highest professional qualification	Phase specialisations in Initial Teacher Education (ITE)
Sontonga Public School	Nokhaya	Bachelor of Education	Primary ³⁶
	Veliswa	Advanced Certificate in Education (Foundation & Intermediate Phase)	Junior Primary
Phambili Public School	Beauty	Further Diploma in Education	Junior Primary
	Nomsa	Advanced Certificate in Education (FP)	Foundation Phase

Table 5.3 highlights the number of years the four teachers have been teaching. In this table, the number of years is disaggregated according to years of teaching experience, years of teaching in the FP and years of teaching in Grade 3. It is not uncommon in South Africa, particularly in

³⁴ The nomenclature of teaching qualifications, and expectations in terms of length of study in South Africa changed during the time that the four teachers' participating in my research studied. Nokhaya did a PTC, a two year qualification that prepared prospective teachers to teach in the entire primary school. Veliswa and Beauty both did the Junior Primary Teachers' Diploma, a three year qualification that equipped prospective teachers to teach Junior Primary (Grades 1-3). Nomsa did a National Teachers' Diploma in Education, which was also a three year qualification equivalent to the qualification of Veliswa and Beauty. All teachers, post 1994, were required to upgrade their qualifications.

³⁵ Post 1994, teachers who did not have a four year qualification were expected to 'upgrade' their qualifications.

³⁶ The nomenclature used to describe the different phases of primary education has also changed. Pre-1994, Substandard A-Standard 1 (Grade 1-3) were referred to as Junior Primary and Standard 2-5 (Grade 4-7) were Senior Primary. Post-1994, Grade R-3 are regarded as Foundation Phase, Grade 4-6 are the Intermediate Phase, and Grade 7, which is the last year of primary school in South Africa, is the first year of the Senior Phase (Grade 7-9).

black schools³⁷, for teachers to teach in a phase that is different from that which they trained to teach in (Centre for Development and Enterprise, 2015). It should be noted that all the children in the schools where these teachers' teach are black.

Table 5.3: Number of years of teaching experience³⁸
(Teacher Questionnaires, 2012)

Schools	Names	Years of teaching experience	Years of teaching experience in FP	Years of experience teaching grade 3
Sontonga Public School	Nokhaya	+ 25 years	0 – 5 years	0 – 5 years
	Veliswa	+ 25 years	21 – 25 years	0 – 5 years
Phambili Public School	Beauty	16 – 20 years	16 – 20 years ³⁹	11 – 15 years
	Nomsa	10 – 15 years	6 – 10 years	0 – 5 years

Both Nokhaya and Veliswa had over 25 years of teaching experience. While most of these years for Veliswa were in the FP, Nokhaya moved to the FP more recently. At the time I met Nokhaya she had been in the FP for 18 months. Both Nokhaya and Veliswa had relatively little experience teaching Grade 3 learners. Nomsa, like Nokhaya and Veliswa, also had less than 5 years' experience teaching Grade 3, but she, compared with the other three teachers, was still relatively young, having taught for 12 years. Beauty had taught for 19 years when I met her; all of those years in the same school. All the teachers had taught in phases that differed to the ones they were trained for, except for Nokhaya, whose initial qualification focused on teaching the entire primary school (i.e. both Foundation and Intermediate Phase).

Having provided a quick introduction to the four teachers I now draw on the empirical data from the life history interviews, to examine how these four research participants made teaching their ultimate concern. In other words, I examine the decision-making process to making teaching their career choice.

³⁷ Despite the numerous changes in education since 1994, the majority of schools in South Africa are still not racially integrated.

³⁸ This was drawn on questionnaire data from the EU:SFTE project which asked teachers to 'tick' a band of years of experience rather than to say the exact number of years that each teacher has taught in Grade 3.

5.3 BECOMING A FOUNDATION PHASE TEACHER

As young people who had reached the age where they were expected to find employment, these four participants had to distinguish their ultimate concerns from their subordinate concerns. It is possible that these concerns are not always compatible, and this requires that agents engage reflexively and evaluate each concern in relation to the consequences for self. In other words, agents have to ‘weigh up’ the positive and negative costs of their decisions in defining their projects.

Identifying the ultimate concern (T2-T3 of the morphogenesis of the person) contains the DDD scheme as agents have to discern, deliberate and dedicate themselves to the decisions they have made (Archer, 2000). *Discernment* is the process of identifying projects that could possibly be worthwhile, and to which the participants, in their youth, had an emotional attraction. *Deliberation* entails the process of reviewing the possible projects and deliberating the relative worth of each in relation to their concerns. *Dedication* involves the process of decision-making and identifying the ultimate concern. Later in this chapter, I identify each of the participants’ mode of reflexivity, as this personal emergent property (PEP) is central to the DDD process. The narrative that I have constructed from the empirical data below, highlights this process of finding an ultimate concern and making the decision to become teachers. As expressed in Chapter Three it is identifying one’s ultimate concern that gives agents their personal identity (Archer, 2000, 2007a, 2012).

The responses to the first question posed in the life history interviews – Why did you become a Foundation Phase teacher? – surfaced this process of deliberation and provided insight into how the teachers negotiated and renegotiated their ultimate concern (T2-T3) in relation to the world of work, and how their decisions to become teachers were conditioned by the situations they were involuntarily placed in (T1). As I narrate in this next section, it is evident that poverty, specifically in relation to the socio-economic context, was the key mechanism conditioning the participants’ process of formulating an ultimate concern, that is, the choice to become teachers.

Three of the four participants, Nokhaya, Veliswa and Beauty stated explicitly that teaching was not their first intention. For Nokhaya, it was the choice of her parents who required her to start working in order to contribute to the family living expenses and the education of her brother.

Beauty and Veliswa, after completing their secondary schooling, were dependent on obtaining financial support in order to study further. In the 1970s and 1980s, when Nokhaya and Veliswa were ready to consider career options, there were few funded study possibilities for women, particularly black woman. Career choices in South Africa were both raced and gendered. Pillay (as cited in Kotecha, 1994) wrote “the narrow range of jobs they (women) hold often resembles the female domestic role: nurses (caring for people), teachers (dealing with children), and domestic workers (actual housework)” (p. 22). The most common, and viewed as ‘high status’ professions for black women, were teaching and nursing (Kotecha, 1994). Veliswa, Beauty and Nomsa all wanted to be nurses when they left school, while Nokhaya had not given her future career choice much thought when she was at school. However, it was clear that none of these participants had the intention initially, to become teachers.

Veliswa (LHI1) opted for teaching because she was firstly unable to obtain a visa to Namibia to study nursing; and secondly, she was denied a bursary to study at university.

I didn’t want to be a teacher firstly. I wanted to be a nurse, but circumstances made me to become a teacher. I applied to be a nurse in Namibia, but I didn’t go, so I changed to being a teacher. ... I think I was going to like to be a nurse and treating people, helping them while they are ill. I don’t know what changed me or I didn’t get a visa to go to Namibia. (tt.22-24)

Veliswa did not disclose why she wanted to study nursing in Namibia. Having not been successful in getting a visa to go to Namibia to study nursing, Veliswa decided to go to university in South Africa, to study a general Bachelor of Arts degree. Given that she was single-parented by a mother who was a domestic worker, she required a bursary to support her further studies. She explained that the bursary was offered conditionally.

When I was doing Form 5 (Grade 12), I went to Zone 6 to try and get a bursary. But when I got there, there was this fat man sitting on a chair who said okay you can give me your ID book (laughs). And then I gave it to him. And then he said, you will get the bursary provided you have a relationship with me. ... And I went home and decided not to go back there. That’s why I didn’t go to university because I wanted to apply at Fort Hare. And now I had no funds because my mother was only working for R20 or R40 a month so I lost ... and I even left my ID there. I got it after some time; they posted it to me. (Veliswa, LHI1, tt.232-236)

With nursing and studying for a general degree no longer an option, teaching became the third choice for Veliswa to pursue. Having made that choice, she decided to do a Senior Primary Teachers’ Diploma (SPTD), but after seeing that there were few students who wanted to do the

Junior Primary Teachers' Diploma (JPTD) she changed her mind and registered for the JPTD. "At first I wanted to be an SPTD teacher" (Veliswa, LHI1, t.10) but "when I went to college, there were not many people who wanted to be FP teachers, so I opted to become a FP teacher" (Veliswa, LHI1, t. 4). The qualification that she chose was based on her perception of where there would be more job opportunities.

Beauty's experiences are similar to those of Veliswa. She too wanted to study nursing.

I didn't like teaching. My aim was to become a nurse ... because I like people and my heart is too soft. And when I see somebody who is sick I feel so sorry for them, so sorry, so I liked a nurse. But due to finance maybe I did not go for that. By the time I finished matric, I was old. I applied to Port Elizabeth. I was 25 years and they say 'No, I'm old, they can't take me.' So, I resorted to teaching. (Beauty, LHI1, tt.2-4)

For both Veliswa and Beauty, teaching thus became the 'only' option for further studies. Beauty's comment "So, I resorted to teaching" (Beauty, LHI1, t.4) is telling, as is the fact that teaching was Veliswa's third choice. Both teachers were reliant on funding for their studies. In South Africa at the time, there were only two options of guaranteed funding for further studies – teaching and nursing. Since they could not get bursaries for nursing, teaching became *the* viable option.

For Nomsa, it was slightly different. Nomsa also wanted to go into nursing when she was young, but unlike Veliswa and Beauty who were constrained because of age and/or money, Nomsa's interest was short-lived. She attributed her initial interest in nursing to the aspirations of most young children at the time when she was at school.

When I was growing up, I was ... I wanted to be a nurse, like every child in that time ... I really don't know but then everyone wanted to be a nurse or teacher. And to become a teacher was such a big thing because if people saw you dressing smart they would think that you are a teacher. Maybe that's what ... but the only thing now that makes me to become a teacher was because of money. My parents did not have money for me to go to better institutions. (Nomsa, LHI1, t. 190)

Even though Nomsa wanted to become a nurse initially, she had an interest in teaching from an early age. She was inspired by one of her primary school teachers. "I think it was fine [referring to her primary schooling] because that, I think, is what inspired me to become a teacher because that teacher was a very good teacher. Even our older sisters and aunts were taught by her. ... It was Mrs P" (Nomsa, LHI1, t. 38). However, escaping poverty, becoming

a professional and earning a salary were also important in making the decision to go into teaching, as her parents did not have the financial resources to send her to a higher education institution. It was with the financial assistance of her boyfriend at the time, that Nomsa enrolled at a Teachers' Training College in 1997.

Nokhaya's experience differed from the other teachers. She was told by her father that she needed to study towards a profession and that teaching would be suitable for her.

Now when I became a teacher in 1979, in the so-called Transkei that was not my idea. That was my parents' idea. We were four at home, in the boarding school, and my father was not at home. It was only ... my father that was working. So when I passed JC (Junior Certificate)⁴⁰, it was JC at that time... Form 3 (Grade 10). My father decided to send me to a training school because he said I must finish up so that I may help him to pay school fees for the others. So I went to training school. And it was easy that time to find a job because we did applications when we were still at school and when you come out, you already have a placement. (Nokhaya, LHI1, t.10)

In addition to assisting in supporting the family, Nokhaya's father thought teaching would be good for his daughter because she was reserved when she was young. She explained:

When I was young I didn't want to talk. Sometimes I only started talking during the day. In the mornings I did not want to talk. And my father said 'If you become a teacher, I will talk'. Because the children will wait for me to talk. So he said I must go to teaching. (Nokhaya, LHI1, t.10)

As a result, Nokhaya, unlike the other three teachers in my research, did not complete her secondary schooling. She was taken out of school so that she could become a primary school teacher. It appeared that Nokhaya had accepted her familial responsibilities and did not entertain the idea of alternative career options. When I asked her what career she would have chosen if it had been her choice, she responded, "any career with better salary" (Nokhaya, LHI1, t.178).

Although Nokhaya, Beauty and Veliswa had opted to go to a Teachers' Training College, they initially had no intention of teaching in the FP. Evident in the narratives of these three teachers, is a *double non-intention*. By that, I mean that their initial intention was not teaching, and once having decided to become teachers, their intention was not to become FP teachers.

⁴⁰ A Junior Certificate was achieved at the end of Grade 10.

Beauty considered becoming a high school Afrikaans and Geography teacher because those were her favourite subjects at school. She applied to Griffiths Mxenge Training College but did not have the finances to go there.

As I said it was not my trend – teaching. I did get [accepted] at school in Mxenge [Griffiths Mxenge Teachers' Training College] for secondary teacher, but I didn't have money that time. When I finished Standard 10⁴¹, I was [accepted] ... in Zwelitsha at Sebe [Teachers' Training] College but I didn't have money at that time ... It was a secondary teachers' college that time ... I was going to major in Afrikaans and Geography. (Beauty, LHI1, tt.208-212)

Beauty ended up going to Cape College in Fort Beaufort once she had saved up sufficient funds to register. At Cape College she registered for JPTD.

As I said it was my last resort; I go anywhere where I get a space ... I go there and I found the school in March. They were short of learners there. Then my friend phones me: 'Come, there is space in Junior Primary'. So I had to go there, to do FP. (Beauty, LHI1, t.216)

Once qualified with her Primary Teachers' Certificate (PTC), which enabled Nokhaya to teach from Substandard A (Grade 1) to Standard 6 (Grade 8)⁴², she took up a position in a primary school in Tsolo as a Grade 5 teacher. She remained a Grade 5 teacher throughout her teaching career (1979 to 2009) and only changed to the Foundation Phase in 2011. This she explained was not her choice either.

That was not my choice ... we usually ... maybe for three years if you are teaching Grade 1, you can be transferred to Grade 5 ... Or if there is a vacancy somewhere, the SMT [School Managing Team] will decide who to move to that class. I was teaching Grade 5 and then the teacher from this grade, Grade 3 left, retired. And then the SMT gathered together to decide who must come to teach Grade 3 and they chose me. ... They called me to the meeting and said that they want me to come to this class, but they wanted to find if I'm ready to come. So I said there's no problem, I can come. (Nokhaya, LHI1, t.4)

From the narratives above, the decision to become FP teachers was, in many respects, influenced by the extent to which these four participants could access funding for their further studies. Not one of them suggested that teaching was their first choice. Three of them initially would have preferred to become nurses. For Veliswa, teaching was her “third choice” and for Beauty, her “last resort”. Nokhaya explained that both teaching and teaching in the FP were

⁴¹ Standard 10 is the equivalent of Grade 12, and in South Africa, is also referred to as ‘matric’.

⁴² I will refer to the Grade level from now on rather than the use of Standards as this is what we currently use in South Africa.

“not her choice” and for Nomsa it was only “through the help of my boyfriend” that she studied to become a teacher.

5.4 A SOCIAL REALIST ANALYSIS OF THE NARRATIVE DATA

Drawing on Archer’s morphogenesis of the person as a theoretical tool, I redescribe the above narrative with a view to working towards an analysis. I begin this redescription with a focus on the concept of *personal identity*; the prioritising of concerns and the development of projects related to the ultimate concern of all four participants. With this lens, we can see the decision to become teachers was not a simple process for the four participants in my study. The structural context, in particular the material context, that all four participants found themselves in as adolescents and young adults, limited the range of career choices available to them. All four participants’ career choices were limited by financial constraints. Veliswa and Beauty were both dependent on getting bursaries to pursue their studies, Nokhaya had to leave school, complete a two-year PTC in order to start contributing towards the family income, and Nomsa was dependent on her boyfriend paying for her studies. All four of these participants were involuntarily placed, through birth, in positions of poverty and it is this position, in conjunction with other structural and cultural mechanisms that I elaborate on in the next section which constrained their choice of career.

The choices of Nokhaya and Veliswa were further constrained by the limited career options for black woman at the time they were delineating, deliberating and deciding their ultimate concerns and future projects. The options available, at that time, were limited to nursing and teaching.

Despite the financial and career constraints, both Veliswa and Beauty were driven by personal aspirations and a concern to become young professionals. With only two funded options available, nursing was the initial career choice for both of them for similar reasons. Veliswa and Beauty thought that they would like to help people, especially those that were ill. It is interesting to note that this interest has, in some respects, remained with them. Veliswa looks after her ageing and ill mother, while Beauty fostered a boy in Nomsa’s class because the social workers explained his parents were mistreating him.

She told me:

I adopted. I just said to them. I was playing that time. And the social workers were here and were saying this child just got smacked and there are no clothes, no what-what. Her life is terrible. I just say why don't you give me this child. The social workers said take her now. (Beauty, LHI1, tt.290-294)

Given that Veliswa did not get a visa to study in Namibia and Beauty could not get the bursary because of her age, both had to reassess their situation in the light of the constraints, and dedicate themselves to a new project. Despite the constraints, we can see examples of agency as they deliberated about what they cared about in order to identify their ultimate concerns, and the actions they needed to take. Having finally decided on teaching as their work-related project, primarily because of the bursaries available for teachers at that time, neither Veliswa nor Beauty had particularly wanted to be Junior Primary (Foundation Phase⁴³) teachers. Both made strategic decisions to become FP teachers based on their knowledge that there were fewer FP teachers in the schooling sector. This was an important consideration, as finding employment was viewed as a means towards economic stability. As I note later in this chapter, Veliswa and Beauty are both autonomous reflexives who adopted a strategic stance towards structural and cultural constraints.

For Veliswa, Beauty and Nomsa, it was their *personal aspirations* that underpinned their persistence to study further and choose teaching as a career. Veliswa attributed her drive to become a professional to her concern for satisfying her mother's aspirations for her. She said: "Yes and I wanted to be successful because my mother had no money. So if I failed then she would have been hurt" (Veliswa, LHI1, t.252). For Nomsa, becoming a teacher, marked an elevation in status brought about by earning a salary and "dressing smart" (Nomsa, LHI1, t.190). Beauty, by contrast, spoke of her sense of pride. She said: "I'm proud. I like to be somebody. And I like when my friends I see ... the people that I was with at the school, they are something, they are professional" (Beauty, LHI1, t.10). Each of these teachers' motivation to become teachers was driven by the desire to earn a salary so that they could move toward economic stability and a higher socio-economic status.

⁴³ For ease of reading, I will use the new terminology, Foundation Phase, rather than the old terminology, Junior Primary even though these teachers were pre-1994 referred to as Junior Primary teachers.

Nokhaya's narrative differed quite significantly from the other three teachers. Unlike Veliswa, Beauty and Nomsa who engaged in the DDD process in order to identify their ultimate concern (i.e. work) and to define their projects (i.e. teaching), Nokhaya had the decision, to become a primary school teacher and ultimately a FP teacher, made on her behalf. Nokhaya, like the other participants, was born into a context of economic disadvantage. This was a context, as explained below, characterised by poverty. Nokhaya's parents took the decision that she should become a teacher on the basis of their perception of what would be good for her given her shyness and so that she could assist the family financially by funding the education of her brother. In Nokhaya's narrative, as will be illuminated in the section below, gender can be regarded as both a constraint and enablement. While her gender constrained her opportunity to complete her schooling, it enabled her move into teaching. It appears Nokhaya is a passive agent, having been comfortable with decisions made on her behalf (i.e. becoming a teacher, and becoming a foundation phase teacher specifically). However, she is not passive in the sense that she is incapable of action. Once the decisions were taken for Nokhaya, she authored her own projects in relation to those decisions. Later in this chapter, I suggest that Nokhaya's acceptance of these decisions could be related to her mode of reflexivity at that time which privileged the voices of her parents and those familiar to her in making decisions (Chapter Three). Archer contends that persons' modes of reflexivity, the manner in which we exercise our reflexivity, plays a role in how persons mediate structural and cultural enablements and/ or constraints.

Interesting in this narrative, constructed from the participants' life history interviews, is a sense that all four were initially reluctant to become teachers. This begs the question, how many other teachers currently in the South African schooling system, and particularly in the Foundation Phase were also reluctant to become teachers. How many of our current teachers in South Africa became teachers because it was viewed, out of a limited array of career opportunities, as a means toward economic advantage and, in Beauty's words, a means to "be somebody" (Beauty, LHI1, t.10)? In other words, becoming a professional was a move toward economic advantage.

I now turn to examine the SS and CS, that conditioned the decisions that each of these four participants made to become teachers. As highlighted in the above narrative, the emergence of each of these teachers' personal identities, that is their ultimate concern, was conditioned by a number of structural and cultural mechanisms that existed in both necessary and logical

relations with each other. These mechanisms conditioned the environment that the four participants were born into. It is these mechanisms that I consider in the next section.

5.5 STRUCTURAL AND CULTURAL MECHANISMS CONDITIONING BEGINNER TEACHERS' IDENTITIES⁴⁴

In the previous section, I constructed a narrative of the four participants' decision-making process in identifying work, and particularly, a desire to be economically stable, as a concern. Later in this chapter, I suggest that this was the ultimate concern at the time, for Veliswa and Beauty. Put differently, I argue it was their *modus vivendi* (Archer, 2000), whereas for Nokhaya and Nomsa, it was but one of their concerns.

I now turn attention to the structural and cultural factors that conditioned the circumstances within which the four teachers in my study found themselves and the situations they confronted. These constraining and/or enabling mechanisms pre-existed each of the participants in my research. Archer (1995) explains that:

Given their pre-existence, structural and cultural emergent properties shape the social environment to be inhabited. These results of past actions are deposited in the form of current situations. They account for what there is (structurally and culturally) to be distributed and also for the shape of such distributions, for the nature of the extant role array, the proportion of positions available at any time and the advantages/disadvantages associated with them; for the institutional configuration present and for those second order emergent properties of compatibility and incompatibility, that is whether the respective operations of intuitions are matters of obstruction or assistance to one another. In these ways, situations are objectively defined for their subsequent occupants or incumbents. (p. 201)

The extract from Archer (1995) provides a synthesis for the theoretical background for this particular section in my thesis. It is the result of the interactions of others at T2-T3, that conditioned the situations that each of the participants in my research were born into. In other words, the present conditions, T1 of the morphogenetic cycle, are always historically situated and conditioned. Using Archer's morphogenetic approach (Chapter Three) as a guiding framework, I focus in this section on the structural and cultural conditions that gave rise to the decisions each of the four participants in my study made to become teachers. Through the

⁴⁴ While the focus of this chapter is the emergence of personal identities (i.e. the decision to become Foundation Phase teachers), the SEP and CEP that I elaborate on below, have also constrained and enabled the four teachers' social identities (i.e. teacher identities). I will draw on this work in the next chapter.

process of asking transfactual questions of the narrative in the previous section, I was able to identify some of the SEP and CEP giving rise to teachers' personal identities. These are categorised in Table 5.4 below.

Table 5.4: Structural mechanisms conditioning the four participants' choices to become teachers

Nokhaya	Veliswa	Beauty	Nomsa
• poverty • limited career opportunities • limited funded further education opportunities • gender • authority figures (parents, SMT)	• poverty • limited career opportunities • availability of bursaries • job opportunities • personal aspirations	• poverty • limited funded further education opportunities • availability of bursaries • space available in teacher training institutions (linked to job opportunities) • personal aspirations	• poverty • availability of funding from her boyfriend • personal aspirations • inspiring teacher

These conditions, giving rise to the choice of each of the participants to become teachers, are embedded in a historical context. This section thus moves beyond the empirical data of the interviews in order to examine the contexts and positions that these teachers were born into, and the contexts and positions of their youth. As such, it explores the natal context of the four participants in this research. These contexts and positions were not of the participants' choosing and in South Africa reflected the state of politics in the country at the time. The next section presents the material and ideational conditions that the participants were born into and in which they lived their lives as young people. From the interviews and discussions with the four teachers, there is some consistency in terms of their experiences growing up in South Africa during the apartheid era.

It is not the purpose of this section to surface all possible structural emergent properties (SEP) and cultural emergent properties (CEP). This would not be possible, nor particularly useful. Rather, I focus on those pertaining to the unit of analysis for this chapter (i.e. the decision to make work an ultimate concern and teaching their project). In other words, I explore, at the level of the real, the mechanisms and powers that constrained or facilitated the participants' decisions to become teachers, as these mechanisms "condition distinctive patterns of cultural action and development" (Archer, 1996, p. 147). To do this, I now draw on the structural and

cultural conditions shaping the four participants' decisions to become teachers, that is, the process of developing their personal identities.

Of all the structural conditions that these participants referred to, in relation to the contexts they were born into and that remained with them throughout their lives as they were growing up, poverty was the most dominant. Economic poverty in South Africa, is not only associated with social class, but invariably intertwined with race. In other words, poverty⁴⁵ in South Africa is overtly political. It is linked to segregationism post-unionisation in 1910, when South Africa was formed, and which was formalised during the apartheid era through policy. The teachers made little reference to the political situation prevalent in the country when they were growing up. However, from the comments they made with regards to poverty, it is clear that the political situation conditioned their lives.

The reality of segregationism is reflected throughout the lives of these teachers. In exploring how segregationism has impacted on the lives and practices of the four teachers in my study, it is necessary to reflect on the implications that segregationism had on geographic space, family life and schooling. Each of these aspects has conditioned the lives of the teachers in my study. It is these conditioning mechanisms, structural and cultural, that are the focus in this chapter.

5.5.1 Poverty as a structural condition

Poverty is conceptualised in a multiplicity of ways. In this chapter, I draw on the notion of poverty as suggested by Sen (as cited in May, 2012). Sen provides an elaboration of the notion of poverty beyond economic disadvantage to include “constrained choices, unfulfilled capabilities and exclusion” (p. 64). Drawing on the teachers' life history interviews, they lived prior to 1994⁴⁶ as marginalised members of society. This had implications on their personal and social identities. Sen's description of poverty considers the implications of social and economic exclusion; the resultant limitations in terms of choices, particularly career choices as

⁴⁵ I elaborate on this term in the next section.

⁴⁶ 1994 is a significant date in the presentation of my data as it was the year that the first democratically elected government, the African National Congress, came into power. Pre-1994 refers to the era of segregationism, particularly the apartheid era from 1948, and post-1994 refers to the democratic era. In many respects, post-1994, should be interpreted as post-apartheid; a signal that while apartheid “is no longer a legal entity” (Thaver & Thaver, 2010, p. 48), the lines of continuity into the present can still be seen in terms of geographic space, schooling, career opportunities (Westaway, 2012).

highlighted above and enables a conceptualisation that focuses on intersectionality (i.e. the relationship between class, race and gender).

This section draws on the life history interview data of the four participants, to demonstrate how poverty defined their lives as they were growing up. It was only once they became young professionals that they were able to move toward economic advantage. This speaks to their agency, which will be explored later in this chapter. With regards to poverty as a structural mechanism conditioning the lives of these teachers, two themes emerged from the data. These included being born into a life of poverty, and being schooled in a context of poverty.

5.5.1.1 Being born into a life of poverty

The natal context that the four participants were born into was structured historically by the segregationist policies post-unionisation in 1910, when the Republic of South Africa was formed. While the various colonial administrations, prior to 1910, passed many discriminatory laws against black people⁴⁷, Westaway (2012) contends that the Native Land Act of 1913 was the most severe and has had the most lasting effects. It was the consolidation of white interests in 1910, after the South African War of 1899-1902, that brought together Afrikaans (Dutch) and English (British), but separated black and white (Dubow, as cited in Westaway, 2012).

The loss of land has possibly been the most important factor in the impoverishment and marginalisation of black people in South Africa. Soon after unionisation, the Department of Native Affairs was created and, in 1913, the Native Land Act passed and as such, segregationism became official policy. The Native Land Act focused on preserving 87% of land in South Africa for whites, while leaving 13% for use by black people. Put differently, 13% of the population owned 87% of land and 87% of the population owned 13% of land. Land reserved for black people was restricted to areas which in the late 1950s became consolidated into the former Bantustans⁴⁸; serving as *de jure* states of the black South Africans during apartheid (Westaway, 2012). Two former Bantustans, the Transkei and Ciskei, were

⁴⁷ I use the racial classifications to denote the extensive period of segregationism in our country. I have chosen not to refer to my teachers as black South Africans, as South Africa emerged in 1910 as a country for whites. The segregationist terms, relevant to the times, that were used were blacks, coloureds and whites. Racial categories are still used in South Africa today in order to redress the inequities of the past. Schools and universities, for example, are expected to report on the number of staff and students they have in each of the race categories.

⁴⁸ I refer to the areas set aside by successive post-1910 white minority governments for exclusive black occupation as 'former Bantustans'. These are alternatively referred to in some literature as 'former homelands'. I chose the term 'Bantustans' because that was used from the 1950s by the apartheid government and it encapsulates the crude harshness of the apartheid regime and era.

established in the Cape Province, both on the eastern side of the province as indicated in Figure 5.1 below. The Transkei was the first to be set up as a former Bantustan; in 1959 it was subjected to a ‘Territorial Authority’ and in 1963 it was accorded self-governing status. The Transkei was declared independent in 1976 and the Ciskei in 1981 (<http://www.sahistory.org.za/places/transkei>). Westaway (2012) asserts that these sites had “tailor-made juristic arrangements” (p. 120) where inhabitants lived “outside [the] normal legal parameters” (p. 121). Beauty described an incident in her final year of school that in many ways signified the brutality of living in the Ciskei, one of two former Bantustans in the Cape Province.

It was so tough. By that time I was not living in the village, I was living in Zwelitsha. So when I go to school, we were blocked by the students not to go to school. I remember one time, I didn’t wear my uniform. I go to school. It’s a long way from Zwelitsha. A car stand [came] by. It was the police. The next thing they have sjamboks [sticks] and ask ‘Why are you not wearing your uniform?’ I was afraid of the learners in Zwelitsha because they attack me when I’m going to school, so I dress in my clothes. And police smack me, it was terrible. At that time the polices in the Ciskei were so brutal. (Beauty, LHI1, t.166)

Many black people, prior to 1948 when the National Party came into power, lived either in these former Bantustans or on white-owned land as labourers. Very few black people owned land as land reserved for black people was restricted to the former Bantustans. Figure 5.1 below shows the former Bantustans within the four provinces of South Africa.

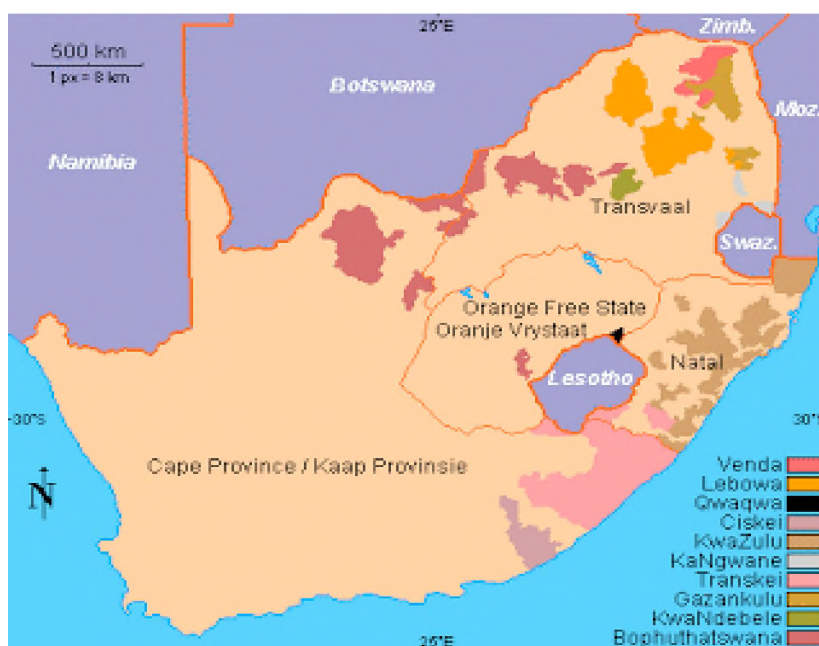


Figure 5.1: The four provinces in South Africa and the former Bantustans pre-1994
(<http://southafricanresearcher.blogspot.com/2010/04/maps-of-south-africa-1.html>)

All four participants in my research were born in contexts where their parents did not have secure land tenure. Nokhaya was the only participant in my study who grew up in a former Bantustan. Veliswa, Beauty and Nomsa were all born in the Eastern Cape portion of the then Cape Province.

Veliswa and Nomsa were born on white-owned farms in the Cape Province where their parents worked as menial labourers. Veliswa was born in 1960 in the Lwandle region in the Cape Province. It was the same farm her father was born on and to which her mother moved when she married her father. Neither of her parents were educated. Veliswa's mother was a domestic worker on the farm. When Veliswa was four years of age her father moved to Port Elizabeth (PE) in search of better employment opportunities.

For Veliswa, life on the farm "was good, but we were suffering because my father left my mother there and so she had to do everything by herself. My father came back to take my brother, my elder brothers, they were two, so I was left with my mother at Ford's Party" (Veliswa, LHI1, 6 August, t.40). Veliswa was uncertain about the reasons for her father's departure. "I didn't know. He went to work in PE and then Saldahna Bay with the soldiers and he didn't come back. He saw other women (laughs) when he was there and came back to PE. He was a soldier there" (Veliswa, LHI1, t.44). In South Africa, it was common at that time due to the shortage of employment opportunities, for black men to seek work opportunities in towns away from their families. This proved difficult for many families. Wilson and Ramphela (as cited in Gelb, 2004) drawing on interview data, capture this difficulty in the words of both children and women – "we find our fathers with concubines yet our mothers are starving" and "for our husbands we are just their old-age home or their hospital" (p. 20). Furthermore it had devastating economic and social consequences for many families as the above two quotes suggest. Once her father and brothers left, Veliswa grew up as an only child on the farm except for the white farmers' two children: a boy her age and a girl who was a few years younger. Veliswa's mother eventually moved to Lwandle as she did not want to stay with her estranged husband's family anymore. In Lwandle she again worked as a domestic worker for a very low wage. Domestic workers were possibly the worst paid workers, who worked, predominantly for whites, for long hours and had no job security (Beinart, 2001).

Nomsa's father "was a farm worker, like herding cattle, and my mother was working in the kitchen as a domestic worker" (Nomsa, LHI1, t.26). She was born on New Years' Farm in

Seven Fountains, a farming community, in the Cape Province in 1974. Like that of Veliswa's father, her lineage, on both sides of the family, can be traced back for generations on the farm. Nomsa grew up in a single dwelling with her grandmother, parents, aunts, uncles, siblings and cousins. They were a large extended family living in one house as her grandmother had eight children and her parents had nine of which she was the fourth-born. Living with the extended family in one house is the reason Nomsa gives for them being a very close family. To this day, the entire extended family always make a point of spending the Christmas holidays together. Despite Nomsa's descriptions of her close knit family, farm workers, by virtue of their isolation living on farms, were often the most excluded of persons living in South Africa.

The living conditions of farm workers were poor, wages low and they had little job security (Atkinson, 2007). They could easily be replaced as they were not skilled labour and were thus often subject to minimum wages and unjust treatment by farm owners. Robertson (as cited in Atkinson, 2007) suggests that in the 1980s wages for farm labourers varied, for the same hours and tasks, from R80 to R240 per month. While farm worker wages were very low (Atkinson, 2007), the wages of domestic workers were even lower (Beinart, 2001). Wages⁴⁹ paid to farm-workers and domestic workers were mostly a combination of cash and in-kind wages (i.e. accommodation, food, medicine) (Beinart, 2001; Atkinson, 2007). The mothers of Veliswa, Beauty and Nomsa were all domestic workers, working in homes for white South Africans and earning a pittance. Veliswa explained "my mother was only working for R20 or R40 a month" (Veliswa, LHI1, t.234).

Beauty's mother worked in Grahamstown in the Eastern Cape and later in Lwandle, as a domestic worker. Beauty was born in Grahamstown in 1962. Her mother and father met in King William's Town. Her father was "working there and my mother was a learner there at Zwelitsha Primary. So she met my father there. And she goes back to her mummy in Grahamstown. Then my mother got married to this step-father. The step-father is also from Grahamstown" (Beauty, LHI1, t.58). When Beauty was a one year old child, her mother married her step-father.

⁴⁹ Minimum wages for farm workers were only introduced in South Africa in 2002 (Atkinson, 2007).

Beauty lived with her mother and stepfather up until the age of 9. Her early years in Grahamstown were impacted by the segregationist policies brought into effect post-unionisation and enforced in the 1960s. Describing her memories of Grahamstown she said:

I was not big that time. I was not, I was still young. But I remember the people that I was living with there. We were living in Currie Street. It was very useful to me. We were living with the coloureds⁵⁰. That is why I was exposed in [to] Afrikaans. I know a little bit of Afrikaans. So it was very good to live in there. (Beauty, LHI1, t.84)

With the implementation of the Group Areas Act in Grahamstown in the 1960s, Beauty's parents moved to Lwandle Township. She moved with her grandmother to Adelaide. Beauty preferred to stay with the grandmother who she said had the most significant influence on her life.

While none of the parents of Veliswa, Beauty and Nomsa had any formal education⁵¹, Nokhaya's parents, by contrast, had some level of education. Her father was a migrant worker who worked outside the territory of the Transkei as a clerk on the railways in Durban in Natal (now referred to as KwaZulu Natal) until he retired. Nokhaya's mother was a teacher by profession, but she did not have permanent employment as it "was difficult for married woman to teach at that time" (Nokhaya, LHI1, t.58) because permanent posts were reserved for unmarried women (Kotecha, 1994). Despite having parents who had some education, Nokhaya was still born into a position of economic disadvantage. She was born in 1957 in Tsolo, a rural village in the former Transkei.

Each of these participants was born into contexts of economic disadvantage. This was a highly politicised context that characterised persons according to race, and positioned black people as subordinate to white people. While my four research participants did not focus on the political situation which they found themselves in, during the interviews, it nevertheless formed the basis for the stories they told about their lives. Despite the different regions that these participants were born into, all were poor. None of their parents had land and the majority had no formal education and thus few employment opportunities. Those who managed to find employment worked primarily as unskilled labour. This meant they were easily replaceable

⁵⁰ A racial category to refer to persons of mixed race. Most speak Afrikaans as their home language.

⁵¹ The 1996 Census (i.e. post the election of the first democratically elected government) showed that around 41% of male farm workers had no schooling and 34% had some primary schooling. Women farm workers had even less education than their male counterparts. (Simbi & Aliber, as cited in Atkinson, 2007)

and thus were subject to harsh employment conditions. Returning to Sen's (as cited in May, 2012) definition of poverty, the lives of these four families were ones of exclusion, subordination and limited choice. All four participants were thus products of an unequal and unjust society. This inequality continued into their schooling.

5.5.1.2 Being schooled in South Africa during apartheid

All four teachers were schooled during apartheid. Schooling during this time was racially segregated in terms of geographic location, demographic profile and in terms of how they were defined legislatively (Carrim, 2006). Carrim (2006) expands on this below:

Analyses of apartheid education in South Africa have been informed centrally by the experiences of racism and abject repression. Ranging from the racial segregation of schools, the patent inequalities in educational provision, the banning of educational organisations and information, the practices of discrimination in schools to misrecognition and nonrecognition of 'black' views and experiences in the construction of knowledge. ... Such expositions have been framed as responses to the unequal nature of education in South Africa, and it being centrally an exercise in apartheid indoctrination rather than education. (p. 172)

Drawing on the quote above and the view of Morrow (2007), schooling in South Africa during the apartheid era was anti-education in that it sought to legitimise white supremacy. I have thus purposefully chosen to use the terms schooling as opposed to education. In this section, I consider the schooling system that all four participants in my research encountered and experienced. To do this, I draw on the life history interviews, particularly in relation to the participants' experiences of schooling during apartheid. I start this section by reviewing the effects of geographic location on access to schooling. Thereafter, I consider the nature of the schooling, both at primary and secondary level.

5.5.1.2.1 Schooling, geographic location and mobility

Nokhaya attended two schools throughout her schooling career, a primary school and a secondary school. Both schools were situated in the Transkei. Beauty and Nomsa went to four different schools and Veliswa attended five. The movement between schools was an attempt to find further, and possibly better, education opportunities. Access to schooling in South Africa during apartheid, was conditioned by the availability of schools and the distances children were expected to travel, usually by foot, to school (Atkinson, 2007). Secondary schools, for black children, were in short supply as it was not regarded as necessary. As a result, Veliswa and Beauty moved across the geographic borders of South Africa and the Ciskei in

search of these opportunities. Table 5.5 highlights the geographic areas within the former Bantustans (Transkei and Ciskei) and Cape Province pre-1994 and within the Eastern Cape post-1994 where these teachers attended school.

Table 5.5: Geographic demarcations during different phases of the teachers' lives

	Born	Primary School	High School	Initial Teacher Education	Schools taught
Nokhaya	Transkei (pre-independence)	Transkei (pre-independence)	Transkei (pre-independence)	Transkei (post-independence)	Transkei (post-independence), Cape Province & Eastern Cape
Veliswa	Cape Province	Cape Province & Ciskei (pre-independence)	Ciskei (pre-independence) & Cape Province	Cape Province	Cape Province & Eastern Cape
Beauty	Cape Province	Cape Province	Cape Province & Ciskei (pre-independence)	Cape Province	Cape Province & Eastern Cape
Nomsa	Cape Province	Cape Province	Cape Province	Eastern Cape	Eastern Cape

Nokhaya and Nomsa experienced relative geographic continuity throughout their lives. As reflected in Table 5.4, Nokhaya only left the Transkei in 1988 to take up employment in the Cape Province and Nomsa remained in the Cape Province throughout her life. However, Veliswa and Beauty both traversed the boundaries between the Cape Province and the Ciskei throughout their schooling careers. Although both were born in the Cape Province, circumstances related to their primary and secondary schooling and teacher training, meant that they moved between the Cape Province and the Ciskei. Veliswa's reasons for moving between South Africa and the Ciskei included being asked to accompany her Grade 6 to 8 teacher to a new school; violent strikes; and requiring a school that offered the final three years of schooling. Beauty's moves were prompted by her moving with her grandmother to Adelaide; her mother's request that she join her in Lwandle; and the struggle to find a secondary school that had place for her in the Cape Province. Table 5.6 provides a more detailed overview of the schools the four teachers attended.

Table 5.6: The schools the four teachers attended

Grades	Nokhaya	Veliswa	Beauty	Nomsa	Grades	
1	Primary school in Tsolo, Transkei	Farm school, Port Alfred, Cape Province	Tantyi, Grahamstown, Cape Province	New Year Farm, Seven Fountains, Cape Province	1	
2					2	
3			Vulindlela, Adelaide, Cape Province	Farm School, Seven Fountains, Cape Province	3	
4					4	
5			Khobonqaga, Adelaide, Cape Province	Seven Fountains Primary, Seven Fountains, Cape Province	5	
6					Nathaniel Nyaluza, Grahamstown, Cape Province	6
7	Mapandla, Alice, Ciskei Std 6 Certificate	Xhantini Lwandle, Cape Province Repeats Std 5	7			
8		Mgcaweaulu, Kwatshashu, Ciskei Leaves school in Std.10. Returns and is put back into Std. 9.	8			
9	Amabele, Alice, Ciskei Form 2			9		
10	Xhantini, Lwandle Form 3-4			10		
11						Amabele, Alice, Ciskei Repeats Form 5 Amazizi, Peddie, Ciskei
12					12	
	2 schools (Transkei)	5 schools (SA & Ciskei)	5 schools (SA & Ciskei)	4 schools (all in SA and all in close proximity)		

Beauty, Veliswa and Nomsa all attended township schools at some point in their schooling career. These are schools situated on the outskirts of towns in areas demarcated for black people living in urban areas. In addition to this, Veliswa and Nomsa both attended farm schools. These schools were typically small with multi-grade classes, and specifically for the children of farm

labourers. Schools, however in the farming areas, were scarce and few black children were afforded the opportunity to attend school⁵² (Atkinson, 2007).

The provision of schools for farm workers' children was dependent on a farmer being prepared to construct a school; provide water, electricity and access roads to the school; and accommodate the teachers, while the state covered the cost of teachers' salaries, furniture, books and stationary (Robertson, as cited in Atkinson, 2007). Farm schools battled to attract quality professional staff as there were limited opportunities; salaries were lower for teachers at farm-schools as opposed to urban areas; classes were multi-grade; and the learner-teacher ratio was often very high (Atkinson, 2007). The state would pay the salaries of a maximum of two teachers per farm school, and as a result, one teacher taught the Junior Primary (Foundation Phase) and the other in the Senior Primary (Intermediate Phase⁵³). With teachers not trained to teach across grades in one class, this often resulted in the children not being sufficiently challenged. Robertson (as cited in Atkinson, 2007) suggests that the farm schools generally offered an inferior education. Veliswa noted when she moved from the farm school to a school in Alice that the children at Mapandla Primary School in Alice had covered more of the curriculum and appeared to be academically ahead of those at the farm school. She found herself having to catch up particularly in mathematics, where she quickly had to learn her times tables and learn about fractions. "And then when I arrived there, they were doing tables, fractions, and they were very good in them. And I had to learn those fractions, because I wasn't good at mathematics". (Veliswa, LHI1, t.164). The poor provision of schooling on farms resulted in some farm workers moving to urban areas in search of better schooling opportunities for their children.

Growing up on a farm meant that both Veliswa and Nomsa had to walk a considerable distance to school, as schools were not all located on the farms where they lived. No transport was provided by the state and very seldom provided by the white farmers. This made it particularly difficult for young children, and many dropped out of school as a result. Veliswa had to walk to school every day as her mother did not have money to pay for transport. This was not a problem for her when she was living on the farm as the school "was near, I walked. It wasn't very far from the farm house" (Veliswa, LHI1, t.70). However, when her mother moved to

⁵² In 1985, 64% of farm children aged between 6 and 14 years of age were attending school (Robertson, as cited in Atkinson, 2007).

⁵³ Senior Primary includes Grade 7.

Lwandle, “it was 7 miles from here [Lwandle] to the school on the farm” (Veliswa, LHI1, t.88). She continued to attend the farm school; walking seven miles to school every morning and home every afternoon. She explained that her mother “accompanied me and then came back. Maybe she took a few miles then came back and went to work”. She walked “every day. Later there were other children who joined me, but they left school, they dropped out” (Veliswa, LHI1, t.90).

Nomsa also had to walk to school every day. She explained that the farm school she attended from Grade 4 to 7 was far away. “Yes, that was very, very far that one” (Nomsa, LHI1, t.76). Nomsa’s parents, coupled with her experience of success at primary school, kept her motivated despite the far distance. “My parents were very strict and I was clever and I also received some gifts” at school (Nomsa, LHI1, t.82). These gifts were awards for doing well.

Veliswa and Nomsa changed schools because they were invited to live with their teachers. They both had teachers who showed a particular interest in them and their education trajectories. Both Veliswa and Nomsa developed good relations with their teachers in primary school. Veliswa became very close to her Grade 4 to 6 teacher, Mrs Booï, who was also the principal of the farm school where Veliswa was at school. At the end of Veliswa’s Grade 6 year, Mrs Booï was offered and accepted the position of principal at a school in Alice. She persuaded Veliswa’s mother to allow her to take Veliswa with her to her new school in Alice. “The principal was changing to Alice so she wanted to go with me ... she liked me. Because if she wanted to send somebody to Lwandle she’d send me. And she asked my mother whether she could go with me or not” (Veliswa, LHI1, tt.76-78). Her mother allowed Veliswa to go with her teacher.

At the end of Grade 4, Nomsa moved to a new school, Lyncrest Farm School. This school was on a different farm and although it catered for children from Grade 1 to 4, she was there for Grade 5 and 6. The school had the two teachers and so the familiarity of multi-grade classrooms continued. The Grade 5 and 6 teacher, Mrs Msuthu, took a special interest in Nomsa. “She was also good because she asked my parents if I could come and stay with her because my farm was far and then I stayed with her until I finished Standard 4 (Grade 6)” (Nomsa, LHI1, t.46). Nomsa surmised that it was as a result of her academic potential that she was asked to stay with Mrs Msuthu. Her parents obliged and Nomsa became a weekly boarder, living during the week with her teacher, Mrs Msuthu, on the farm of her primary school and going home to the farm

where her parents lived on the weekend. Despite the hardships that the participants in my research faced in terms of finding suitable schooling opportunities, there were teachers who assisted them to find better schooling opportunities.

Nokhaya and Beauty attended schools in rural villages. Nokhaya attended two schools her entire schooling career. While they were in different rural villages in the Transkei, they were in close proximity to each other. Nokhaya explains, “I grew up in Tsolo, I did my primary [school] in Tsolo and I went to do my JC (Junior Certificate) at Ndamase in the district of Ngqeleni. ... My mother was a teacher and her home was at Ndamase so she knew that high school, that school, Ndamase School, because she worked there” (Nokhaya, LHI1, tt.52-56). Nokhaya’s mother, having taught at the high school in Ndamase, insisted that her children attend that school.

Beauty attended a rural school in the Ciskei when she decided to go back to secondary school to complete her final year. Her description of the school was bleak: “When I came there, the school was behind. There were no buildings, there were no desk. You sit on the floor or stand. It was terrible” (Beauty, LHI1, t.154). As highlighted earlier in this chapter, her experiences were marred by excessive violence from the Ciskei police due to student protests.

While geographic mobility in an effort to find employment (in the form of migrant labour) is well documented (South African History Online, 2011) in South Africa, mobility in search of schooling opportunities is not; yet, three of these teachers changed schools often in search of further schooling opportunities. Veliswa spent her secondary schooling at three different schools. I include this lengthy interview transcript into this chapter to provide a sense of the extent to which she moved between the three schools, and the reasons for her mobility between the schools. This excerpt (Veliswa, LHI1, tt.189-206) highlights some of the challenges black children faced in trying to complete their schooling.

189.	<i>Lise</i>	So you did Form 1 and 2 (Grade 8-9) in Alice. Did you start Form 3 (Grade 10) in Alice?
190.	Veliswa	No, I came back to Xhantini.
191.	<i>Lise</i>	That’s the only high school, besides Phambili here?
192.	Veliswa	It was.
193.	<i>Lise</i>	Why did you come back?
194.	Veliswa	I think it was because of the strike there. There was a strike so my mother said I should come back home.
195.	<i>Lise</i>	And was there no strike here?

196.	Veliswa	There was, but she thought it best for me to be here at home because it was a very dangerous time.
197.	<i>Lise</i>	And did you write Form 3 (Grade 10) here?
198.	Veliswa	Yes, I passed ...
199.	<i>Lise</i>	You passed.
200.	Veliswa	Yes. Then I went back. There was not Form 4 (Grade 11) here, so I went back.
201.	<i>Lise</i>	And you finished Form 4 (Grade 11)?
202.	Veliswa	Yes.
203.	<i>Lise</i>	In Alice?
204.	Veliswa	Yes I did.
205.	<i>Lise</i>	And did you do Form 5 (Grade 12). Is that matric?
206.	Veliswa	Yes Form 5, I did. But they said our papers, Xhosa papers, were lost so we didn't pass that year. There were two classes so we didn't pass because of the Xhosa papers. They said they were lost. So I came back and I started working here at a garage, Main Street Garage. After the first term I went back to school in Peddie, Amazizi in Peddie. It was April and I did Form 5 and I got a distinction. Not a distinction but a, what do you say?

Having completed Form 1 and 2 (Grade 8 & 9)⁵⁴ in Alice, Veliswa returned to Lwandle at her mother's request. Her mother was concerned with the strike action in schools at the time, particularly in Alice, and wanted her daughter closer to her. Veliswa thus completed Grade 10, or her Junior Certificate, in Lwandle. Given that there was no school in Lwandle where she could do Grade 11 and 12, she returned to the secondary school in Alice. She repeated Grade 12, her final year of schooling in Peddie, a town situated in the Ciskei. Veliswa's mother's "family was [originally] from Fraser's Camp ... but they moved to Peddie" (Veliswa, LHI1, tt.128-130), one of the reasons for her choosing to go to Amazizi Senior Secondary School.

Similarly, Beauty's (Beauty, LHI1, tt.127-150) interview transcript below highlights the extent she went to, to find further schooling opportunities.

127.	<i>Lise</i>	And then from Adelaide, where did you go?
128.	Beauty	I came here to Lwandle. It was 1977. And we didn't like to stay. Maybe we didn't like to stay with my parents.
129.	<i>Lise</i>	So your parents, your mother and step-father had moved from Grahamstown to here [Lwandle] and your granny to Adelaide?
130.	Beauty	Yes.
131.	<i>Lise</i>	So now you're back at home.
132.	Beauty	For two [years] but I did not feel good. I failed ... Standard 7 (Grade 9). I repeated it in 1978.
133.	<i>Lise</i>	Standard 7 is that Form 1 or Form 2?
134.	Beauty	Form 2 (Grade 9).
135.	<i>Lise</i>	So you were here for Form 1 and 2?
136.	Beauty	Form 1 (Grade 8) I did it in Adelaide in 1976.
137.	<i>Lise</i>	So what was the difference staying with your granny and staying with your parents?

⁵⁴ I now refer to the 'forms' as grades as this is the term we currently use in South Africa.

138.	Beauty	Maybe, I was taking my granny as my mother. I liked to stay with her. My mother was too harsh at that time. So I'm used to stay with my grandmother, but when I come back, I go back to Adelaide in 1979. But when I was there, the school was full. So then I go to King William's Town for school; to do Standard 8, Form 3 (Grade10).
139.	<i>Lise</i>	And who did you stay with in King William's Town?
140.	Beauty	I was staying with my mum's uncle.
141.	<i>Lise</i>	And how was that?
142.	Beauty	It was not nice. Lot of children. Lot of my mum's cousins with their children.
143.	<i>Lise</i>	So you moved around a lot when you were young.
144.	Beauty	Yes, didn't like to stay there.
145.	<i>Lise</i>	And the school that you were at in King Williams' Town?
146.	Beauty	Mgcawezulu, it was in the village, Kwatshashu.
147.	<i>Lise</i>	Where is that?
149.	Beauty	Where Sebe was living. You know Sebe? Sebe and Charles and all of that, that village.
150.	<i>Lise</i>	So it was in the Ciskei?
151.	Beauty	Yes.

Beauty's secondary schooling spanned schools in South Africa and Ciskei. Like Veliswa, she too attended Xhantini Secondary School in Lwandle. However, she did not enjoy staying with her mother and stepfather in Lwandle and chose to return to Adelaide to be with her grandmother. When she realised the schools in Adelaide were full, she sought a school close to her mother's relatives near King William's Town.

In summary, the transcripts above show that finding schooling opportunities for black children was not a simple process. There were a limited number of schools in both rural and urban areas. Children on farms often had to walk great distances to get to school. There were fewer secondary schools than primary schools for black children during the apartheid era and as a result, those children who wished to attend secondary school had to often leave home in search of schools. Nokhaya was the only participant who attended a single primary and single secondary school, both in close proximity to the village that she was born in. Nomsa attended three different farms schools all on neighbouring farms for her primary schooling. She had to move to Grahamstown to attend a secondary school. Veliswa and Beauty moved between South Africa and the Ciskei in search of schooling opportunities. Veliswa attended four different schools and Beauty five. Having presented the challenges faced by these participants specifically, and black children generally, in finding suitable schooling prospects, I now consider the learning experiences at the schools the four participants in my study attended as learners.

5.5.1.2.2 Schooling, teachers and teaching

It is common when reading about the effects of schooling in South Africa, particularly the schooling of black South Africans, for authors to use as their starting point, 1948, when the National Party came into power, and the sign-post of apartheid. In doing this, they provide a distorted view of the nature of black schooling in South Africa by romanticising black education prior to 1948 and ignoring what the National Party carried over from the education system prior to 1948 (Molteno, 1984). Primary schooling for black children, over the past 150 years, has been “a harsh and not very effective screening process, from which would emerge those who ‘deserved’ further opportunities and to whom better resources could be allocated” (Hartshorne, 1992, p. 22). Delivery, access, equity and quality of primary education, since 1910, have been inconsistent. Segregationism has had deep-seated effects in economic, social and political terms. The schooling system, pre-1994, had continually pushed black children out of the system and thus many did not attain basic literacy and numeracy. The inadequacies of the schooling system, pre-1994, led to a rejection of the apartheid state, protests and resistance (Hartshorne, 1992).

The purpose and content of education for black children in schools was to know their social place. The aims of education for black children, from the nineteenth century till the legislative demise of apartheid, foregrounded industry and subordination. I include below a few references to this, taken from Molteno’s (1984) chapter, *Historical foundations of the schooling of black South Africans*, at various times in history:

- The intention of the Dutch slave-masters, in the 1650s, in creating schools for their slaves, was that they learn to work for their masters;
- The 1865 Education Act discouraged the missionaries from opening schools that were open to all races. The purpose of schooling was to mould children for their respective positions in life;
- In 1880, the Inspector of Native Education in Natal suggested that schools needed to instil diligence and industry;
- The Select Committee on Native Education in the Cape (1908) emphasised that schooling of black children consider the language of the child, “their home conditions, social and mental environment, their heredity, tribal or racial instincts and their future position and work in the country” (p. 65);

- The African People's Organisation (1909) said that schooling needs to prepare the black child for his place in life and the work he will do;
- The Native Economic Commission of 1930 to 1932 emphasised black children should learn to school their bodies for hard work;
- JN le Roux, to parliament in 1945, recommended not an academic education, but rather a manual education to prepare the black child for manual labour;
- Verwoerd, in his infamous statement as Minister of Bantu Education, said that there was no point in teaching the black child literacy and numeracy as there would be "no place for him [*sic*] in the European community above the level of certain forms of labour" (Verwoerd, 1954, p. 24).

The deliberate indoctrination into the idea of white supremacy and a system of institutional inferiority, with the focus on discipline (industry) and obedience, promoted subordination.

Whilst the Union government understood schooling as a device of socialisation, there was little time and effort given to the rollout of basic education for black children prior to 1948. "The denial of all political rights and the use of state power for the regimentation and physical control of the lives of black people as a means of the reserve system⁵⁵, pass laws, and an encompassing net of repressive legislation" (Molteno, 1984, p. 72) meant that there was little purpose for mass schooling in South Africa. Rather, it was believed that schooling was politically dangerous and possibly economically disadvantageous to the interests of white capital (Molteno, 1995, p. 72).

The National Party government however, once in power from 1948, took a keen interest in the schooling of black South Africans. There were two issues that led to this concern: firstly, the growth in the manufacturing industry and the establishment of new mines; and secondly, a rising political consciousness and calls for unity amongst oppressed people. The apartheid government legislated the racial segregation of schools (Carrim, 2006) and the Bantu Education Act was passed in 1955 and in 1956 a new curriculum for primary schooling was established. The curriculum sought to promote the values of "obedience, communal loyalty, ethnic and national diversity, acceptance of allocated social roles, piety, and identification with rural culture" (Molteno, 1984, p. 89). Schools for black children were placed under control of the

⁵⁵ The reserves are former Bantustans.

Bantu Authorities. While the 1959 Promotion of Bantu Self-Government Act promoted the physical removal of persons most notably to former Bantustans, the Bantu Education Act promoted the psycho-ideological ‘resettlement’ of persons “in their separate places of subordination” (Molteno, 1995, p. 93). In other words, Bantu Education represented an attack on the mind by controlling the boundaries of knowledge through a limited curriculum; restricting communication across languages by enforcing mother tongue education until Grade 7; and conditioning children to a life of servitude.

Like the education system prior to 1948, Bantu Education promoted inferiority and subordination. Schooling during the apartheid era promoted an ideology that sought to maintain and develop the apartheid system of white supremacy (Christie & Collins, 1982). In the words of Carrim (2006), “apartheid schools and schooling were based on inequalities, violations of human rights, and were blatantly racist” (p. 175).

Key in the promotion of white supremacy was a theory of pedagogy, namely Fundamental Pedagogics, underpinning the curriculum during apartheid. Fundamental Pedagogics was premised on the notion that children were “ignorant and undisciplined, in need of guidance from the teacher, whose authority was derived from the God of the Dutch Reformed Church” (Ensor, as cited in Hoadley, 2011, p. 144). Learners were regarded as passive recipients of knowledge. They were required to recite and chorus answers, memorise and regurgitate the textbook or knowledge taught by the teacher (Walker, 1991).

This is, to some extent evident in the narratives of Nokhaya and Veliswa. Both explained in the life history interviews, that listening to the teacher was their preferred method of learning. Veliswa said, “It’s just that I was a good listener. I listened and if, apart from the fractions that I had to learn by rote, I listened and kept what I was learning. I tried to keep it and remember it when I was to write an exam or something” (Veliswa, MHI, t.14). Nokhaya (Nokhaya, LHI1, t.152) contrasts the teaching methods in her primary school with her high school:

It was very different, because in primary school, I used to listen from the teacher, now in high school I had to study. I didn’t like studying; I preferred listening and then go to the book. But most of the teachers there, they referred us to the book. You must read chapter what, chapter what and chapter what, then the following day, you must come and discuss [the chapters]. I didn’t like that.

Nokhaya and Veliswa describe a pedagogy in their primary school that positioned their teachers as the knowers of all and them, as learners, as passive recipients of the knowledge. Nokhaya contrasted this with her high school teachers who required more independent self-study. In these classes ‘authority’ seemingly shifted from the teacher to the textbook.

All four participants were products of apartheid education, suggesting they were products of a curriculum that was intellectually sterile and pedagogies dominated by teacher talk, with transmission of prescribed and narrow forms of knowledge. Teaching positioned learners as passive recipients of knowledge, whilst teachers were regarded as the knowers of all. The curriculum offered in black schools was inferior to that of white schools – teaching obedience, subservience and acceptance of their social roles in a context of segregationism, poverty and inequality.

The structural and cultural mechanisms, at the level of the real, conditioning the personal identities of the four participants can be traced back, through asking transfactual questions, to the segregationist policies post-1910. These policies, in terms of geographic location and schooling, had a significant impact on the natal context and experiences of the four participants in my research. All four grew up in a context in which they were economically disadvantaged and were prepared, through their schooling, for a life of labour and servitude. Yet, all four of the participants managed, through their decision to become teachers, to move towards a life of economic advantage. As such, they have demonstrated that they are not merely products of a system, but that they have agency. It is to this that I now turn, by considering each of the participants’ mode of reflexivity (i.e. their internal conversation) as it enabled the participants to mediate between what they care about, their resultant projects, and the effects of structural and cultural constraints.

5.6 MODES OF REFLEXIVITY

To engage in one form of internal conversation more than any other is to have a particular life of mind, which thinks about the self in relation to society and vice versa in a particular way.

(Archer, 2007a, p. 100)

Central to the emergence of personal and social identities (Chapter Three), and the emergence of the social actor, is reflexivity, that is, the mental ability of persons to consider both their

social contexts in relation to themselves, and themselves in relation to their social context. In the previous section of this chapter, I provided a brief overview of the socio-political and economic context that each of the teachers in my research were born into, and how this context, conditioned and enabled their decision to become teachers, that is, their ultimate concern in relation to their future careers. The internal conversation, an agents' PEP, enables persons to deliberate about their concerns in the world, and mediate the effects of the social and cultural systems on agency, and the projects that they formulate.

Of interest in this chapter is how the four participants mediated the structural and cultural constraints and enablements in relation to their project (i.e. to become teachers). Each person has a distinctive mode of reflexivity. In other words, how persons exercise their reflexivity differs from person to person. In Chapter Three, I presented Archer's four modes of reflexivity: communicative reflexive, autonomous reflexive, meta-reflexive and fractured. While persons are able to move between modes of reflexivity during their life time, Archer (2003) contends that persons have dominant modes of reflexivity at certain times of their lives. In this section, I suggest that the modes of reflexivity of the four teachers in my study were formed during their childhoods and have primarily remained consistent. I argue that Nokhaya and Nomsa are both communicative reflexives in that they are reliant on persons close to them to complete their conversations for them. Veliswa and Beauty, by contrast, are both autonomous reflexives, in that they are self-reliant in their decision-making processes. Key to the identification of the dominant mode of reflexivity for each of the teachers in my research, is the extent to which they experienced contextual continuity or discontinuity in their lives.

I begin this section by focusing on Nokhaya and Nomsa, the two communicative reflexives, followed by Veliswa and Beauty, the two autonomous reflexives. The particular mode of reflexivity of these teachers is of importance in my study as it assists in explaining how each of the teachers make the decisions they do; how they mediate social and cultural constraints; and how they monitor their practices. Each mode of reflexivity has a distinctive stance toward society and the properties and powers of the social and cultural systems. I noted in Chapter Three that communicative reflexives adopt a primarily *evasive stance* and are prone to promoting morphostasis, whereas autonomous reflexives adopt a *strategic stance*, which generally promotes morphogenesis (Archer, 2007).

5.6.1 Nokhaya and Nomsa as communicative reflexives

Drawing on the data from the life history interviews of both Nokhaya and Nomsa, I suggest that they are communicative reflexives, that is, persons whose reflexivity is initiated through the internal conversation, but whose reflexivity is not complete until their conclusions have been confirmed through dialogue with significant others in their lives. In other words, both Nokhaya and Nomsa complete their thoughts about themselves, and their projects, in relation to their social contexts, by talking with other people. It is in the process of talking them through with other people that they conclude their reflexive deliberations.

Three features common among communicative reflexives are evident in the data from Nokhaya's and Nomsa's life histories. These features include biographical, geographical and occupational contextual continuity; success at dovetailing their concerns; and contentment. These features are common in agents, like Nokhaya and Nomsa, who use a "thought and talk" pattern (Archer, 2003, p. 167) in identifying their concerns and developing projects to address their ultimate concerns. Employing a "thought and talk" pattern suggests the social order is privileged as they work hard to sustain relationships with family and friends, precisely because they depend on "similar and familiar" others (Archer, 2007, p. 195) to assist in completing their internal conversations. While their concerns, particularly as adults, may be raised intra-personally, they are usually resolved inter-personally. Dialogue with suitable persons, whom they trust, influences what they do, how they act and ultimately whom they become.

I elaborate on each of the three features highlighted above, by drawing on the life histories of Nokhaya and Nomsa to argue that their dominant mode of reflexivity is communicative.

5.6.1.1 Lives of contextual continuity

Nokhaya's and Nomsa's life histories are ones of biographical, geographical and occupational contextual continuity.

5.6.1.1.1 Biographical continuity

In this section I illuminate, using the life history interview data, the natal context of Nokhaya and Nomsa. Nokhaya was born in 1957 in Tsolo, a rural village, in the former Transkei. Unlike the other teachers in my research, Nokhaya was born into a home where both parents had some level of education. Her father was a clerk on the railways in Durban in Natal (now referred to as KwaZulu Natal) until he retired, and her mother was a teacher. She was the fourth born of

five children; three girls and two boys. Despite her father's long absences from home, he remained instrumental in any decision-making related to his children. This is evident in his decision that Nokhaya should leave school after her Junior Certificate⁵⁶ and enrol at a teachers' training college to become a teacher, as noted earlier in this chapter. Nokhaya's mother was also instrumental in assisting her daughter to make decisions in her life, particularly in relation to her first teaching post. "Yes. I got [teaching posts at] two schools. The other one was locally and the one was too far. My mother said I must stay" (Nokhaya, LHI1, t.22).

Nokhaya regards her mother as the most influential person in her life. She was a teacher by profession, but she did not have permanent employment as it "was difficult for married woman to teach at that time" because permanent posts were reserved for unmarried women (Nokhaya, LHI1, t.58). This meant that she spent long periods at home and had an opportunity to focus on her children's education. She fostered in Nokhaya a love for books and reading from an early age. "I think I liked books very much that time because I used to take my reading book and turn it upside down (she takes a book to show me). I turned it upside down because I wanted to know if I could read it when it is upside down" (Nokhaya, LHI1, t.80).

While Nokhaya did not elaborate on her relationships with her family once she left the Transkei at the beginning of 1988, it is evident in this short narrative that she developed a close relationship with her mother, and that her mother was in many respects, the person that she consulted with when she wished to talk through matters of concern to her.

With Nomsa neither of her parents were her trusted interlocutors, instead it was her older sister, the eldest in the family, who took this role. Although her parents were strict and motivated her, and all their children, to get an education and become professionals, it was her eldest sister who was the first to do so and was thus much admired in Nomsa's home. In relation to her sister, she said that "she's the most influential in the family and we respect her" (Nomsa, LHI1, t.320). Nomsa admires her sister and appears to have followed in her footsteps. "Yes and we were also doing the same subjects at school" (Nomsa, LHI1, t.285). On completion of her schooling, Nomsa's sister persuaded her to become a teacher and to go to Algoa College. This occurred a few years later when Nomsa's then boyfriend agreed to pay for her studies.

⁵⁶ During the apartheid years, one could obtain a Junior Certificate at the end of Grade 10.

Nomsa's sister convinced her, after she had been teaching at Daniels Primary School in Zwile in Port Elizabeth for three and a half years, to take up a permanent post at the same school that she was teaching in. Nomsa thus moved to Lwandle and started teaching in the FP at Phambili Public School where her sister was the HoD. Nomsa, having gained experience as a primary school teacher indicated that she was interested in becoming a HoD. While there was a HoD post available in Lwandle Township, Nomsa was interested in applying to schools in Port Elizabeth, "but my sister doesn't want me to go back to PE (Port Elizabeth), I'm not sure why ... but she's the one who advised me to come here. She's also teaching here" (Nomsa, LHI1, tt. 280-282). Her sister is thus not supporting her in this decision, and it appears that Nomsa for now, is complying.

Nomsa has the greatest respect for her sister, as does the rest of the family. "She is a very honest person. If I can count her boyfriends, only two that I know (laughs), only two. It's her boyfriend and the one that's she's married to. She was the first one in the family to drive a car, she was the first one to become a professional" (Nomsa, LHI1, t.286).

Both Nomsa and Nokhaya come from stable home environments. Both had parents who were in long-standing relationships and who had the interests of their children at heart. Both Nokhaya and Nomsa were able to identify, early in their life, significant interlocutors who they consulted with about their concerns (i.e. what they care about in the world), and who assisted them in formulating and monitoring their projects. The communicative reflexive becomes dependent on having at least one person who they trust implicitly and can communicate with, in order to share their "thought and talk" pattern (Archer, 2003, p. 167). Developing relations of trust is central to this/these relationship(s) (Archer, 2007, p. 158) and trust is earned, "as the more that has been shared, the easier it is to share more, provided there is mutual recognition of similarities by those involved" (Archer, 2007, p. 165). The 'familiar' for both Nokhaya and Nomsa were family members. Despite the significant biographical continuity in the lives of Nokhaya and Nomsa, their lives were also framed by relative geographical continuity.

5.6.1.1.2 Geographic continuity

Both Nokhaya and Nomsa lived in, what is currently known as the Eastern Cape, throughout their lives. Nokhaya lived in two regions in the Eastern Cape: the Transkei, where she lived from birth till age 30 and Lwandle in the Eastern Cape formerly known as the Cape Province, where she has remained since.

As noted earlier in this chapter, Nokhaya's schooling started in the village of Tsolo, but she moved to Ndamase Secondary School in Ndamase, a neighbouring village for her secondary schooling, as there were no secondary schools in Tsolo. Her mother made the decision that her daughter should go to Ndamase Secondary School. At the end of her Junior Certificate, Nokhaya went to Shawbury Teachers' Training College in Shawbury to start her Primary Teachers Certificate (PTC). Her first teaching post was in Lower Esinxaku, a village close to Tsolo. Ndamase, Shawbury and Lower Esinxaku are all within a 60km radius from Tsolo, which meant that for the first 30 years of Nokhaya's life, she lived close to home. Since leaving the Transkei in 1988, and taking up employment at Sontonga Public School in Lwandle, Nokhaya has lived in Lwandle Township.

Nomsa's primary schooling started on New Years' Farm. This farm school had a single class from Grade 1 to 4. Nomsa (Nomsa, LHI1, t.32) describes it in this excerpt:

[The school] was called New Year Park. It was from Grade 1, it was then called Sub A to Standard 2 (Grade 4). And then Standard 3 to Standard 4 (Grade 5-6) to another farm, then Standard 5 (Grade 7) to another farm. Then from Standard 6 (Grade 8) in Grahamstown because there were not high schools on the farm.

Nomsa thus went to three different multi-grade primary schools all in the same vicinity on neighbouring farms. As there were no high schools in the district of Seven Fountains, Nomsa went to school in the closest town, Grahamstown, 30km from the farm on which she grew up. "Yes and I was so young, and others would say are you coming to do Standard 6 (Grade 8)?" (Nomsa, LHI1, t.130). There, she schooled at Nathaniel Nyalusa, the oldest black school in the former Cape Province. She started her high school education in 1988. During this time she lived with her aunt until her family moved from New Age Farm in Seven Fountains to settle in Grahamstown in 1990. After four years of unemployment and living at home, Nomsa went to Algoa College in Port Elizabeth to do a National Professional Diploma in Education (NPDE) in 1997. Once she graduated in 1999, she taught in Port Elizabeth for eight and a half years.

Like Nokhaya, Nomsa never moved far from her natal context. The furthest place geographically from Seven Fountains, was Port Elizabeth, which is 100km away. Both teachers' lives thus reflect ones of geographical continuity. I next consider the extent to which their lives represent ones of occupational continuity.

5.6.1.1.3 Occupational continuity

Nokhaya and Nomsa both have family members who were teachers and influenced their decision to become teachers. As highlighted earlier, Nokhaya's parents made the decision for her to become a teacher. Since obtaining her PTC at the end of 1978, Nokhaya taught in two schools. She started teaching Grade 5 in 1979 at Lower Esinxaku Secondary School. It was Nokhaya's mother who suggested that she take up the position at Lower Esinxaku Secondary School. When she applied for a teaching post she was offered two places. At Lower Esinxaku, Nokhaya taught Grade 5 for ten years.

In 1988, she moved to the school where she currently teaches, Sontonga Public School in Lwandle. At Sontonga, she taught Grade 5 until the end of 2010. It was only when she was asked by the School Management Team (SMT) if she would be prepared to teach Grade 3, that she considered teaching in the FP. One of the FP teachers retired at the end of 2010 and the SMT thought that Nokhaya would be a suitable replacement for her. She saw this move as an opportunity because she realised that there was much that could be done in the FP. "I was teaching Grade 5 and then the teacher from this grade, Grade 3 left, retired. And then the SMT gathered together to decide who must come to teach Grade 3 and they chose me" (Nokhaya, LHI1, t.2).

Having followed in her mother's footsteps, Nokhaya, throughout the 33 years she had been teaching when I met her, had taught in only two schools. For the vast majority of that time (i.e. 32 years) she taught Grade 5. In August 2012 when I met her, she had been teaching Grade 3 for 18 months. Her occupational narrative reflects one of significant stability and continuity.

Nomsa's eldest sister who studied to become a teacher, has been very influential in Nomsa's teaching career. After a year of not working post completion of her NPDE, Mrs Ngqakayi, a teacher she met at a hairdressing salon, suggested that she go to Elundeni Public Primary School in Motherwell, a suburb of Port Elizabeth in January, as there were a number of posts available at the school. This she did and started her teaching career as a Grade 3 teacher. Nomsa taught at Elundeni Primary School for three years, from 2001 to 2003. She moved to Daniels Primary School in Zwide, another suburb in Port Elizabeth. At Daniels Primary School, she taught maths in the Intermediate Phase (Grade 5 to 7) from 2004 to mid-2007. Finally in mid-2007, Nomsa found a permanent post at Phambili Public School in Lwandle. Her sister was

“the one who advised me to come here” (Nomsa, LHI1, t.282). Nomsa is currently teaching Grade 3 at Phambili Public School. Nomsa expressed an interest in applying for a more senior position in a school. “Like one day I want to be a principal ... I think I have to do my honours and after that nothing will stop me. Even now I’m going to apply in the bulletin for a HoD post” (Nomsa, LHI1, tt.302-304). However, she later explained that it was unlikely that she would leave as “my sister doesn’t want me to go back to PE, I’m not sure why” (Nomsa, LHI1, t.280).

Three characteristics related to contextual continuity characterise the experiences of Nokhaya and Nomsa. Firstly, both come from a stable and supportive family. Nokhaya, being close to her mother, was able to develop a trusting relationship and one in which she could share “thought and talk” (Archer, 2003, p. 167). For Nomsa, that person was her sister. Secondly, their biographies suggested a natal context typified by geographical stability that resulted in continuity throughout their schooling, from primary school to initial teacher training, and into their first teaching posts. Thirdly, there existed for both Nokhaya and Nomsa, having qualified with their respective teaching qualifications, occupational options within close proximity to their natal contexts.

This contextual continuity in both Nokhaya and Nomsa’s lives have enabled them to “realise their ‘ultimate concerns’ through developing a *modus vivendi* expressive of them” (Archer, 2012, p. 133). Committing to a career, like teaching, is a big step in shaping the identities of persons. The choice of occupation “serves (provisionally) to seal continuity with the natal context or to signal rapture with it. Even the provisional choice of work continuous with that context may foster new ties rebinding subjects to the familial background” (Archer, 2012, p. 154). Nokhaya and Nomsa chose occupations that are deeply embedded in an extension of their natal social context.

5.6.1.2 Dovetailing their concerns: Nokhaya and Nomsa’s decision-making processes

Deciding on one’s ultimate concern, as explained in Chapter Three and earlier in this chapter, involves the DDD process (Archer, 2000). It is through this process, that persons dovetail their concerns in the three different orders of reality and decide on their ultimate concerns. Throughout Nokhaya’s life, she has seemingly had decisions made about her future on her behalf. While it is understandable that parents make decisions on behalf of their children while they are minors, it appears from the life history interview with Nokhaya that key decisions have

been made on her behalf well into adulthood. The trajectory thus of a seemingly passive agent however, is one that emerged in her youth and is reflected in her decision to become a teacher; the decision to teach at a school close to her home village of Tsolo, and the decision to become a FP teacher.

The deliberative process of identifying her ultimate concern, was for Nomsa, driven primarily by finances. As shown earlier in this chapter, it was only when her then boyfriend offered to pay for her studies, that Nomsa made the decision to follow in her sister's footsteps and become a teacher. She enrolled at Algoa College in Port Elizabeth for her NPDE.

5.6.1.3 Contentment

Archer (2012) suggests that communicative reflexives are passive about their careers. In the life history interviews with Nokhaya and Nomsa, it became clear that their life choices were directed by decisions made on their behalf – becoming a teacher (Nokhaya & Nomsa) and moving to Lwandle (Nomsa). Yet, their stories appear to be one of contentment.

Despite telling me in her life history interview that she would have chosen a “career with better salary” (Nokhaya, LHI1, t.254), Nokhaya acknowledged that teaching *is* her career and it is the hope that the children she teaches will ultimately be successful, that keeps her going.

I suggest that Nomsa's narrative is also one of contentment as she stated that she wished to remain within the teaching profession. She is interested in applying for a HoD position and ultimately a principalship. Her sister has suggested that she apply for HoD positions, not in Port Elizabeth, but in Lwandle Township.

While communicative reflexives depend on significant interlocutors to assist them in the process of deliberating about their concerns in the world, they are not simply people to whom things happen, rather they are authors of their own projects, based on their ultimate concerns. Both Nokhaya and Nomsa, once deciding to become teachers, had to develop projects that they considered desirable and that they could live by. In defining their projects, that is, their course of action to realise their concern for teaching, they engaged in the process of reflexive deliberations which is a first-person task. As Archer (2003) notes “there cannot be a third-person substitute for the author of reflexive acts” (p. 190).

I now consider Veliswa and Beauty's modes of reflexivity and suggest that both are examples of autonomous reflexives, as they do not depend on significant others to assist them in making decisions.

5.6.2 Veliswa and Beauty as autonomous reflexives

I argue in this section that Veliswa and Beauty are autonomous reflexives in that they take responsibility for their decisions. While autonomous reflexives make mistakes because their decisions are always fallible, they are quick to self-diagnose their errors and self-correct with new knowledge about themselves. Being inherently private and individual, they are confident in their own decision-making and are decisive (Archer, 2003, 2007, 2012).

Three broad themes emerged through the life histories of Veliswa and Beauty that suggest that they are both autonomous reflexives: firstly, their ease and willingness to move away from their natal context; secondly, an unproblematic dovetailing of their concerns; and lastly, their individualism (Archer, 2003, 2007, 2012). These themes are features of autonomous reflexives; agents who are self-confident in their own judgements, in identifying their concerns, and developing projects to address their ultimate concern.

5.6.2.1 Geographic discontinuity: Moving away from the natal context

Veliswa and Beauty both had disruptive starts to their early years. As noted earlier in this chapter, Veliswa was born on the same farm her father was born on and to which her mother moved when she married her father. Her parents separated when she was young and her father took her two brothers with him to Port Elizabeth. Her mother moved from the farm to Lwandle where she found work as a domestic worker. Veliswa grew up as an only child, single-parented by her mother. At the end of her Grade 7 year, Veliswa moved away from her mother in Lwandle and went to live with one of her teachers in Alice. Alice, unlike Lwandle was situated in the Ciskei, 160 kilometres away from Lwandle. Veliswa stayed in Alice with her primary school teacher Mrs Booie where she attended Mapandla Primary School and Amabele Secondary School until the end of Grade 9. Here Veliswa was confronted with new encounters and situations from her natal context (i.e. beyond the "familiar and similar") (Archer, 2007, p. 195).

Moving to a new town meant that Veliswa was removed from her natal context. She had to confront experiences which the natal context had not necessarily provided her with guidelines

for. When this new context presented challenges, despite being shy, Veliswa would have had to draw on her own resources to deal with new situations in Alice. She reflected (Veliswa, MHI, tt.8, 12):

Shoo, I was confused and that made me not to be sure of myself. In Elliotville [near Alice] I was sure that I was going to do it, I was going to be number one. So when I arrived there, I became confused, because it was an environment that I was not familiar with ...[but] I just adapted myself to the situation in which I found myself in.

When confronted with not being as confident in her studies as the children in Alice, she had to adapt to that situation, thus developing her self-reliance. After returning home for two years because of the strike action at the time, Veliswa went back to Alice in the Ciskei, to complete her last two years of schooling. With the satisfaction of being able to hold her own in this environment, Veliswa developed independence leading her to trust her own resources; that being, her internal conversation. This independence, coupled with her determination to get her Senior Certificate, contributed to her repeating Grade 12 in the town of Peddie, also in the Ciskei. While many young black students would have not returned to school, Veliswa did.

Beauty's life was also one of contextual discontinuity from an early age. As explained earlier in this chapter, Beauty stayed with her mother and step-father for the first nine years of her life. With the implementation of the Group Areas Act in Grahamstown, Beauty moved with her grandmother to Alice. She moved between her mother and step-father, grandmother and some relatives throughout her schooling career.

Beauty's schooling reflected the geographic discontinuity that she experienced early in her life. She started her schooling at Tanti Lower Primary School in Grahamstown in 1969 and stayed there for Grade 1 and 2. She and her sister then moved with her grandmother to Adelaide and attended Vulindlela Junior Primary School and then Khobonqaga Higher Primary School. Beauty started her high school career in Adelaide, but moved to Lwandle at the end of her Grade 8 year to live with her parents. In Lwandle, she enrolled as a Grade 9 learner at Xhantini Public School. She failed her Grade 9 year as she was not happy to be in Lwandle. She repeated her Grade 9 year in Lwandle in 1978 and passed.

In 1979, Beauty's mother and step-father agreed to allow her to return to live with her grandmother in Adelaide. However, when she got there, none of the schools could

accommodate her so she went to live with her uncle, her mom's cousin, in Zwelitsha. None of the Zwelitsha schools could accommodate her at that late stage, so she was sent to Mgcawezulu School in Kwatshashu Village in the Ciskei, 5 kilometres away from Zwelitsha (Beauty, LHI1, t.148).

During her final year of schooling Beauty became sick and had to leave school. In 1985 she decided to go back to school to complete her matric. Beauty's mother tried to dissuade her, suggesting that she rather register for a Primary Teachers' Certificate. However, Beauty wanted to obtain her Grade 12 certificate. She went back to Kwatshashu Village where she rented accommodation so that she could complete her schooling there. When she got to the school, the new principal insisted that she re-do her Grade 11 year. Not letting that deter her, Beauty spent two more years at school. She finally obtained her matric certificate in 1986 at the age of 24.

Both Veliswa and Beauty's narratives of their childhoods reflect contextual discontinuity. Archer (2003) suggests that "this gave an early spur to the development of a self-contained life of mind – the making of an 'autonomous reflexive'" (p. 235). While Beauty's narrative, particularly after her Grade 9 experience at Xhantini Public School, suggests an intentional desire to move away from her parents, Veliswa speaks about her mother with great fondness. Her move from the natal context was based on the perceived urgency for better educational opportunities. As Archer (2003) posits, autonomous reflexives, unlike communicative reflexives, seek projects from an early age that enable them to move beyond their social backgrounds. We see evidence of this in both Veliswa and Beauty's narratives. It is the self-reliance and independence that emerges from a life of contextual discontinuity that motivates autonomous reflexives to prioritise finding employment opportunities.

5.6.2.2 The prioritisation of work and employment as an individual venture

For both Veliswa and Beauty, the prioritisation of work and employment, was driven by a desire to improve their economic situation. Both had aspirations to study further and become professionals.

After failed attempts to become a nurse or register at the University of Fort Hare to do a Bachelor of Arts degree, Veliswa opted to become a teacher. Her strategic stance, typical of autonomous reflexives, enabled her to position herself with a view to finding employment once

she left Cape College. For this reason, Veliswa opted to do the Junior Primary Teachers Diploma, despite initially wishing to do the Senior Primary Teachers Diploma. Once Veliswa had dedicated herself to her ultimate concern – becoming a professional – she had to strategise about courses of action and projects that would assist her in achieving her desired outcome. In this way she had to deliberate about the constraints and enablements that shaped the situation that she was involuntarily born into. While Veliswa wished to make a socio-economic break from her natal context by finding employment, she managed to do this without jeopardising her relationship with her mother – a relationship that was of great importance to her.

Beauty's mother wanted her to register for a Primary Teachers' Certificate after having obtained her Junior Certificate, but Beauty had higher educational aspirations. Like Veliswa, she had aspirations of moving beyond her current socio-economic context and becoming a professional. As noted earlier, she explained that she wanted to change her life. Seeing people that she was at school with become professionals, motivated and encouraged her to believe that this was possible. She realised that she needed a Grade 12 certificate. She returned to school to complete her Grade 12 even after being told that she would have to re-do Grade 11. Being clearly goal-orientated and committed to achieving her dreams, Beauty accepted this.

Veliswa and Beauty as autonomous reflexives, managed to dovetail their concerns relatively easily. While their *modus vivendi* was to become young professionals, becoming teachers, as noted earlier in this chapter, was not a project they initially wished to invest in. For autonomous reflexives, only they can know what is of importance to them and as such, develop projects based on what they consider worthwhile pursuing (i.e. which projects they are able to live with) (Archer, 2003). Archer (2003) suggests, unlike communicative reflexives, autonomous reflexives are not able to avoid structural and cultural constraints and enablements. It is the interest in moving beyond the natal context in terms of career choices, that exposes autonomous reflexives to structural and cultural conditions. Nevertheless, for all four of the participants in my research, financial constraints were a major structuring mechanism that conditioned the choice to become teachers.

5.6.3 Significance of the modes of reflexivity in this research

When personal concerns (e.g. career choices) are fulfilled within the boundaries of the natal context, as in the case of both Nokhaya and Nomsa, communicative reflexives then endorse and reproduce the context “through the practices they establish as their own *modus vivendi*” (Archer, 2007, p. 145). The projects that communicative reflexives envisage, within the context

of their involuntary placement, do not trigger social constraints. As such, the evasion of objective costs possibly incurred through the process of resisting constraints, fosters social immobility, reproduction of the social context and morphostasis (Archer, 2003, 2007). Social immobility, as suggested here, is not the result of passive agents, but rather considered deliberation which is dependent on active agents (Archer, 2003, 2007a, 2012). For Archer (2007a), “‘staying put’, as is the tendency for communicative reflexives, has to be worked at by an active agent” (p. 158).

The life histories of autonomous reflexives require numerous adjustments of their circumstances related to their concerns and the projects that they develop, to assist and deal with their changing contexts. They have thus been exposed to the powers of social constraints and enablements, far more than communicative reflexives, which have been activated through their projects. Archer (2003) considers the projects of autonomous reflexives to be transformatory as they “distance the subject from his [*sic*] original context of involuntary social placement and his [*sic*] re-location to a new social context” (p. 244).

Archer (2003) argues that autonomous reflexives are inclined to embrace a range of *modi vivendi* (ultimate concerns) throughout their lives, as an outcome of learning about self and society and self in society. Both Veliswa and Beauty have, in many respects, resigned themselves to teaching. For both, this was a move to perceived economic advantage. Veliswa maintains that she stays in teaching because of the children and the money. While Beauty would love the DBE to pension her off, she realises it would not be strategic to leave the profession at this moment in time, as she would lose a considerable amount of her pension and not be able to support her children who are still at school.

5.7 CONCLUDING REMARKS

Personal identities, for Archer (2000, 2007), are based on what people care about in the world (i.e. within the three orders of reality). As persons, each of these participants, had to distinguish their ultimate concerns from subordinate ones. This was done by examining the consequences of each through the internal conversation (i.e. reflexively ‘weighing up’ both positive and negative costs to be borne). This is evident in the ultimate career choice made by each of the participants in my research. Delineating their ultimate concerns involved the DDD process. Discernment involved a preliminary review of the projects worth pursuing. Veliswa, Beauty

and Nomsa all articulated the urge to escape the contexts into which they were born by becoming professionals. All three initially considered nursing as a viable project for becoming professionals. Discernment enabled these three participants to identify and record concerns for consideration and deliberation – the concerns being influenced by the positions into which they were involuntarily placed.

Deliberation is the process of developing an ultimate concern, or what Archer (2000) refers to as the *modus vivendi*. The ultimate concerns of these participants were influenced by the structural and cultural emergent properties that either impinged on the positions they were born into and/or the projects the participants had initially chosen. During this process of deliberation, all four chose the teaching profession as their ultimate concern and had to engage with ascertaining whether they had the emotional energy to see this project through. This is the process of dedication, where projects are prioritised and aligned (Archer, 2000) and the ultimate concern acknowledged. It is through this process that each of these participants developed their strict personal identity as teachers.

Persons' projects, and their personal identity, are adjusted in accordance with the structural and cultural conditions that emerge through the pursuit of their projects. As evident in this section on becoming FP teachers, we do not make our personal identities under situations of our own choosing, for we are placed and embedded in contexts and positions that are not of our choosing. It is the structural and cultural conditions of the contexts in which they were and are embedded, that impinged on the development of the personal identities of these teachers.

In Chapter Six and Seven, I analyse the expression of teachers' identities through the teaching of mathematics. As such, I examine their social identities, that is, the expression of their roles as FP teachers of mathematics. Drawing on Archer's morphogenetic approach, I expose the structural and cultural mechanisms that condition the social identities of the four teachers, and the extent to which they 'act back' as they teach mathematics.

CHAPTER SIX

STRUCTURAL AND CULTURAL MECHANISMS CONDITIONING TEACHERS' IDENTITIES IN TEACHING FOUNDATION PHASE MATHEMATICS

In achieving the specific need for equality, relevance and quality in South African education, the teacher is the key person. Increased funding, better physical activities, new curricula, improved syllabuses and learning materials, democratic structures, effective planning and administration, as well as political will to change and popular support for what is done, all have their part to play, but in the end, success or failure depends upon the teacher in the classroom.

(Hartshorne, 1992, p.218)

6.1 INTRODUCTION

Ken Hartshorne's assertion is in line with an argument that I made in Chapter One of this thesis, namely that understanding *who the teacher is*, is central to bringing about change in South African schooling and addressing the crisis of learner underperformance. It is this question of 'who the teacher is' that forms the focus of Chapter Five to Seven in my thesis. Central to these chapters is my resolve to answer the overarching question in my research: *What are the conditions that enable or constrain the emergence and expression of teachers' identities in the teaching of Foundation Phase mathematics?*

As I noted in Chapter Four, the analysis of my empirical data is presented over two time periods or, as Archer (1995) puts it, two morphogenetic cycles. The first concerns the decision that the research participants took to become teachers (Chapter Five). I examine the context that each of the four teachers was born into and how that context influenced the array of career opportunities available to them. In so doing, I foreground the structural and cultural mechanisms (T1) that gave rise to their ultimate concern in relation to work and the development of their personal identities. Put differently, I uncover the mechanisms at the level of the real, conditioning the discern-deliberate-dedicate (DDD) process (T2-T4) and the participants' decisions to become teachers (T4). Central to this DDD process is the mode of reflexivity of each of the four participants in my study.

The second time period, or morphogenetic cycle, forms the core of Chapter Six and Seven. These chapters explicitly relate to the time that I spent in the research participants' classrooms.

In these two chapters I give prominence to the expression of the research participants' social identities. Social identity for Archer (2000) refers to the expression of social roles in society. In relation to my research, *teacher identity is the expression of the roles of teachers*. When I refer to teacher identities, I am referring to the expression of teachers' roles in and through the teaching of Foundation Phase (FP) mathematics. Like Sfard and Prusak (2005), I do not suggest that the expression of the roles of teachers through their teaching is the representation of teacher identities. Rather, I propose that the expression of teachers' roles through the teaching of FP mathematics *is* their teacher identity. While Sfard and Prusak (2005) "equate identities with stories people tell" (p. 14) about self and others, I posit that identities are our (inter)actions with self and others. In this sense, I offer a view of identity that is not limited to the discursive (i.e. linguistic and communicative), but includes the full range of (inter)actions of the person in expressing their social roles. For the sake of brevity, in the next two chapters, instead of writing the expression 'the teachers' roles in teaching FP mathematics', I will simply use the term *teachers' identities*, and make the assumption that the reader recalls that the context is the teaching of FP mathematics.

Before examining the four teachers' identities, I provide a brief introduction to the context in which they teach. It is this context which in many ways despite 20 years of democracy resembles the natal context of the teachers (Chapter Five), and which conditions the manner in which they express their roles as teachers of FP mathematics. This context is one of poverty.

6.2 INTRODUCING THE CONTEXT IN WHICH THE FOUR TEACHERS' WORK

Lwandle Township faces high population density, widespread economic deprivation, high rates of unemployment, low levels of education and challenges relating to teenage pregnancy, alcohol abuse and crime. All four teachers recognise this; in my interviews with them they all described the context in which they teach as being one of the most challenging aspects of their work.

As Beauty (MHI, tt.112-114) expressed, the community of Lwandle Township faces many social and economic challenges which impact her role as teacher.

Even the teachers in the location⁵⁷, they cry. ... It's because [the children's] parents are ... they're pregnant. ... Most of these kids live with their grandmothers. The mothers go and live with their boyfriends and they care less about their kids. They don't care for them. And I decided not to give them homework because nobody helps them. At least when you give a child homework, you think somebody's going to help him or her, but you see nobody helps, she doesn't do it.

Beauty's comments about the present, are reminiscent of her own childhood experiences. As narrated in Chapter Five, Beauty's mother became pregnant with her when she was still in primary school and she spent most of her formative years living with her grandmother. In addition to Beauty's view that parents are negligent, she also mentions the violence young children have to endure.

These kids become raped at a young age so you must go to the parents, go to the social workers, seek the psychologists. That's what I like about young children. Young children say my mom was drunk yesterday I couldn't write my homework. You must call the parents so the child can stay here and do all their work. You must tell the parents what to do with their kids. (Beauty, LHI, t.264)

Given this situation, Beauty explained that the role of teachers extends beyond the confines of the classroom. Veliswa concurred and told me that it was the responsibility of teachers to get to know the home environment of each child in their class. "You have to meet them (the parents) and discuss some things so that they can do something about their children's work" (Veliswa, LHI 1, t.318).

Meeting with parents is not always easy. Nokhaya explained that "sometimes if you call a parent, the parent doesn't respond" (MHI, t.102). As highlighted above, all four teachers reflected on their roles in the context of economic disadvantage, as extending beyond the confines of the classroom. For them, it is a necessity to visit children's homes in order to understand the child holistically, interact with parents, liaise between parents, psychologists and social workers, and provide some of the children with food and uniforms. In many respects the context within which they work, requires them to adopt a pastoral role.

⁵⁷ Location is another word for township.

This role is systemically mandated through the feeding scheme and inscribed in the Norms and Standards for Educators (SA.DoE, 2000a), which considers the importance of teachers adopting a community-orientated, citizenship and pastoral role that requires teachers to:

practise and promote a critical, committed and ethical attitude towards developing a sense of respect and responsibility towards others. ... Within the school, the educator will demonstrate an ability to develop a supportive and empowering environment for the learner and respond to the educational and other needs of learners and fellow educators. Furthermore, the educator will develop supportive relations with parents and other key persons and organisations. (p. 14)

Nokhaya and Beauty also noted that the school children need to be loved and encouraged. “These are small children, they want to be loved. They want you to come to their level. ... So I come to them, I go around them and when they find some difficulties I try to help them and I always encourage them to ask if they don’t understand” (Nokhaya, MHI, t.92). While the teachers acknowledge that the children need to be loved, they also regard them as troublesome and requiring discipline. Both Veliswa and Nomsa emphasised that children prefer to play in class rather than do their work. Veliswa contended that “Sometimes they play when they are supposed to be writing” (PI1, t.90). She suggests that walking around the class while the children are doing their independent work is necessary to ensure that they are all on task. Nomsa concurred, “I think another problem, when you are doing examples on the board, they are playing. ... They are not listening at all, especially those ones who are not clever in class. They are the ones who are not listening. ... When it comes the time to answer questions they know nothing” (MHI, t.116). Similarly Beauty asserted that ‘these’ children are not interested in education. “But these kids are not keen on education. They don’t like education. Some people say it’s because of this. ... They don’t like education” (Beauty, MHI, t.130).

During my research I spent time in two schools: Sontonga Primary School and Phambili Public School. The schools have quite different origins. Sontonga Primary School was established as a mission school and then taken over by the Bantu Education Department in 1979. Phambili Public School was established more recently, in 1997. It was hoped that this school would afford adults and children involved in the anti-apartheid struggle, an opportunity to complete their education, and that it would also accommodate the children of displaced farm labourers who had hitherto only received a rudimentary education at farm schools. Given the community in which the schools are situated, both are now non-fee-paying schools and children are given

a cooked meal everyday as part of the School Nutrition Programme. For some children, this is the only meal that they eat in a day (Stats SA, 2013).

There are some differences between these two schools in the present day. Sontonga Primary School is typically under-resourced, with no library, laboratories or computer facilities. By contrast, Phambili Public School does have a library and computer centre (although this is primarily for the use of the secondary school children). Sontonga Primary School offers classes from Grade R to 7, whereas Phambili Public School is a combined school with classes from Grade R to 12. Children from the squatter camp across the main road from Lwandle Township attend Phambili Public School because of its proximity. The school has large class sizes. The two Grade 3 classes in which I conducted this research, had 51 and 53 children in them, whereas the number of children in each of the two Grade 3 classes at Sontonga Primary School, was 27 and 28. A 40:1 learner-teacher ratio is deemed appropriate for primary schools (De Lannoy & Hall, 2012).

Both Beauty and Nomsa raised concerns about teaching large classes. For Nomsa a large class constrains her teaching of FP mathematics. “I think children find difficulty in maths. ... Like in my class, if I can have 20 or 25 learners I will be able to reach out to them. It’s very difficult for me to teach maths in this full class because I think in maths, learners must get individual attention” (Nomsa, MHI, t.104). Beauty explained “Lise, we have these big classes it’s difficult for us. When you see that there are a lot of them who did not get it, you go and do it again on the board” (Beauty, PI2, t.110).

Absenteeism at both schools is very high. It is seldom that all the children are in class on a particular day. On social grant days (i.e. when welfare money is deposited into the recipients’ accounts) many of the learners accompany their parents or caregivers to the respective paypoints. For example, on the 3rd of August, Nokhaya told me that she had very few children in her class that day as it was grant day and many parents had taken their children with them to town. She surmised that they wanted to spoil their children (Nokhaya, FN, p. 11). This has negative implications for work coverage and learner progression.

The structural context in which all four teachers teach, conditions the expression of their roles in teaching FP mathematics. Specifically, the material condition in the community in which the two schools are located, is one of abject poverty. Access to resources (e.g. water, electricity

and sanitation) is limited, many people have meagre formal education and unemployment is extremely high. The most significant income source for most families is social grants. In this environment, parents are inclined to view teachers as the ones who will look after their children during the day, while they try to find employment or food, and who will provide an education that will enable their children to become active in the formal economy. By contrast, teachers tend to believe that parents do not care sufficiently for their children and their schooling.

Having examined the material context in which the four teachers who participated in my research live and work, I now turn my attention to the expression of these teachers' identities in teaching FP mathematics. In doing so, I focus on T2-T3 of Archers' morphogenetic approach, that is the level of social and social-cultural interaction (Archer, 1995). I have chosen to do this through a narrative in which I foreground the teacher roles (Archer's (2000) social roles) expressed by the participant teachers in teaching FP mathematics. All of the roles identified through the mathematics history and practices interviews and my observation of the teachers' teaching FP mathematics, are orientated to teaching children mathematics content. Four key roles across all four teachers emerged from the empirical data in my research. These I refer to as: *teacher as effective communicator*, *teacher as promoter of dialogue*, *teacher as knowledge-worker*, and *teacher as connector*.

6.3 THE EXPRESSION OF TEACHERS' IDENTITIES IN TEACHING FOUNDATION PHASE MATHEMATICS

Both personal and teacher identities occur at the intersection of structure, culture and agency. Teacher identities are relational on two accounts. Firstly, teacher identities are animated by personal identities, which means that teachers express their identities in different ways, depending on their concerns in the world (Archer, 2000). Thus, a change in personal identity influences teacher identities. Secondly, while personal identities are animated through teacher identities, teacher identities, in turn, influence personal identities. Teacher identities comprise both *agents* (i.e. collectives to which a teacher may belong) and *actors* (i.e. individual teachers). These are in an iterative relationship with each other. Both agent and actor are incorporated into the explanation of teacher identity; this is presented in Chapter Seven. In this chapter I elucidate the teacher as actor. Figure 6.1 provides a summary of the conception of teacher identity that informs this research and is based on Archer's (2000) stratified view of persons.

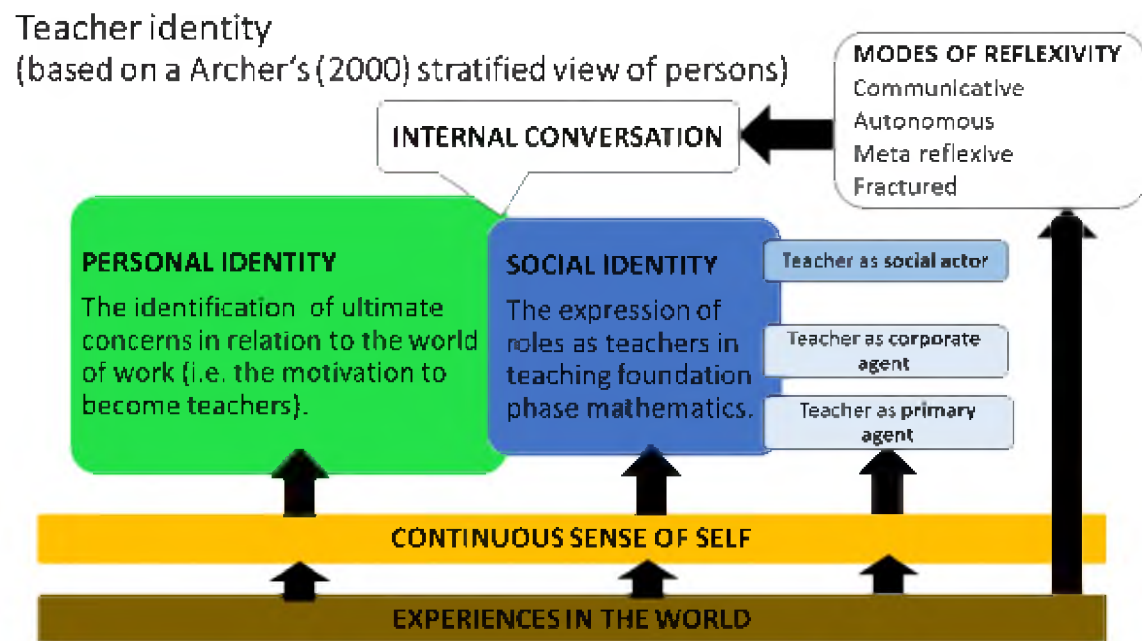


Figure 6.1: A graphical representation of the emergence of teacher identity
(adapted from Millar, 2014, p.90)

As noted above, teacher identity is the manner in which teachers express their roles as teachers (of FP mathematics) and includes the teacher as agent (both primary and corporate) and actor (Chapter Three). This is conditioned by teachers' sense of self, practically formed, as persons interact in the world, and personal identities, which are one's ultimate concerns in the world. Teacher identities are further conditioned by the structural and cultural mechanisms at the level of the real (Bhaskar, 1978) and their mode of reflexivity (Archer, 2003, 2007a, 2012).

The narrative that I have constructed below from the empirical data, highlights the teacher identities of the participants. In so doing, I focus on the third subquestion in this research: *How are the identities of Foundation Phase teachers expressed through the teaching of mathematics?* I present rich data on only two teachers, in order to enable deep engagement and a smooth narrative. That being said, in analysing each of the four teacher roles, I provide a broad overview of each of the four teachers' identities at the start of my analysis of each role. In developing a more substantial narrative I elaborate and provide examples from my empirical data on the two selected teachers. I have chosen Nokhaya and Beauty as the two teachers whose narratives I present in greater detail, in other words as my sample within a sample. The reasons for this sample selection are as follows: they teach in different schools, they have had different life experiences, and they exhibit different modes of reflexivity. As established in Chapter Five,

Nokhaya is a communicative reflexive, while Beauty is an autonomous reflexive⁵⁸. Nokhaya has experienced a life of contextual continuity while Beauty's has been one of discontinuity (Chapter Five). I argue in Chapter Seven that these modes of reflexivity influence the way in which teachers engage with the structural and cultural mechanisms that condition their teacher identities. Where Nomsa and Veliswa's expression of a role differs from either Nokhaya or Beauty's, I have included it in the narrative below. For this reason I have also included some of their data in the *Empirical Data Book*.

In presenting the empirical data in relation to the four roles of teachers, I frequently refer to a number of appendices. For ease of reading the chapter I have compiled a 'stand-alone' text which I refer to as the *Empirical Data Book*. I have included in this book the empirical data from Nokhaya (appendix 8), Beauty (appendix 9), Nomsa (appendix 10) and Veliswa (appendix 11) that I refer to extensively in this chapter. The empirical data for Nomsa and Veliswa has also been included to provide further detail into the expression of the identities of all four teachers. This data is also included in the appendices; for this reason, the appendix numbers in the *Empirical Data Book* are the same as those used in the thesis. Each section of the book begins with *lesson summaries* of the three video-recorded lessons, two transcribed and translated *lesson excerpts*, and two *vignettes*. Reading the lesson summaries first, assists in orientating the reader to the narrative that follows.

The first role identified from the data relates to the necessity of communicating mathematics content effectively. As I argue below, all four teachers highlighted the importance of being able to explain the mathematics content in order for effective learning to take place. Central to this *role as effective communicator* is the explanations that the teachers provided and the language they choose to communicate in.

⁵⁸ Like Nokhaya, Nomsa is a communicative reflexive, and like Beauty, Veliswa is an autonomous reflexive.

6.3.1 *The role of effective communicator*

According to the Norms and Standards for Educators⁵⁹ (SA.DoE, 2000a), being able to communicate effectively is a key aspect of the teachers' role as learning mediator. This policy document reads as follows:

The educator will mediate learning in a manner which is sensitive to the diverse needs of learners, including those with barriers to learning; construct learning environments that are appropriately contextualised and inspirational; *communicate effectively* (italics added), showing recognition of and respect for the differences of others. In addition an educator will demonstrate sound knowledge of subject content and various principles, strategies and resources appropriate to teaching in a South African context. (p. 13)

Communicating effectively for the participant, involves giving clear explanations, making sensible decisions about the language of LoLT in the classroom, and asking a variety of questions about the mathematics topic being learnt at the time. In Table 6.1, I provide the reader with an overview of how each teacher expresses the role of teacher as effective communicator. I do this by highlighting the role, the language used in teaching FP mathematics, and the teachers' concerns and challenges in relation to this.

⁵⁹ The Norms and Standards for Educators introduced in 2000 provides a core curriculum for teacher education and outlines new roles for teachers. Learning mediator is one of those roles.

Table 6.1: Teacher as effective communicator

	TEACHER AS EFFECTIVE COMMUNICATOR			
	Sontonga Primary School		Phambili Public School	
	Nokhaya	Veliswa	Beauty	Nomsa
Teachers need to:	explain clearly	explain clearly	explain clearly	explain clearly
Language used to teach mathematics	isiXhosa ('corrected' children who used English)	isiXhosa was dominant and she 'corrected' children who used English. There were one or two instances where children used an English number word.	isiXhosa / English used interchangeably. Translated terminology from isiXhosa to English.	English / isiXhosa used interchangeably. Translated terminology from isiXhosa to English. Used English terminology. English was the default language when she taught mathematics.
Teachers explained that language choices are conditioned by the following mechanisms	ANA⁶⁰ are written in isiXhosa. Used formal isiXhosa in ANA versus colloquial isiXhosa. isiXhosa mathematics terms differ depending on the dialect. Concerned with children learning in English is grade 4.	Department of Basic Education Grade 1 teachers use English. We're told children learn better in their home language.	ANA are written in isiXhosa. ANA and national workbooks⁶¹ do not use the colloquial terms that children are used to. ANA and workbooks sometimes include isiZulu terms.	The language used is "old fashioned". isiXhosa mathematics terms differ depending on the dialect. ANA and workbooks sometimes include isiZulu terms.

As highlighted in Table 6.1, all four teachers hold that it is the teachers' role to explain mathematical concepts clearly to the children in their class. The language they chose to do this in differed. Nokhaya and Veliswa teach in isiXhosa and seldom use English in their mathematics lessons. If children use English, Nokhaya and Veliswa correct them either by

⁶⁰ As noted in Chapter One, the ANA (Annual National Assessments) are national assessments conducted annually in grades 1-6 and 9. The mathematics ANA is written in the LoLT. In the two schools in which I conducted my research, this is isiXhosa.

⁶¹ These are a collection of worksheets based on the curriculum that have been formatted into a book that the children are expected to work in. They were developed by the Department of Basic Education.

telling them to stop speaking English or by stating the English word in isiXhosa. By contrast, Beauty and Nomsa use isiXhosa and English interchangeably in their mathematics lessons. Terminology is given to the children in both isiXhosa and English. For Nomsa, English is the default language in the class. By that I mean that she appears to ‘naturally’ communicate number words and mathematical terms in English in her lessons. All four teachers attribute the complexity of deciding which language(s) to use in teaching mathematics, to various structural and cultural mechanisms. I have presented these in Figure 6.1 and elaborate on them below in relation to the expression of Nokhaya and Beauty’s teacher identities.

The word *clear* is used by all four teachers to express a way of being (i.e. to be clear) and is used to distinguish teachers who are deemed to be good at teaching mathematics from those who are not. Nokhaya contrasted her own primary school and high school experiences in relation to the clarity of the explanations that the respective teachers offered. In primary school “our teacher was good at explaining because *maths is about explaining what to do*. So he was good” (Nokhaya, MHI, t.16), whereas in high school, “I didn’t like it much. There was a lot to be done and our teacher was not quite clear about maths because he was not a maths teacher, but he was told to teach maths so I didn’t get it the way I wanted” (MHI, t.20).

Beauty contrasted her high school mathematics experiences, with that of her experience at teachers’ training college. She was critical of her high school teachers and suggested that they were not able to explain the mathematics sufficiently clearly, whereas she held her college lecturers in high regard. Beauty explained, “The teacher that was teaching us in Grade 12 ... was not clear when he was teaching us” (MHI, t.22), however, at the college “we were doing didactics and content. It was taught. It was very good. It was clear. I never failed that” (MHI, t.50). Both Nokhaya and Beauty, as with the other two teachers, placed a high value on their role as effective communicators.

In the teachers’ classrooms, providing clear explanations was not a simple process and was often accompanied with the use of a number of supporting devices to assist the children’s understanding. In Nokhaya’s third video-recorded lesson (appendix 8, lesson summary 8.3 & lesson excerpt 8.1) on analogue time, she explains the difference between ‘before’ and ‘after’ as represented on a clock. The lengthy sequence from tt.34-73 (lesson excerpt 8.1) involves her trying to ensure that the children understand that ‘when the hand of the clock moves up’, it is ‘before the hour’ and ‘when it moves down’, it is ‘after the hour’. To support her explanation

of ‘before and ‘after’, and in an effort to explain these concepts, Nokhaya uses a clock and questioning. Specifically, she uses these techniques to try to ensure that the children are focused on her explanation and that they are able to determine when time is ‘before the hour’ or ‘after the hour’. Her explanation is coupled with getting the children to repeat the words ‘phambi’ (‘before’), ‘phambili’ (‘going forward’) and ‘emva’ (‘after’), and the phrases ‘uya phambili’ (‘you are moving forward’), ‘luyenyuka’ (‘it is moving up’) and ‘luyehla’ (‘it is moving down’). She uses repetition and chorusing to enforce her explanation. In this example, Nokhaya is explaining the action of the minute hand on the clock moving ‘up’ and ‘down’ the clock face, rather than developing a conceptual understanding of why the time is ‘past’ or ‘to’. The difficulty with developing children’s conceptual understanding is also reflected in the example from Beauty’s first video-recorded lesson.

In her lesson on multiplication and division in excerpt 9.1 (appendix 9, lesson summary 9.1) Beauty tells the children that “multiplying can also be like adding” (t.1). Using tallies, she draws six groups of five tallies on the board to represent the calculation ‘ 5×6 ’. The tallies are added up by counting all of them and the answer is given on this basis. It is evident that Beauty wants the children to see the relationship between multiplication and repeated addition. However, the connection between multiplication and addition is not clear, as the tallies are counted in 1s rather than in groups. Later in the lesson the children are asked to give the answer for ‘ 5×2 ’. One of the children suggests that the answer is ‘7’. Beauty responds “5 times 2. *We are not adding when we times*” (t.15). This statement appears to contradict her earlier claim that multiplication is like adding. This short episode suggests that giving clear explanations requires careful thought and planning.

Later in the same lesson, Beauty introduces the children to division. When I asked Beauty why she taught multiplication and division in one lesson she hinted at the relationship between the two. “When we are doing multiplication we multiply by that number, by that number. When we do division we ask how many times did that number go there?” (Beauty, PI1, t.56). Later in the interview, Beauty told me that she moved from multiplication to division and back to multiplication in her teaching “just to remind them. I’ve told them that there is a difference between multiplication and division” (PI1, t.6). Whether she chose to focus on the similarities or differences between division and multiplication, it was clear that the relationship between the two remained implicit, with Beauty assuming that the children would understand it on their own.

As noted above, the teachers' schooling and teacher training experiences have led them to believe that one of their roles as teachers of mathematics is to clearly explain content. Emerging from this short description is the use of other devices (e.g. tallies, repetition, chorusing) to assist in providing clear explanations, teaching for conceptual understanding, and ensuring that relationships between concepts are explicit to the children. In retrospect, while in the teachers' classrooms, I should have asked them to give me an indication of what it meant to explain a mathematical concept 'clearly' given that they regard this as key to effective communication. But whilst 'clarity' here may relate to some form of understanding, it is inadequate to enable the identification and exploration of relationships and the development of conceptual understanding and sense-making.

In terms of government policy, teachers are required to use the Language of Learning and Teaching (LoLT) "appropriately to explain, describe and discuss key concepts in the particular subject" (SA.DBE, 2000b, p.16). While the LoLT in both schools was isiXhosa, teachers differed in their opinions as to whether this was the appropriate language for learning mathematics. The choice of language the teachers used, differed across the two schools; those at Sontonga Primary School (Nokhaya and Veliswa) used isiXhosa almost exclusively and those at Phambili Public School (Beauty and Nomsa) used a combination of isiXhosa and English. The Language in Education Policy (SA.DoE, 1997c) states "the right to choose a language of learning and teaching is vested with the individual" (p. 1). However, the South African Schools Act (SA.DoE, 1996) gives School Governing Bodies the right to choose the LoLT in schools, provided that the choice is made within the overall framework of multilingualism. Presently in South Africa, the first four years of schooling (Grade R to 3) should be taught in the home language of the child. With the home language of over 70% of people in Lwandle being isiXhosa (Stats SA, 2012), it is not surprising therefore that the LoLT from Grade R-3 in the two schools where I conducted my research was isiXhosa.

Nokhaya expresses her teacher identity by teaching FP mathematics in isiXhosa. When the children speak in English, she asks them to revert to isiXhosa. In the first video-recorded lesson (appendix 8, lesson summary 8.1; appendix 7, tt.87-90) on addition of two three-digit numbers, Nokhaya asks the children to read the answer to an addition sum that had been calculated. The class says "three hundred and five" to which she immediately responds "No, you are using English" (Nokhaya, appendix 7, tt.91-92). During the first practices interview, I asked her why she wants the children to speak solely in isiXhosa in the mathematics lessons. She explained

“I want them to master their language in so much that I encourage them not to use any English word when we are doing Maths and isiXhosa. ... So that they can like their language” (Nokhaya, PI 1, t.24). However, she also expressed concern knowing that the children would be learning in English the following year “But I ... if we makes English and isiXhosa in Grade 3, the kids will understand better, but our question papers⁶² encourage us to only use isiXhosa” (Nokhaya, MHI, t.122).

Knowing that children are expected to learn in English from Grade 4 was a cause for concern for all four teachers. Beauty (PI1, t.14) articulated this tension, when she explained why her children count in isiXhosa despite them counting in English in their everyday lives.

The curriculum says that when we count, we must count in our language. But it's difficult for them. ... We teach them our language how to count in our language. But the problem is ... when they go to ... the intermediate phase, they won't say 'nye' ('one') anymore. And they don't understand how to count in our language and even to write it. They can count, but they can't write it.

Beauty thus uses a combination of isiXhosa and English in her class. For example, the children count in 1s in isiXhosa and for the rest they use English. Not surprisingly then, Beauty's class was not sure of the isiXhosa number names after one hundred. In a lesson on addition of two three-digit numbers with regrouping, as highlighted in vignette 9.1 (appendix 9), Beauty has two sums written on a chart that she asks the children to read. The first sum is '239+156'. My field notes record the unfolding events as follows: “Beauty takes a pointer. She reads the first sum in isiXhosa. She then asks the children to read it. She has to help them as they are not very sure of the isiXhosa number names for '239' and '156'. She gets them to repeat it” (Beauty, FN, p. 6).

Beauty translates mathematics terminology into English. In her lesson on multiplication and division she uses the terms 'phinda-phinda' ('multiplication') and 'times' interchangeably (appendix 9, lesson summary 9.1 & excerpt 9.1). However, when she asks the children to calculate, she generally uses the term 'times' e.g. “five times two” (t.9) rather than “five phinda-phinda ngo-two” (t.11). In excerpt 9.2 (appendix 9) she tells the children that the lesson will focus on 'imilo' ('shapes'). In her lesson on shapes, she uses the isiXhosa term 'imilo' followed by the English term 'shapes'. Both words are written on the board (appendix 9,

⁶² The question papers she is referring to here are the ANA.

excerpt 9.2, tt.23). The mixed use of isiXhosa and English terminology continues as she introduces the children to the names of different 2-D shapes (appendix 9, excerpt 9.2, tt.35-39).

While Beauty uses both isiXhosa and English, Nokhaya does not. During her first practices interview, Nokhaya told me “Sometimes I code switch⁶³ so that when they go to Grade 4 they know some of the words” (PI1, t.28). However this is a rare occurrence in her classroom and in contradiction with how she expresses her role as an effective communicator of FP mathematics, and the beliefs she holds about the importance of children learning their home language. Teaching almost solely in isiXhosa is not without its complications. Both Nokhaya and Beauty described some challenges with the use of isiXhosa in the ANA exemplar and the national workbooks. Nokhaya complained: “Ja (Yes), and if they were using the words that are too close to English like ‘ihafu’ (‘half’) instead of ‘isiqingatha’ (‘half’), they would understand it more better when reaching Grade 4. But they use the more difficult words in Xhosa” (MHI, t.126). Even the instructions given to the children in the ANA papers are confusing. In the 2012 ANA paper, the term ‘rhanqela’ (‘to make a circle’) was used instead of the term ‘yetsa isanqa’ (‘to make a circle’) (Nokhaya, MHI, tt.128-132). As indicated in my field notes below, Beauty complained about the use of isiZulu terms in the national workbooks.

Extract 6.1: Beauty’s concern with the use of isiZulu in the national workbooks
(Beauty, FN, p.14)

Beauty shows me p. 54 in the national workbook and says “Look at what they expect the children to do. They have to read all this and they can’t. They put words we don’t know in isiXhosa here too. Look ‘thata omnye *umcu*’. This is an isiZulu word”.

Thatha omnye umcu uze uwusonge ngonanophelo shafini.
Wuvule. Unamacala alinganayo amangaphi?
Bhala i- $\frac{1}{2}$ kwisiqingatha ngasinye uze usike emigobeni.

(DBE, 2012b, p. 54)

She elaborated on this problem in relation to the national workbooks during the first practices interview (Beauty, PI1, t.92):

Yes, they mix it with isiZulu and other languages. They said we must teach them isiXhosa but that book, unlike this Januari, Februari, March (referring to her date on the board 18 Okthoba 2012 that is written in an anglicised version of Xhosa). They must use those imiQumbu, uMga, those things.

⁶³ Codeswitching is the process of alternating between languages, in this case isiXhosa and English, in order to assist children in understanding the mathematics content.

In other words, the national workbooks and ANA papers use terms that are not used colloquially in isiXhosa, or that children are familiar with. At home, children typically use English when referring to numbers, telling the time, naming shapes and working with fractions. English seems to be the ‘default language’ in mathematics lessons for children, which is why Nokhaya has to repeatedly remind them not to speak English.

The teachers’ choice of language to communicate mathematics, is structured by their concern that the children will be learning in English from the following year, the ANA and the knowledge that the children use English mathematics terms at home. However, the structuring of language use in mathematics lessons goes deeper than that. While all the teachers are isiXhosa first language speakers, Nokhaya places particular value on isiXhosa. She regards it as important for children to learn *their* language. She is proud of her first language and wants her children to share this pride. Her sense of self is inextricably intertwined with her being a first language isiXhosa speaker.

Beauty is concerned that the Grade 4 teachers will judge her if her children cannot do mathematics. “I will be happy if there are a few children that can show the Grade 4 teachers that I did teach them maths” (Beauty, MHI, t.134). This, together with the shift between learning in isiXhosa in Grade 3 and English in Grade 4, is of great concern to her. The complexity of language in schools where children transition from learning in their home language to learning in an additional language at the end of the FP, cannot go unrecognised, as the implications for communicating mathematics concepts clearly, is significant.

An added complication is that while the policies expect the teachers to teach in isiXhosa, many parents would prefer their children to learn in English. Language is political and the dominant view is that epistemological access requires English competence (Phakeng & Moschkovich, 2013). Neville Alexander (2013) argues that “we have to change radically the inherited linguistic *habitus* in terms of which English is the only feasible candidate for language of high status – a view which, among other things, implies that it is the language especially of science, mathematics, technology and business” (pp. 76-77). While all four teachers suggested that one of their roles is that of effective communicator, my research has shown that giving clear mathematical explanations is not a simple process, and that this challenge is complicated by the decisions teachers have to make with regards to which language to use to teach mathematics.

The second role that I identified through the analysis of my empirical data, was the *teacher as promoter of dialogue*. All four teachers encouraged the children to participate in their mathematics lessons by asking questions. Underpinning this question-answer exchange for all teachers is the initiate-respond-evaluate structure, which is typical of whole class teaching in South Africa (Chick, 1998).

6.3.2 The role of teachers as promoter of dialogue

The role of teacher as promoter of dialogue is linked to the role of effective communicator. The Norms and Standards for Educators (SA.DoE, 2000a) notes that teachers should be adept at “using key teaching strategies such as higher level questioning, problem-based tasks and projects; and appropriate use of group-work, whole class teaching and individual self-study” (p. 15). Whole class teaching and the basic underlying structure of the initiate-respond-evaluate (IRE) structure, are the dominant teaching practices in all four teachers’ classrooms (Sinclair & Coulthard, 1975; Wells, 1993; Cazden, 2001). Cazden (2001) explains the IRE structure as follows: the teacher *initiates* with a question to which the children *respond*. The teacher then provides the children with feedback having *evaluated* the response. Evaluation takes the form of assessing the children’s responses or expanding on their responses. All the teachers in my research taught mathematics through this sequence of question and answer exchanges. In Table 6.2, I provide a summary of how each of the teachers express their role as promoters of dialogue.

All four participant teachers ask questions⁶⁴ in order to promote learning. There are four dominant types of questioning relating to the teaching of mathematics shared by the teachers, and one type that relates specifically to the teaching of Nokhaya and Nomsa. I include this type of question in this text below, because it provides an indication that these teachers may be attempting to adopt new roles. These roles are in line with the systemic roles for teachers as expressed in the post-1994 curricula (SA.DoE, 1997a; SA.DBE, 2011b, 2011c) and in the Norms and Standards for Educations (SA. DoE, 2000a). Having read Boaler and Brodie (2004) I found similarities between the types of questions they identified and my own. I have adopted

⁶⁴ There were numerous questions that encouraged non-mathematical participation and centred on organising and managing children. I have not included these in this section.

their terminology where possible. While I identified five main types of questions, Boaler and Brodie (2004) identify nine⁶⁵.

Included in the expression of the four teachers' identities, and through the IRE structure, were questions that:

- gathered information about the children's knowledge;
- encouraged children to repeat and chorus answers;
- probed understanding and encouraged learners to explain their thinking;
- encouraged learners to peer assess; and
- checked to see that the children were focused on the lesson content.

The third type of question listed here is that which is specific to Nokhaya and Nomsa. I use corresponding colours in the excerpts relating to Nokhaya and Beauty (i.e. appendices 8 and 9⁶⁶) to assist the reader in identifying the types of questions they asked.

Table 6.2 provides an overview of the questions that each teacher asked during the teaching of FP mathematics. I elaborate on these by citing examples from Nokhaya and Beauty's mathematics lessons below. The examples are taken from the *Empirical Data Book* (appendix 8 & 9).

⁶⁵ These include questions that gather information, insert terminology, explore mathematical meanings, probe to get children to explain their thinking, generate discussion, point to relationships, extend thinking, orientate and focus the learning, and establish context.

⁶⁶ Examples of Veliswa and Nomsa's types of questioning can also be found in the *Empirical Data Book* (appendices 10 & 11).

Table 6.2: Teachers as promoters of dialogue

	TEACHER AS PROMOTER OF DIALOGUE			
	Sontonga Primary School		Phambili Primary School	
	Nokhaya	Veliswa	Beauty	Nomsa
How is this expressed?	whole class teaching IRE structure	whole class teaching IRE structure	whole class teaching IRE structure	whole class teaching IRE structure
Types of questions asked Questions that:	- gather information - closed ended focused on children's prior knowledge and lesson content - encourage repetition and recitation - probe children's thinking (i.e. the relationship between 'quarter to' and 'fifteen minutes to' on the clock) - encourage peers to assess each other's answers - ensure children are focused on the lesson topic	- gather information - closed ended focused on children's prior knowledge and lesson content - encourage repetition and recitation - encourage peers to assess each other's answers - ensure children are focused on the lesson topic	- gather information - closed ended focused on children's prior knowledge and lesson content - open ended questions when links were made with children's everyday experiences - encourage repetition and recitation - encourage peers to assess each other's answers - ensure children are focused on the lesson topic	- gather information - closed ended focused on children's prior knowledge and lesson content - open ended questions when links were made with children's everyday experiences - probe children's thinking (i.e. how the children know that '1000' is 'one thousand') - ensure children are focused on the lesson topic
Feedback is expressed by:	moving onto the next question and asking peers to assess each other	moving onto the next question and asking peers to assess each other	moving onto the next question and asking peers to assess each other	moving onto the next question

All four teachers used whole class teaching, with the IRE structure conditioning their mathematics lessons. The teachers generally asked closed-ended questions which are

performative questions or what Cazden (2001) refers to as “display questions” (p. 46). This means that they are closed-ended, test the children’s knowledge about the content of the lesson, and require a single correct answer from the children. Only Beauty and Nomsa asked open-ended questions at the time I conducted my research in their classrooms. They did this by linking the mathematics to children’s everyday life experiences (e.g. “Which other things, which we don’t have here today, are weighed in kg and grams?” (Nomsa, VRL2, p. 68).

Five different types of questions were identified and listed above. The type most commonly and frequently posed by the participant teachers, were those which sought to gather information about the children’s knowledge. In many respects this is not surprising, as it is this type of question that elicits children’s prior knowledge and their knowledge of the concept being taught. As suggested by Nystrand (as cited in Hogan et al., 2012), this type of question requires children to recall and report on information that is, by and large, already known. In other words, these questions are usually predictable and test recall of previously taught knowledge. Notable across the four teachers was the limited use of feedback. This concurs with Brodie’s (2007) research that sometimes the *evaluation* component of the IRE structure is absent or implicit (e.g. when teachers ask another question immediately after the learners have responded).

6.3.2.1 Questions that gather information about the children’s knowledge (and encourage repetition)

The questions highlighted in turquoise in the *Empirical Data Book* are questions that seek to gather information about the children’s prior knowledge, everyday life-experiences and knowledge of the content of the lesson. Those highlighted in pink refer to questions that encourage repetition of teacher-led words and phrases, and chorusing of answers. For example, “We are going to talk about a circle. It is round. How is it? **It is round.** How is it? **It is round.**” (adapted from Beauty, VRL2, tt. 46-51, **children’s responses in bold**).

Children in Nokhaya (appendix 8, excerpt 8.1 & 8.2) and Beauty’s (appendix 9, excerpt 9.1 & 9.2) classes tended to respond to these questions individually, but repetition or rephrasing of the question encouraged the children to repeat the answer in unison. This is in contrast to Nomsa’s class (appendix 10, excerpts 10.1 and 10.2) where children generally responded to each question in unison, unless she called upon a particular child to respond. In Nokhaya and Beauty’s classes, the chorusing of answers did not relate to new content but rather information

that was already available to the children. Chorusing is a device that encourages a repetition of answers that individual children have already provided (Chick, 1998).

Beauty asked open-ended questions when linking the lesson content to the children's everyday lives. For example, in her lesson on shapes Beauty asks the children to name examples of the two-dimensional shapes they have noticed in their everyday lives (appendix 9, lesson summary 9.2, excerpt 9.2). Interestingly, when the children worked within the number domain (i.e. numbers, number operations and relationships), questions were always closed-ended (appendix 7; appendix 9, excerpt 9.1).

Nystrand, Gamoran, Kachur and Prendergast (as cited in Brodie, 2007, p. 4) suggest that teachers should ask "authentic questions", that is, questions that take an interest in what children think. While I did not see many such questions during my time in the participant teachers' classrooms, in one of Nokhaya's lessons I observed her probing the children's thinking by asking them questions that required them to explain how they knew the answer.

6.3.2.2 Questions that probe and get learners to explain their thinking

Questions that push children's thinking are highlighted in green. In her lesson on time, Nokhaya (appendix 8, excerpt 8.1) purposefully set the clock to '07:15' so that she could engage the learners about possible ways of reading and telling the time. In turns 78–86, she repeatedly asks the children to give her another way of saying 'a quarter past seven'. When they are not forthcoming, she gives them a clue by using the word "minutes" (t.86). The children respond that it is "fifteen minutes after the hour of seven" (t.87). In turn 94, she continues to push their thinking asking them "**How do you know that this is fifteen minutes?**" She uses similar techniques in turns 140-162 (appendix 12). Having set the clock to 08:35, she asks the children to suggest another way they can read the time. Later in the same lesson (tt.232-243) she probes their thinking about the relationship between 'quarter to seven' and 'fifteen minutes to seven' and ascertains that they have made the required connection.

I observed very few examples in Nokhaya's lessons where she probed children's thinking and had them explain further. The examples that I did observe, appeared in lessons that were not solely focused on number operations. When children responded to questions that sought to gather information about their knowledge and probe their thinking, the participant teachers used these responses to assess the children's learning. However, it was seldom in my research

that I observed the teachers explicitly evaluating children's responses or giving them feedback. Typically teachers asked questions that would encourage the children in their classes, to collectively assess their peer's answers.

6.3.2.3 Questions that get the class to collectively assess their peer's responses

While the IRE structure was evident in the manner in which the four teachers expressed their role as promoters of dialogue, there were few examples where they evaluated or built on a response that the children provided. When a child answered a question correctly, the teachers typically moved onto the next question. Moving onto the next section is deemed to signify a correct answer. This is why I have opted for the (American) IRE structure rather than the (British) IRF structure (Sinclair & Coulthard, 1975) where the 'F' stands for feedback. Children in these four classes were not given meaningful feedback, at best their responses were evaluated usually by moving onto the next question. When the teachers did want to assess a response, they asked the children collectively in the class to assess their peer's response. Questions that encouraged the class collectively to assess a response are highlighted in blue. Typical terms used to encourage peers to assess each other are: "**uright?**" ("is s/he correct?"), "**nyani?**" ("really?"), "**nyanisile**" ("is it correct?"), and "**he?**" ("hey?") (Nokhaya, appendix 8, excerpt 8.1; Beauty, appendix 9, excerpt 9.1). By contrast, Nomsa⁶⁷ (appendix 10, excerpts 10.1, 10.2) seldom asked the children to assess each other's responses as the children in her class typically answered questions in unison. Questions that get the children to assess their peers' responses (e.g. "**is she correct?**") are also questions that check to see if the children are listening and focusing on the lesson content.

6.3.2.4 Questions that check to see whether the children are focused on the lesson

There are two distinct forms of this type of question evident in the classrooms in which I conducted my research. I highlighted these in red. The first involved checking to see if the children were observing what the teacher was doing, and the second was checking if the children were listening. Typically these questions seek to draw the children's attention to what the teacher is doing or saying. In her lesson on time Nokhaya (appendix 8, excerpt 8.1) uses questions to focus the children's attention on a clock that she is holding in her hand. She moves her hand down the right side of the clock (as you look at it) and up the left side of the clock in an effort to represent the movement of the hands of the clock. When she asks "**Do you see?**";

⁶⁷ I have included Nomsa here as her practice was different in that she did not get the children to assess the responses of their peers.

“Have you seen me?”; “What have you noticed?” she does not wait for the children to respond as she is simply directing their attention to what she is doing.

Likewise in her lesson on multiplication and division, Beauty (appendix 9, excerpt 9.1) asks the children a number of questions to draw their attention to the strategy of concrete counting that she is demonstrating on the board. Referring to her groups of tallies on the board in turn 5, she says “It’s the first ones, isn’t it?”; “How many are there?” and “Check what will the answer be?” Later in excerpt 9.1 (appendix 9) she draws the children’s attention to ways in which one can phrase a division sum. “You are asked here, how many times does this number go into this number? It says divide it. You are asked how many times four goes into twenty?” (t.23).

None of these questions that Nokhaya and Beauty ask are meant to elicit a response from the children. This is confirmed by the absence of ‘wait time’. They are used solely to direct the children’s attention to what the teacher is doing or saying. These questions, while seemingly rhetorical, serve to orientate the children to the focus of the lesson.

The IRE structure serves to transform “a monologue into a dialogue by eliciting short items of information at self-chosen points” (Cazden, 2001, p. 46). Apart from the occasional example from Nokhaya (and Nomsa⁶⁸) where questions were asked to push children’s thinking, the dialogue was not intended to ascertain whether the children were making sense of the mathematics content. This ritualised form of exchange in the IRE structure and evident in my research, limits the likelihood of promoting understanding or cognitive depth (Chick, 1998; Cazden, 2001; Hogan et al., 2012). In addition the children did not ask questions for further explanation or to clarify their thinking.

During the time I spent in the four teachers’ mathematics lessons, I never heard one child ask a mathematics-related question during whole class teaching. When I asked Nokhaya about this, she was very quick to respond, “Yes, but mine ask questions. They lift up their hands and I go to them and they ask questions (laughs)” (Nokhaya, MHI, t.154). While I did observe a few children asking her questions when she moved around the class marking their work, this was not the case when she was teaching the whole class. Furthermore, this was not a practice that I observed in any of the other classes.

⁶⁸ I include Nomsa here as she, like Nokhaya, asked a question that pushed her children’s thinking.

The lack of opportunity for children to ask questions indicates that the IRE structure serves as a mechanism to control the interaction and who participates in the interaction. In this way, the teacher controls the topic, the pacing, and the allocation of turns. As such the IRE structure entrenches asymmetrical relations of power in the classroom where the teacher is the authority and the one who ratifies what is regarded as valid knowledge (Hogan et al., 2012).

In the next section I consider what it is that teachers engage children in ‘dialogue’ about. I refer to this role as *teachers as knowledge workers* (Adendorff, Mason, Modiba, Faragher, & Kunene, 2012). The four teachers have a particular approach to their role as knowledge-workers which I suggest later in this chapter, is based on their belief that mathematics is about taught procedures and rule following, and that it is their responsibility to ensure through their clear explanations that the children in their class know how to calculate using set procedures.

6.3.3 Teachers as knowledge-workers

The role of teachers as knowledge-workers was coined by Adendorff et al. (2010). The role is sometimes described to refer to or understand teachers as both transmitters of knowledge and facilitators of learning. In this section, I use it in the context of teachers being transmitters of mathematical knowledge. In Table 6.3 I provide a summary of the expression of the role of teacher as knowledge-worker for each of the four teachers who participated in my research.

Table 6.3: Teachers as knowledge-workers

	TEACHER AS KNOWLEDGE-WORKER			
	Sontonga Primary School		Phambili Public School	
	Nokhaya	Veliswa	Beauty	Nomsa
How is this expressed?	Teach prescribed methods and procedures. Teaches the ‘breaking down and building up’ method.	Teach prescribed methods and procedures. Teaches the ‘breaking down and building up’ method. Teaches the standard vertical algorithm. Uses the standard vertical algorithm as the default method.	Teach prescribed methods and procedures. Teaches the ‘breaking down and building up’ method. Uses the standard vertical algorithm as the default method.	Teach prescribed methods and procedures. Teaches the ‘breaking down and building up’ method. Teaches the standard vertical algorithm. Uses the standard vertical algorithm as the default method.

All four teachers teach the children methods for performing number operations and focus on correct answers. During my time with the four teachers, I observed all four teachers teaching addition of two three-digit numbers, Beauty and Nomsa teaching subtraction of two three-digit numbers, and Veliswa and Beauty teaching multiplication and division. While I was told during the practices interviews that children are allowed to use their own methods, this seldom occurs in practice. Veliswa and Nomsa explicitly teach the children two methods for solving addition and subtraction sums, taking the learners through the procedures step-by-step. These methods are the ‘breaking down and building up’ method and the standard vertical algorithm. When I asked Nomsa if the children were allowed to use their own methods, having observed her teach two methods, she told me:

No, these are my methods, but I’m doing these methods with them. As you can see I got the answers from them. These we did together. ... They can do this method but I’m allowing them to do their own method as long as the answer is the same. As long as they’re going to explain why do this method instead of that one. (Nomsa, MHI, tt.62-66)

From this interaction, one can gather that it is difficult for Nomsa to conceive of other methods, even though she says the children have the option to choose their own methods. This was the case across all four teachers. While Veliswa and Nomsa actively taught two methods, Nokhaya and Beauty taught a single method. For Beauty, Veliswa and Nomsa the standard algorithm is the default method in their mathematics lessons.

In vignette 9.1 (appendix 9) Beauty shows the learners how to calculate using the ‘breaking down and building up’ method. After she explains the method to the children, she calls on two children to calculate the sums she has written on the board. The children use the ‘breaking down and building up’ method. Interestingly, as she teaches this method, and as shown on the chart in vignette 9.1 (appendix 9), Beauty lines the answers to each part of the calculation in the standard vertical algorithm format, before she works out the final answer. The importance of children learning to calculate was expressed in Beauty’s comment to me during her first practices interview. She said:

You must be sure that they know these basic operations. ... All of them. ... We must be sure that they know all the basic operations. That is why, whether we do time or whatever, shapes, whatever, there must be some sums, addition and subtraction or multiplications. ... Yes, it’s the basics, the basics of mathematics. (Beauty, P11, tt.270-284)

As noted in vignette 8.1 (appendix 8) a typical expression of Nokhaya’s role as knowledge worker, is to invite the children to show the class how to perform an addition or subtraction calculation on the board. Of the four teachers, this was unique to her class. Since 1994, government policy has expected teachers to adopt more learner-centred and progressive approaches to teaching, that is, approaches that encourage children to participate actively in the lesson. For Nokhaya, inviting the children to share their working out of a taught procedure with the class, is an example of learner-centred teaching. In her lesson on subtraction of two three-digit numbers, the children in Nokhaya’s class used the ‘breaking down and building up’ method with brackets, as specified in the Curriculum and Policy Statements (CAPS) (SA.DBE, 2011c). The example for subtraction using this method when calculating provided in CAPS (2011c, p. 422) for Grade 3, Term 3 is as follows:

$$\begin{aligned} 889 - 137 &= \\ 889 - 137 &= (800 + 80 + 9) - (100 + 30 + 7) \\ &= (800 - 100) + (80 - 30) + (9 - 7) \\ &= 700 + 50 + 2 \\ &= 752 \end{aligned}$$

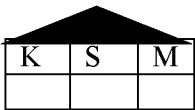
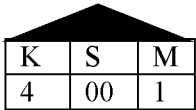
Of interest, is that there are no examples provided in CAPS that require regrouping (‘borrowing’) (e.g. 887-139).

While Nokhaya did not take the children through the ‘breaking down and building up’ method step-by-step, she may have taught them this procedure for calculating. The manner in which

the children wrote the method (i.e. starting with the brackets, then the addition signs, followed by the subtraction signs before inserting the numbers) suggests she taught this method procedurally. Her use of this method was underpinned by the structure of the standard vertical algorithm. While the ‘breaking down and building up’ method may work in certain circumstances, it does not work in all cases, especially when children are required to regroup. This led to Nokhaya requesting that the children write ‘00’ for the ‘tens’ (appendix 8, vignettes 8.1 & 8.2). I asked Nokhaya where this ‘breaking down and building up’ method originated. “It comes from my experience and it is there in the CAPs syllabus where the kids are supposed to break down the numbers, to write the place values, and if they do the sum like this they understand better because in this there is place value” (Nokhaya, PI2, t.4). She explained with regards to subtraction with regrouping “if a child is going to subtract a number that is bigger, I always tell them to go to the next number, to borrow and they must understand which number to subtract. Because others twist the number because they want the easier way” (Nokhaya, PI2, t.6). The term ‘twist’ means ‘to swap’. For example, when given the sum ‘34-17’, Nokhaya was concerned that the children will swap the ‘4’ and the ‘7’ around. The net result is that the sum becomes ‘37-14’ rather than ‘34-17’. Later during this interaction, she remarked that “CAPs asks us to break down the numbers, they say this method (pointing to the vertical method) is for Grade 5” (Nokhaya, PI2, t.10).

In an effort to make mathematics *easier* for the children, comply with CAPS and avoid the reduction of calculating to single-digit numbers as in the standard vertical algorithm (Venkat & Askew, 2012), Nokhaya required the children to insert ‘00’ into the calculation in vignette 8.1 (appendix 8) (i.e. $108-66=(100)+(00-60)+(8-6)$) in order to signify the ‘tens’. The *double zero* was an important feature in her class when children decomposed numbers. Nokhaya altered the manner in which the children decomposed a number where there are ‘0 tens’ (e.g. 309). In vignette 8.2 (appendix 8) I noted that Nokhaya insisted that the children write ‘300 + 00 + 9’. I asked her why the children should write ‘00’ for the ‘tens’. I recorded in my field notes that she “told me that they need to know that tens consist of two digits. She was concerned that they would get confused if they did not write the ‘00’” (Nokhaya, FN, p. 12). Ironically, in an effort to make it easier for the children, Nokhaya taught the children something that does not necessarily promote conceptual understanding or sense-making. I later observed a lesson where the children were required to write three digit numbers in a ‘house’ Nokhaya had drawn on the board, as shown in the diagram below. Nokhaya asked one of the children to write ‘401’ in the house as indicated in extract 6.2 below.

Extract 6.2: A child writes ‘401’ in a place-value ‘house’ on the board
(Nokhaya, FN, p.11)

Nokhaya’s diagram	The child’s work
	

In my field notes I noted that

The teacher asks the class if this is correct. Most are unsure. She questions them about the ‘00’ asking: “What is wrong with ‘00’?” The girl who wrote the digits into the columns removes one of the 0s. The teacher asks the class if it is correct and they say yes. (Nokhaya, FN, p. 11)

In this example the children are confused as they have been taught that ‘0 tens’ is written as ‘00’. The question ‘What is wrong with 00?’ is not used to promote the child’s thinking, but rather to encourage the child to correct her work. Furthermore the chorusing of ‘yes’ in response to the teacher asking ‘is it correct?’ does not indicate that the children understand.

In all four classes the teachers’ expressed their role as transmitters of knowledge and skills by teaching standard procedures (or variations thereof as shown in the example above) for addition and subtraction calculations. They taught the children the ‘breaking down and building up’ method as highlighted in CAPS.

In the next section I consider the role of *teacher as connector*. In my research, the teachers expressed this role by assisting children to make connections by exploring links between mathematical topics, linking mathematics to the children’s everyday life, and exposing children to different modes of representation of mathematical topics. It should be noted that these are not the only roles that emerged from my analysis of the empirical data, but that they are the most common across the four teachers.

6.3.4 The teacher as connector

All four teachers expressed this role by attempting to assist their children to make connections. The performance of this connector role does not necessarily result in connectionist outcomes anticipated by Askew, Rhodes, Brown, William and Johnson (1997), as the participant teachers

did not necessarily develop the children's mental agility, their ability to use a variety of strategies for calculating, to pose challenging questions and encourage discussion.

The connections that the teachers who participated in my research made, included: firstly, connections between children's everyday lives and/or prior knowledge and the mathematics content to be learned; secondly, connections within and across mathematics topics; and thirdly, connections between different modes of representation. To unpack these connections, I draw on Bruner's (1996) three modes of representation, namely the enactive mode, the iconic mode and the symbolic mode. The enactive mode or concrete mode refers to touching and manipulating objects (e.g. counters) for learning mathematics. The iconic mode emphasises the use of visuals and models (e.g. tallies, number lines etc.) to express mathematical ideas and develop an understanding of mathematics. The symbolic mode signifies the use of words and symbols to describe, represent and explain a concept or method of calculation.

Not all the teachers made connections in the same manner and some attempts at making connections appeared more successful than others. A summary of the way in which each of the four teachers expressed the role of teacher as connector is highlighted in Table 6.4.

Table 6.4: Teacher as connector

	TEACHER AS CONNECTOR			
	Sontonga Primary School Nokhaya	Veliswa	Phambili Public School Beauty	Nomsa
How this is expressed in lessons the focus on numbers, number operations and relationships?	Using the symbolic mode of representation.	Using the enactive, iconic and symbolic modes of representation: • counters and symbols for multiplication and division; • tallies for subtraction; and • symbolic for addition of two three-digit numbers.	Using the enactive, iconic and symbolic modes of representation: • fingers, tallies and symbols for multiplication and division; • symbols for addition of two three-digit numbers; and • pictures and symbols for fractions.	Using the enactive, iconic and symbolic modes of representation: • apple, fraction wall and symbols for fractions; and •
How is this expressed in lessons that do not focus on numbers, number operations and relationships?	Use of enactive, iconic and symbolic mode of representation: • calendars to teach time; and • a clock to teach analogue time.	Use of iconic and symbolic mode of representation: • calendars to teach time and time terminology	Using the enactive, iconic and symbolic modes of representation: • ‘2D shapes’ that could be manipulated; • pictures of shapes; and • shape terminology.	Use of the enactive and symbolic mode of representation: • measuring objects; and measurement abbreviations and terminology.
The expression of this role within and across mathematics topics		Linked counting in 5s to division. Made an implicit connection between multiplication and division.	Made a connection between multiplication and addition. Made an implicit connection between multiplication and division.	
Making a connection between the children’s everyday and prior knowledge and the mathematics knowledge		The use of word problems relating to real-life experiences.	The use of word problems relating to real-life experiences. Identifying representations of 2-D shapes in the world around us.	Made a connection between the children’s prior knowledge of fractions and new knowledge. Used everyday products to introduce her lesson on measurement and weighed children using a bathroom scale.

Noteworthy across all the teachers, is the different modes of representations that they used to teach mathematics concepts. Veliswa, Beauty and Nomsa all used the enactive, iconic and symbolic modes of representation across their teaching, while Nokhaya used only the symbolic mode when teaching the domain of number. The modes of representation used by the teachers differed when teaching the other domains (e.g. measurement). Veliswa and Beauty both made connections within and across mathematical concepts, and Beauty and Nomsa both linked the mathematics content to the children's everyday knowledge and experiences.

6.3.4.1 Teachers made connections by drawing on different modes of representation

In analysing my data, it became apparent that the teachers moved across Bruners' (1966) three modes of representation. All four teachers emphasised the importance of concrete forms of representation for developing children's understanding of mathematics. Nokhaya reflected on her experience as a primary school child and ascribed her success in mathematics at primary school and in high school, to the solid foundation that was developed in her primary years and the use of concrete materials. "Maths is about concrete. I think because they used mostly concrete [when I was young] that made me to understand it much easier" (Nokhaya, MHI, t.60). The belief that concrete materials were important in learning mathematics was further entrenched when Nokhaya was at teachers' training college. She learned "learners, especially the young ones, they learn more easier by touching and by seeing things rather than theory" (Nokhaya, MHI, t.70). Her own practice as a FP teacher has shown her that concrete modes of representation assist children in developing their understanding of mathematics. She expounded, "Oh I like maths now because I have seen that the learners like to use counters and touching objects so I do it and they understand. By the time I finish the lesson, some of them know what to do and some of them even want to do it more" (Nokhaya, MHI, t.88). Despite her belief in the value of the enactive mode of representation and her own experiences as a school child, concrete objects are not used in her class. Rather, she uses the symbolic mode of representation. This however, may be related to the particular content that she was teaching at the time (i.e. addition and subtraction of two three-digit numbers).

Both Nokhaya and Beauty used the symbolic mode of representation when teaching addition and subtraction of two three-digit numbers. For example, Nokhaya invited her children to show their working out of the 'breaking down and building up' method on the board (appendix 7, tt.29, 48, 65) because "the kids use the method that is easier for them" (Nokhaya, PI2, t.8). It soon became apparent that the children were using a taught procedure when adding and

subtracting two three-digit numbers, namely the ‘breaking down and building up’ method, with the underlying structure of the standard algorithm when adding and subtracting two three-digit numbers.

In her first practices interview, Beauty emphasised that before children begin writing mathematics and grappling at the symbolic level, they must have had experience in working with physical objects. She explained:

If I’m going to do maybe subtraction and this addition, I must have all the apparatus and the assessments and all the resources so that the children, I can teach them the concretes and in writing. They must, before they write, I must be sure they know what I’m talking about. (Beauty, PI, t.118)

I also observed Beauty teaching multiplication of numbers up to 10×10 . In her lesson on multiplication and division (appendix 9, excerpt 9.1) Beauty exposed the children to all three modes of representation. In exposing the children to different strategies that they can use to perform multiplication and division calculations, she used the enactive and iconic modes. The strategies, drawing tallies on the board or using their fingers, both promoted concrete counting. In excerpt 9.1, turn 5 (appendix 9), Beauty draws tallies on the board which she groups into groups of five. Later in this lesson, she uses her fingers to show the children how to multiply by ten. In the first practices interview with Beauty I asked her why she drew tallies on the board. She responded, “They are used to them and when we are using counters, maybe bottle tops, they are used to them, they like to use those sticks” (Beauty, PI1, t.4). The reliance on concrete counting methods was evident when Beauty engaged the children with basic mental mathematics as most of the children used their fingers (Beauty, FN, p.3). She argued that concrete counting is “where they start from in Grade 1, they must count on their body parts, they start there” (Beauty, PI2, t.26). I probed by asking her if she thought the children would become reliant on their fingers. She responded explaining that she did not only encourage the use of fingers: “I use counters. ... And use sticks or write some, count with circles” (Beauty, PI2, tt.32-34). Reflecting on the use of fingers she explained, “I said to them, when counting in tens, you can take your fingers and count ten, twenty, thirty, forty. Ten times ten is like saying, like counting in tens up to hundred and you can use your fingers” (Beauty, PI1, t.24).

While Beauty suggested that such methods start in Grade 1, she continues to promote concrete counting methods. In many Foundation and Intermediate Phase classrooms, children are exposed to and engage with concrete methods of calculation and the enactive or iconic modes

of representation, rather than more abstract algorithms based on the symbolic mode of representation (Schollar, 2008; Ensor et al., 2009; Hoadley, 2012).

In this research, all four teachers used symbolic representations for addition and subtraction of whole numbers. Veliswa used concrete and symbolic modes of representations whilst teaching multiplication and division, and the iconic mode when subtracting two two-digit numbers. Nomsa incorporated concrete, iconic and symbolic modes of representation in her fractions lesson, while Beauty used these three modes of representation during her lesson on multiplication and division. While there is little consistency between the teachers, it appears that the mode of representation used depended on the topic of the lesson. One might assume that towards the end of Grade 3 when children are adding and subtracting two three-digit numbers, concrete modes of representation may no longer be necessary.

6.3.4.2 Teachers make connections within and across topics

Beauty and Veliswa taught lessons in which they attempted to establish and clarify the relationship between two mathematics topics. In her lesson on multiplication, Beauty (appendix 9, excerpt 9.1) tries to assist the children to make the link both between repeated addition and multiplication, and between multiplication and division. However, as indicated earlier, these connections were not made adequately explicit, in order to be understood by the children.

While Veliswa and Beauty were the only teachers who attempted to make connections across mathematics topics, Nokhaya taught connections within a mathematics topic. Specifically in her lesson on time (appendix 8, lesson summary 8.3, excerpt 8.1) she makes an explicit connection between ‘quarter past’ and ‘fifteen minutes past’, ‘thirty-five minutes past’ and ‘twenty-five minutes to’, and ‘quarter to’ and ‘fifteen minutes to’. Nomsa, Veliswa and Beauty were the only teachers who made connections between the children’s every day and/ or prior knowledge and the new mathematics knowledge as discussed below.

6.3.4.3 Teachers make connections between every day and/or prior knowledge and new mathematics knowledge

Of the four participant teachers, Nomsa was the only one who explicitly emphasised the value of moving learners “from the known to the unknown” (Nomsa, PI 2, t.18). Nomsa, Veliswa and Beauty made links between the everyday experiences of the children and the mathematics

content taught in their lessons. For example, in her lesson on shapes, Beauty (appendix 9, excerpt 9.2) assists the children in seeing 2-D shapes (i.e. squares, circles, triangles and rectangles) in everyday objects. In response to Beauty's question to name things that *are circles*, the children call out the following objects: ball, a golf ball, apple, tomato, peach, onion, 'a disky' (small bouncing ball), eye, head, mango, potato, watch, marble. While the children are initially fixated on naming fruits and vegetables, Beauty shifts the answers that the children provide by stating "I don't want veg (vegetables)" (appendix 9, excerpt 9.2, tt. 84-86). In this lesson, children ascribed to 3-D objects the names of 2-D figures.

Beauty also advocated for the use of manipulatives in developing children's understanding of mathematics, however, she extended the conception of physical materials to include iconic representations of physical objects and practical work. In explaining how she plans her measurement lessons, she said:

I must first bring concrete things. Maybe I'm going to do millilitres and litres. I must show them the difference with those concrete things, I must bring it. I must bring them pictures and maybe magazines to cut all the kgs or the grams. And we must measure. (Beauty, MHI, t.106)

Beauty and Veliswa were the only teachers I observed using word problems in class. Beauty did this during her mental mathematics sessions. I recorded examples of such word problems in my field notes and include them below.

Extract 6.3: Examples of Beauty's word problems
(Beauty, FN, p.3)

- Beauty does some mental problem-solving with the class:
- Inkomo zi-4. Zingaphi yimilenze? (There are four cows. How many legs are there?) 16
 - Bantwana ba-7. Zingaphi eyes? (There are 7 children. How many eyes do they have?) 14
 - Umama itenge ilettece exi-8. Share these between 2 children? (Mother buys 8 lettuces. Share these between 2 children?) 4

The role of teacher as connector is to enable children to see connections between different modes of representation, between different mathematical topics, and between the everyday and prior knowledge of the children and the new mathematical knowledge in the lesson. The participant teachers expressed this role in different ways and each performed the role variably depending on lesson content.

In table 6.5 I summarise this section by emphasising how each teacher attempted to explain mathematics clearly, teach set methods and procedures for calculating, use concrete, iconic and symbolic modes of representation, and try to assist the children by making connections. These practices were observed in the context of whole class teaching and the accompanying IRE structure. Nokhaya and Nomsa are the only two teachers who showed evidence of probing children's thinking.

Table 6.5: A summary of the mathematics teaching practices of each of the Foundation Phase teachers' mathematics lessons observed in my research

	Sontonga Primary School		Phambili Public School	
	Nokhaya	Veliswa	Beauty	Nomsa
Teacher as effective communicator	Emphasised the importance of explaining clearly. Used isiXhosa and 'corrected' children who used English.	Emphasised the importance of explaining clearly. isiXhosa was dominant in her class and she 'corrected' children who used English.	Emphasised the importance of explaining clearly. isiXhosa and English used interchangeably. Translated terminology from isiXhosa to English.	Emphasised the importance of explaining clearly. English and isiXhosa used interchangeably. Translated terminology from isiXhosa to English. Used English terminology. English was the default language when she taught mathematics.
Teacher as promoter of dialogue (Asking questions)	Questions that: - gather information - encourage repetition and chorusing of answers - probe the learners thinking ('quarter to' and '15 minutes to') - require the children to assess their peers answers - ensure the children are focused on the lesson	- gather information - encourage repetition and chorusing of answers - require the children to assess their peers answers - ensure the children are focused on the lesson	Questions that: - gather information - encourage repetition and chorusing of answers - require the children to assess their peers answers - ensure the children are focused on the lesson	- gather information - probe the learners thinking (How do you know '1000' is a thousand?) - ensure the children are focused on the lesson
Teacher as knowledge-worker (Methods for calculation)	Taught set procedures: breaking down and building up method	Taught set procedures: breaking down and building up method and standard algorithm	Taught set procedures: breaking down and building up method Standard algorithm is default method	Taught set procedures: breaking down and building up method and standard algorithm
Teacher as connector	Enactive and symbolic Explicitly taught 'quarter past' and '15 minutes past' etc.	Concrete, iconic and symbolic Implicit reference to relationship between division and multiplication	Concrete, iconic and symbolic Attempted connection between repeated addition and multiplication Implicit reference to relationship between multiplication and division Shapes (identifying 2-D shapes in 3-D objects) Numbers (using word problems)	Concrete, iconic and symbolic Fractions-moving from 'known to unknown'. Measurement-children bringing everyday products into the classroom

6.4 A SOCIAL REALIST ANALYSIS OF THE EMPIRICAL DATA

Drawing on Archer's morphogenesis of the person as an explanatory tool, I redescribe the above narrative with a view to working towards a deeper analysis. I begin this redescription with a focus on the concept of *social identity* that is, the expression of social roles in society. As mentioned in the introduction of this chapter, I regard teacher identity as the expression of teachers' roles in the context of teaching FP mathematics classrooms. Using this lens we can see that the roles that teachers express in their classrooms, are familiar in the sense that they are roles that carry with them particular history. By that I mean, these teacher roles existed prior to the four teachers and emerged at T2-T3 from the (inter)actions of teachers and various other education stakeholders prior to the four participants becoming teachers. Drawing on Bhaskar (1978), the roles at T1 are referred to as *systemic roles*, meaning that they exist as part of the social system⁶⁹. As such, they have their own properties and powers that condition the (inter)actions of the four teachers in my research. In other words, they condition the *social roles* (i.e. teacher roles) of the teachers in my research. Bhaskar (1978) and Archer (2000) distinguish between systemic roles which are part of the social system and social roles which are the roles enacted by persons.

Systemic roles exist, in the sense that they are real, with a variety of structural and cultural mechanisms. I attempt to establish the relations in the SS and CS that impinge upon the projects of teachers. It is the process of identifying the mechanisms that exist in logical relation within the structural and cultural systems at T1, and that have a causal relation on teachers' identities at T2-T3 (Archer, 1996). This forms the basis of the next section in this chapter, where I show how the emergence and expression of teachers' identities is conditioned by a number of structural and cultural mechanisms that exist in logical relations with each other and condition teachers' identities.

6.5 STRUCTURAL AND CULTURAL MECHANISMS CONDITIONING TEACHERS' IDENTITIES

In order to examine the structural and cultural conditions that have given rise to the morphostasis of the teachers' roles in teaching FP mathematics, I draw on Archer's (1995) morphogenetic approach. I commence this examination by asking: *What are the necessary*

⁶⁹ The beliefs, theories, ideas, discourses etc. underpinning these systemic roles are part of the cultural system.

conditions that keep teachers' identities as they are? As explained in Chapter Four, this is a transfactual question that assists me to move beyond what is immediately observable and perceivable to uncover the mechanisms that condition and influence what we are able to see. By asking this question I am able to identify the structural emergent properties (SEP) and cultural emergence properties (CEP) that condition the teachers' identities, and sustain these systemic roles of teachers. Using Archer's morphogenetic approach, my focus in this section shifts from T2-T3, to uncovering the conditions at T1 that are necessary to sustain teachers' identities and the structural and cultural conditions at T4.

For the participant teachers, the most significant structural factor that conditioned their respective teacher identities was their own schooling and teacher training. For instance, Nokhaya described her primary school teachers as having the greatest positive influence on her as a mathematics teacher. She said they were the "ones that built those foundations because those foundations set one for the rest of one's life" (Nokhaya, MHI, t.75). For Beauty, the biggest influence on her teaching was her "high school and also at Cape College" (Beauty, MHI, t.80) where she did her Junior Primary Teachers' Diploma. With reference to what she learned at college, she said, "We used to use the old approach by that time. It was very helpful to the kids. And by that time we go to the school, teachers were using those old methods. So I used the methods from the college. It helps me" (Beauty, LHI1, t.220). In elaborating on these old methods: "I do use them because these kids sometimes they use this approach, something must come from them, I must not tell them ... and it's easy because they must think for themselves. But sometimes it becomes difficult" (Beauty, LHI1, t.222).

In Chapter Five, I explained that all four teachers were products of apartheid schooling and were thus products of a curriculum that endorsed limited knowledge and skills, and taught children to be obedient, subservient and to accept their social roles in a context of segregationism, poverty, inequality and blatant racism. Rather than addressing the schooling system further in this chapter, I continue the analysis with a focus on curricula prior to 1994 particularly in relation to teacher training and the teaching experiences of Nokhaya, Veliswa and Beauty (Nomsa was only trained as a teacher after 1994). I purposefully use the term teacher training rather than teacher education. Like Morrow (as cited in Carrim, 2006) who argue that the schooling black children received during apartheid was "anti-education" (p.173), I suggest, and demonstrate below, that the teacher training the teachers in my study received could be viewed as anti-educational.

6.5.1 Teacher training as a structural and cultural mechanism conditioning teachers' identities

Central to comprehending the emergence of the participant teachers' identities is an understanding of the teacher training system that the teachers were subject to. As noted in Chapter Five, Fundamental Pedagogics underpinned curricula for black children during apartheid. It was a philosophy of education supposedly based on a "scientific method" (Enslin, 1984, p. 141). While it purported to offer universally valid knowledge, it also sought to legitimate Christian National Education (CNE), thus reproducing the dominant ideology of the ruling class (Enslin, 1984).

CNE was a statement of beliefs that promoted Christian values and the racial superiority of whites. As such, it was a component of the apartheid government's education ideology. It suggested that black people were still in a stage of "cultural infancy" and thus entrusted the more "advanced" Afrikaners with black education (Enslin, 1984, p. 140). CNE was used to justify a separate and inferior schooling system for black children (Enslin, 1984). Together, CNE and Fundamental Pedagogics, endorsed the superiority of the Afrikaner specifically, and white people generally, and promoted the view of the inferiority of blackness (Enslin, 1984). Enslin (1984) argues that Fundamental Pedagogics was an "ideological practice masquerading as a theoretical practice" (p. 145).

Teacher training in South Africa emerged in a rather unsystematic manner from mission schools, provincial initiatives and universities (Chisholm, 2010). One of the central concerns with teacher training up to 1948 was the lack of uniformity in terms of curriculum, examinations and certification of black teachers through the Mission churches. Shortly after winning the 1948 elections, the National Party government appointed the Eiselen Commission to evaluate and make recommendations pertaining to the education system which included teacher training. The Eiselen report proved to be nothing but "a harbinger for 'domestic colonialism'" (Hartshorne, 1992, p. 234) with its recommendations based on the assertion of a separate Bantu society and economy. The introduction of the Bantu Education Act in 1953 was a clear indication that the National Party Government wanted to rid black teacher training and schooling of the influence of the English missionary institutions (Wolhuter, 2006). Enslin (as cited in Le Grange, 2008) explains that the Eiselen Commission proposed that black education,

be in the mother tongue, not be funded at the expense of white education; by implication, to prepare blacks of equal participation in economic and social life; preserve the ‘cultural identity’ of the black community (although it will nonetheless consist in leading ‘the native’ to acceptance of Christian and National principles; and must of necessity be organised and administered by whites. (p. 401)

It insisted that the intention of state control of teacher training and the development of separate teacher training institutions, was to meet the regional and ethnic ‘needs’ in South Africa (Hartshorne, 1992; Wolhuter, 2006). Furthermore, it recommended that primary school teaching be the preserve of female teachers who were deemed to be suited to take care of young children (Verwoed, 1954).

In the 1960s, teacher training institutions for black teachers were closed and relocated to the former Bantustans (Wolhuter, 2006; Chisholm, 2010). English-speaking principals in the teacher training institutions were replaced by those that spoke Afrikaans, and CNE and Fundamental Pedagogics became the order of the day in the professional training of teachers. By the late 1960s, teacher training “as it had existed under the mission churches had been ruthlessly and systematically destroyed. It was replaced by a closed, narrow, ideological approach that failed to produce teachers of quality and commitment of the earlier dispensation” (Hartshorne, 1992, p. 236).

The period 1960-1980 saw further rapid acceleration in the building of teacher training institutions, still confined to the former Bantustans (Hartshorne, 1992). This period is of direct interest to my research, as it was in 1977 that Nokhaya having completed Grade 10⁷⁰ entered Shawbury Teachers Training College in the Transkei, to register for her Primary Teachers’ Certificate (PTC). The PTC was a two year qualification introduced in 1972. It sought to provide a common national curriculum, developed by the South African state. In her PTC Nokhaya “did all the subjects so that I can teach from Sub A to Standard 6 (Grade 1-7)” (Nokhaya, LHI, tt.22-26). While Nokhaya remembered the LoLT being English at her “training school” (Nokhaya, LHI, t.6), Hartshorne (1992) has it that the teaching subjects (i.e. content subjects) were mostly taught in the language that the teachers were likely to teach them in, at the schools where they were employed.

⁷⁰ In 1979 only 6.3% of students registered for the PTC had a Grade 12 qualification (Soudien & Menton, 2010).

The PTC was an overloaded curriculum promoting “intellectual overcrowding” (British McNair Report cited in Hartshorne, 1992, p. 239). The qualification paid insufficient attention to the early grades (Grade 1-3). It placed great emphasis on developing teachers’ competence in English and Afrikaans, often at the expense of methods of teaching (Hartshorne, 1992). When I asked Nokhaya what courses she did at teacher training college, she responded, “All the languages, maths and the method of teaching those” (Nokhaya, LHI, t.154). More prominent in Nokhaya’s memory were the values that she learned. She told me,

I notice that I must learn to be independent. If I want teaching, I must love children. I must have confidence in myself first so that the learners can have confidence too. I learned that I must be dedicated to my work and that there should be more relationship between the learners and me so that the learners can trust me. (Nokhaya, LHI, t.152)

Preparation was regarded as important. “I remember that before you go to class you must prepare (Nokhaya, LHI, t.176). This is something that Nokhaya continues to value. In her first practices interview, she told me,

We (both her and Veliswa) do our planning on Wednesdays from one o clock because Wednesday is the sports day. So we take all our syllabuses, the maths one, the CAPs, and all our references and now we look at the syllabus, what are we going to teach next week? ... we take it from our own experience and we want in each term to touch all the aspects let’s say fractions, shapes, data collection and so on. We don’t take as it is written in the CAPs syllabus but we want to touch all those aspects. (Nokhaya, LHI, tt.2-4)

While Nokhaya said that she and Veliswa planned together, I did not observe this. In Chapter Seven, I suggest that Veliswa tends to mimic that which Nokhaya does. In other words, she does not plan *with* Nokhaya, but relies on Nokhaya for her planning.

Teacher training institutions in the 1970s promoted authoritarian and prescriptive teaching methods, an over-reliance on textbooks, regurgitation of lecturer notes, little discussion or questioning, and limited free time to engage in self-study or use the library. Teachers were trained to be obedient and loyal employees of the state, who were able to follow departmental instructions and regulations. Put differently, teacher training institutions produced skilled crafts persons rather than educated persons who understood the complexities of the world they were living in and their responsibilities and roles as teachers and of the school. Teachers in the 1970s were not educated to be responsible, autonomous, independent and strong thinking people (Hartshorne, 1996; Wolhuter, 2006).

During the 1980s there were renewed efforts to increase the number of teacher training institutions. This was coupled with the ‘upgrading’ of these institutions to colleges of education. Numerous challenges emerged in the process (Chisholm, 2010; Soudien & Menton, 2010). A key challenge in the training colleges was staffing. There was insufficient staff with the required qualifications (i.e. a degree) to lecture in the new training colleges. As a result they took on large numbers of young staff members, with very little experience in the field. Many of the young lecturers were products of Bantu Education themselves and had not been prepared for their new role as teacher trainers. As a result, the quality of teaching and learning in the colleges was poor, with low completion rates (Chisholm, 2010).

While neither Veliswa nor Beauty intended to become teachers (Chapter Five), this was the only option at the time for funded further education opportunities. They both completed a three-year qualification (i.e. Junior Primary Teachers’ Diploma (JPTD)) during the 1980s. When I asked Veliswa what she remembered from her three years at training college, she remarked:

Didactics. Yho, my memory is very. ... It’s about education. ... Yes, they call it pedagogics. ... Mmm, I liked maths. Yho, but I wasn’t specialising in it because we were taught all the primary subjects. So I made sure that I learned all those and I had to pass them. (Veliswa, LHI, tt.242-250)

Like Beauty, her drive to pass related to her personal aspirations (Chapter Five). She “wanted to be successful because my mother had no money. So if I failed then she would have been hurt” (Veliswa, LHI, t.252). Veliswa enrolled at the Cape College of Education in 1983 and Beauty enrolled there too in 1990. Beauty remembered learning “Environment, Mathematics, English and Afrikaans was there, Afrikaans, Education” (Beauty, LHI1, t.220).

With an overcrowded curriculum, and the practice at that time of ensuring that student-teachers were kept busy with face-to-face activities,⁷¹ there was little time for independent work and self-study (Hartshorne, 1992). The increasing numbers of students placed great pressure on the teaching practice component of the qualifications. Student-teachers received little actual teaching experience in schools, rather they spent time peer-teaching, micro-teaching and watching videos of teachers in the classroom (Hartshorne, 1992).

⁷¹ The colleges wanted the student-teachers to be busy so that they would have little time to get involved in the political struggles at that time (Hartshorne, 1992).

In the mid-1990s, Nomsa went to Algoa College of Education in Port Elizabeth. At that time there were still significant differences between the training colleges based on racial and urban/rural divisions. Jansen (as cited in Chisholm, 2010) suggests that in some cases, teachers learned little more at these training colleges than in the existing Grade 12 curriculum. He thus refers to these colleges as “glorified high schools” (p. 18). Metcalfe (as cited in Gordon, 2009) argues that, “teachers [in the colleges] were not taught to their full potential because curricula represented the worst of ‘bantu education’ and did not extend subject knowledge beyond matric” (p. 17). Nomsa, being very social (Chapter Five) enjoyed her time at college “Yho, it was nice. It was very nice. I met so many people, I’ve made friends. Ja, it was nice” (Nomsa, LHI1, t.184). She registered for “lots of subjects, maths and maths didactics, education, Xhosa, Xhosa didactics, yho, lots, physical education, mmm, lots of things” (Nomsa, LHI1, t.204). What stood out for Nomsa was the amount of responsibility given to the students. She explained to me: “Mmm, like the way it was taught. It was different from high school because there you are on you own, you must be more serious even if you don’t want to attend lectures they don’t care, you have to be responsible” (Nomsa, LHI1, t.198).

Nomsa was at the Algoa College of Education from 1997 to 1999, a time when colleges were being incorporated into higher education institutions in a bid to smooth the unevenness in provision of quality teacher training. From 1994 there was a significant amount of change in the education sector. In 1997 a new curriculum for schooling, C2005 (SA.DoE, 1997a) was introduced and in 2000 the Norms and Standards for Educators (SA.DoE, 2000a) provided a core curriculum for teacher education and introduced new roles for teachers. These new roles required a shift in teachers’ identities. I elaborate on this in Chapter Seven when I examine the post-1994 roles of teachers.

All four teachers completed their teacher training in environments where the quality of education was insufficient and poor. They received teacher training and a curriculum in colleges designed under apartheid, or as in the case of Nomsa, still influenced by Bantu Education (Metcalfe, as cited in Gordon, 2009). By 2001 the training colleges were being incorporated into universities and universities of technology (Chisholm, 2010). Also, a new curriculum for learners (one with a social constructionist orientation) had been introduced, and a new core curriculum for teacher education in the form of the Norms and Standards for Educators (SA.DoE, 2000a) was adopted. However, for Sayed (as cited in Soudien & Menton, 2010) apartheid education was a “system of systems” (p. 12) which reproduced itself politically

and ideologically. For him it still conditions teacher identities today, despite numerous attempts to dismantle it.

Having explored the teacher training system during the time that each of the four teachers received their qualifications, I now analyse the roles of teachers as defined in the curricula while these teachers were trained and that informed their teaching prior to 1994.

6.5.2 The systemic roles of teachers pre-1994

I concur with and draw on Bernstein's (1975) distinction between curriculum and pedagogy. "Curriculum defines what counts as valid knowledge, pedagogy defines what counts as valid transmission of knowledge" (Bernstein, 1975, p. 85). In this section, I examine both curriculum and pedagogy, particularly in relation to the systemically defined roles of teachers. I delineate between *systemic roles*, that is the roles of the social and cultural systems⁷², and *social roles*, that is the social roles as expressed by persons. As Archer (1995) explains:

Roles have autonomy in the sense that they endure various occupants with different dispositions and personal characteristics. As a result, 'different 'performances' of the same role ... leads both to role re-definition and personal development – through the process of double morphogenesis. (p. 186)

Systemic roles condition teacher identities, but no two teachers will express their roles as teachers in the same way. It is in the process of teaching, that both teachers' identities and the systemic roles are redefined. In order to analyse this change in teachers' identities and the roles, it is necessary to differentiate between the *systemic role* and the occupants of those roles (Archer, 2000). In this section I consider the systemic roles of teachers as articulated through curriculum policies prior to 1994. I rely in this account on secondary sources, as I was not able to locate curricula for the 'education' of black children, student teachers and teachers prior to 1994.

Fundamental Pedagogics was based on the view that children were ill-disciplined and ignorant (Enslin, 1984) and that the teachers' responsibility was to discipline both the body and the mind (Woods, 1996). Earlier in this chapter, I noted that the teachers in my research viewed the children that they taught as troublesome, unmotivated and in need of discipline. References to

⁷² While 'roles' are part of the social system (Chapter 3), I have included the CS in this section, because roles are informed by theories, ideas, discourses, beliefs etc.

these children were common. This designation sets them apart from children being schooled in schools in more affluent communities; needless to say, the teachers' own children attend these better-resourced schools. One of the systemic roles of teachers prior to 1994, was to transmit 'objective knowledge' to obedient children.

Prior to 1994, teachers were viewed as implementers of a fixed prescribed curriculum. This curriculum emphasised basic skills and the building of mathematical knowledge through the mastery of the component parts of each concept. The "curriculum [and syllabus] is presented part to whole" (DoE, 2000a, p. 12), promoting an atomised view of learning. It was a syllabus that was viewed as non-negotiable and based on rigid time-frames. In addition, it was based on the objectives model that defined education as 'changing of behaviour' (Woods, 1996). The use of objectives also sought to make learning measurable and teachers accountable (Woods, 1996).

Children were regarded as passive recipients of knowledge and were required to recite and chorus answers, memorise facts, and regurgitate the textbook or knowledge taught by the teacher (Walker, 1991; Chick, 1998). Put differently, teachers were required to impart knowledge to children who were viewed primarily as empty vessels. Teachers did this through explaining the lesson content clearly. Earlier in this chapter, in relation to the role of teachers as effective communicators, I suggested that their experiences as learners in schools had given rise to this role, as they described 'good' teachers as those who explained mathematics clearly.

In line with the above, Nokhaya, Veliswa and Nomsa emphasised the importance of learning, by listening in primary school. Nokhaya and Veliswa both reflected on their own success at school, particularly at primary school, and attributed this to them being good listeners. Comparing her primary and high school experiences, Nokhaya (LHI1, t.130) commented that her reliance on listening was insufficient for high school.

Yho, it was very different, because in primary school, I used to listen from the teacher, now in high school I had to study. I didn't like studying; I preferred listening and then go to the book. But most of the teachers there, they referred us to the book. You must read chapter what, chapter what and chapter what, then the following day, you must come and discuss. I didn't like that.

Like Nokhaya and Nomsa, Veliswa credited her achievement in primary school to her being a good listener. Even when she moved from the farm school to the township school in Alice, she

managed to do well despite the differences between the two schools. She explained: “It’s just that I was a good listener. I listened and if, apart from the fractions that I had to learn by rote, I listened and kept what I was learning. I tried to keep it and remember it when I was to write an exam or something” (Veliswa, MHI, t.14). Nomsa (MHI, t.116), reflecting on the children in her class told me that they are not learning mathematics because they are not listening.

When you are doing examples on the board, they are playing; they are not listening. They are not listening at all, especially those ones who are not clever in class. They are the ones who are not listening while you are teaching. ... When it comes the time to answer questions they know nothing.

Whole class teaching and individual completion of tasks, dominated classrooms when the participant teachers were learners in school. Correct answers were valued and seen as validation that children were learning. In this sense, mathematics was also viewed as being about taught procedures and correct answers. Beauty (MHI, t.54) explained that at college, mathematics was about taught procedures.

By that time, it was the method we were using in the olden days. It was not these methods that we are using. Addition was done, tens and units and what-what, and there were not, no place values there in the vertical method. It was addition and subtraction and multiplication and word sums.

Assessment primarily through tests and examinations were viewed as separate from teaching (DoE, 1997a, 2000a) and competition was encouraged.

Reflecting on the time when she was at school Nomsa (PI2, t.220) said:

Yes there was a lot of competition ... with our days, those learners that were slow learners or those who were at the last group, they were shy and the clever ones were, but now the slow ones are the ones that are making a lot of noise. I don’t know.

Nomsa expressed the view that having their position in class written on their reports, motivated them to work harder. “There’s nothing that motivates them. Like in our days we had like position one, position two, position three, you fight to be in the first five. Now there are these levels. I think that it’s not challenging” (Nomsa, PI2, t.204).

In many respects, teachers were positioned as passive and compliant with authority. As such, teachers were expected to comply with education policies specifically and all forms of authority generally. In the socio-political context of the time, there was little chance for teachers to

express their corporate agency (Chapter Three). All four teachers were subjected to this context as learners and pre-service teachers. In addition, this context also informed Nokhaya and Veliswa's teacher identities prior to 1994. In concluding this section, I present a summary from the above narrative of the systemic roles of FP teachers of mathematics pre-1994. The roles of teachers were to:

- Comply with authority (i.e. state, education officials, values, curriculum);
- implement a clearly structured and prescribed curriculum;
- discipline the body and mind of those in their care;
- promote mathematics content knowledge by teaching set procedures that produce correct answers;
- use whole class teaching and independent completion of tasks;
- promote competition to motivate children; and
- use tests and exams to assess children's knowledge and skills.

Drawing on empirical data presented earlier in this chapter, it is evident that many of these systemic roles are reflected in the manner in which the research participants currently express their teacher identities. They continue to view mathematics as a set of procedures and rules that children are required to learn through whole class teaching and the IRE structure. Earlier in this chapter, I highlighted the roles that were most dominant across the four teachers. The expression of these roles have been shown here to be conditioned, not only by the teacher training system and pre-1994 curricula, but also by the beliefs about mathematics, learning and teaching and children, held at that time (e.g. the teachers' beliefs about teaching and learning, that is, that teachers are expected to explain mathematics clearly and children are expected to listen to their teachers). Earlier in this chapter I argued that the four teachers emphasised their role as carers, extending beyond the confines of the classroom. They expressed that the children in their classes are inherently troublesome and thus need to be disciplined and loved. In the next section I show how beliefs about the subject mathematics, which are part of the cultural system (T1), have conditioned their teacher identities.

6.5.3 Conceptions of the school subject mathematics

Three dominant conceptions about the school subject mathematics were evident across the teachers.

6.5.3.1 Maths is difficult

All four teachers refer to mathematics as *difficult*. For example, in a 25 minute mathematics history interview with Beauty, she uses the word *difficult* 14 times to describe the subject

mathematics. While all four teachers suggested that mathematics was relatively easy for them at primary school, it was during their high school careers, that the notion of mathematics as a difficult subject was forged.

For Nomsa and Beauty, it was from Grade 11 and Grade 12 respectively, that mathematics became particularly challenging. Beauty was surprised to learn that she failed mathematics in her Grade 12 examination. She said: “First I was thinking I was going to pass it because we had done a lot of practice. We were not sleeping, doing this maths, but at the end I failed” (Beauty, MHI, t.4). Similarly Nokhaya found her high school mathematics experience challenging. She said “I think the teacher who taught me in primary made it, made me to like maths because although it was difficult in high school, I never stopped liking it” (Nokhaya, MHI, t.56).

The belief that mathematics is difficult was pervasive when Veliswa was at school. Veliswa thus chose to do functional mathematics instead of pure mathematics, during her last two years of schooling. In response to why she made this change, she explained, “I don’t know. It’s just hearing people say it’s very difficult and you won’t pass ... you get afraid and not sure of yourself that you’re going to achieve in that subject” (Veliswa, MHI, t.66). It was a decision that she regrets today.

The belief that mathematics is difficult carries through in all four teachers’ conversations about the extent to which the children in their classes are able to grasp mathematics concepts. They all expressed concern with the struggles their children experience learning mathematics. “Oh. Basically I think maths is a very challenging subject, especially to learners, as you can see, look at their faces when they do maths (refers to the learners). They look so lost and they know nothing. I don’t know what it is” (Nomsa, MHI, t.114). Beauty similarly pronounced that her learners have challenges particularly with place value, a concept that is foundational in understanding numbers, relationships and number operations. “Yes, if my learners have got that (referring to counting and number operations), I’m sure they will pass. Other things like place value, expanded notation, it’s a lot, but I must make sure they can add. *These* kids it’s so difficult for them” (Beauty, MHI, t.94). Her fear that *these* children will be overwhelmed by the difficulty of learning mathematics, along with other structural and cultural conditions, has led to a restricted mathematics curriculum with low cognitive demands.

One of the many criticisms of South African mathematics teachers across the phases, is that they have low expectations of the children and thus expect little cognitive engagement from them (Reeves & Muller, 2005; Ensor et al., 2009; WCED, 2010; Carnoy et al., 2011; Hoadley, 2012). Chick (1998) contends that in an attempt to “save face” (p. 34) and “hide unpleasant realities” (p. 34), teachers and children collude to conceal limited understanding of content and poor teaching. Beauty’s lesson on 2-D shapes (appendix 8, lesson summary 8.2) requires children to name 2-D shapes (circles, triangles, squares and rectangles), identify them by the way they look, identify their properties by counting the number of sides, and link these shapes to examples found in our everyday lives. Her lesson relates primarily to Van Hiele’s (1999) level 0 (visualisation) in which children identify a shape by resemblance, rather than the properties of the shape. While Beauty makes an attempt to move to level 1 thinking (description), this is limited to counting the sides of the shape. Similarly, in relation to her lesson on addition of two three-digit numbers as represented in vignette 9.3 (appendix 9), Beauty explicates: “I don’t know. ... Have you noticed that I just did addition, I didn’t do the carrying? I’m afraid, they don’t know how to. It’s few that can [carry]. I’ve done that with the two-digit numbers and we haven’t done it with the three-digit” (MHI, t.96). Her comment that “few can carry” (t.96) is underpinned by a belief that mathematics is not a subject that all learners can grasp.

The belief that mathematics is difficult, plays out in the classroom through the presentation of mathematics as abstract and, in some instances, devoid of meaning. In Nomsa’s lesson on measurement (appendix 10, lesson summary 10.2) the children are required to add 2,5kg to 2,5kg as shown in vignette 10.1. In this vignette, the children are expected to add decimals and use the standard algorithm to answer it. In trying to assist the children, Nomsa and the children confuse ‘tenths’ with ‘units’ and ‘units’ with ‘tens’. The result is an example of mathematics that provides little opportunity for sense-making and leads to her becoming frustrated with the children. The children’s perceived inability to understand the mathematics, entrenches Nomsa’s view that mathematics is not for everyone. This is the next belief held by the participant teachers, which I now discuss.

6.5.3.1 Mathematics is not for everyone

In interviews, Nokhaya, Beauty and Nomsa intimated that mathematics was not for everyone. Both Nomsa and Beauty told me that there were some children in their classes who would never be able to succeed in mathematics. I noticed in both Beauty and Nomsa’s classes, that

children are grouped according to ability. While the children who were struggling were seated in a row closest to the windows, the children who were perceived to be the ‘weakest’ in the class were seated at the back of that row. I asked Beauty (PI 2, tt.196-198) why this was the case.

Mmm. Ma’am, these children are not struggling like that won’t know it tomorrow, they won’t know it forever. ... They’re all from Grade 1 they were having a problem. As a result, last week we were arguing with the Intermediate Phase. I said to them the big boys here and those that are repeating, they must go but they know nothing. They asked us what have you done. There’s nothing; we’ve done nothing. We call the parents and tell them they must take the child to the psychologist or the therapist. Some of them take them, some of them don’t take them.

Placing these children at the back of classrooms that have 51 and 53 learners in them, meant that there was little interaction between the teacher and these learners. As there was little interaction, these children hardly received any individual attention from the teacher. The only time these children received attention, was when the teacher addressed them directly from the front of the class or if they went to her table to ask for assistance. This however was seldom the case as I show below, in relation to Nomsa’s teaching of FP mathematics.

In Nomsa’s class I noticed that there was little communication between her and the children when she marked their books. I asked her about this. She responded “Eish, I don’t know, but like in my first group, if a learner did something wrong, then sometimes I explain and ask that learner to do corrections, you see but with that last group, I will know that if he does not know it, he will never know it” (Nomsa, PI2, t.114). When children make a mistake, Nomsa re-explains to those children who she believes can do maths, but not to those who she believes cannot do maths. This belief that mathematics is not for everyone is further expressed in the manner in which she orientates herself when she teaches mathematics. I noticed that she positioned herself so that she was facing the ‘first group’⁷³ which she perceives to consist of more mathematically capable children. In vignette 10.1 (appendix 10), for example, Nomsa only asks children from her ‘first group’ to participate in calculating ‘2,5kg + 2,5kg’. I enquired about this after we had watched her teaching a lesson on fractions (appendix 10, lesson summary 10.1). She replied “Maybe it’s because I know *the answer is going to obviously come from them*. Ja (Yes), but I didn’t notice that up until you told me and you showed me that video

⁷³ I use Nomsa’s terminology here. Her ‘first group’ is the group perceived to be relatively competent in mathematics.

that I was concentrating on that group. And then I've tried not to do that again" (Nomsa, PI2, t.88).

Nokhaya expressed a similar sense of helplessness with the fact that some of her learners are seemingly not able to understand the mathematics. "They are too slow. It's the pace and my last group, I sometimes don't know how to help them because others don't seem to understand, even if I explain timeously they don't understand, so I have got a problem with the last group" (Nokhaya, MHI, t.96). Despite these teachers' attempts to explain the different mathematics concepts and procedures to their children, they complained that many children are not able to grasp them, leaving them to conclude that some children are not able to do mathematics.

6.5.3.2 Maths is about the basics

Nokhaya, Veliswa and Beauty view mathematics in the FP as *the basics*. They refer primarily to counting and calculations in the four number operations. In her first practices interview, Nokhaya told me that "the four number operations" (Nokhaya, PI1, t.6) are the most important aspects of the mathematics curriculum in the FP. Beauty concurred with this, suggesting that if her children are able to perform the basic operations, they should be able to pass. However, she added that in order to add, subtract, multiply and divide numbers, children need to be able to count. "Yes, it's the way before we do maths, the counting, the rote counting, we were taught that at the college" (Beauty, MHI, t.68). She re-emphasised the significance of counting in the second practices interview, explaining that "all the mathematics is based on counting" (Beauty, PI2, t.8). Beauty went as far as to say that counting and the number operations, are far more important than place value. "Yes, if my learners have got that (referring to counting and number operations), I'm sure they will pass. Other things like place value, expanded notation, it's a lot, but I must make sure they can add" (Beauty, MHI, t.94). Like Beauty, counting for Veliswa, is the foundation of mathematics and as a result she begins every lesson with a counting activity. In Table 6.6, I provide a summary overview of the teachers' roles that I identified as systemic roles and the concomitant beliefs about mathematics, teaching and learning, and children.

Table 6.6: The role of the teacher pre-1994 and the concomitant beliefs

Role of the teacher	Concomitant beliefs
Teachers are expected to discipline the body and mind.	Children need to be disciplined.
Teacher imparts/transmits ‘objective’ mathematical knowledge.	Teachers must explain clearly and children should listen attentively. Learning occurs through memorisation and regurgitation of mathematical knowledge.
Teachers use whole class teaching.	Learning occurs through chorusing answers. Teachers need to be in control of children’s learning.
Teachers ask a variety of questions.	Answering questions promotes participation and learning.
Teachers implement a clearly structured and prescribed curriculum.	Mathematics is about the basics which includes taught procedures.

What is notable from this table, is the consistency between the systemic roles of teachers’ pre-1994 and the concomitant beliefs about mathematics, teaching and learning, and children. These roles and beliefs are part of the social system and the ‘intelligibilia’⁷⁴ in the cultural system and condition the participant teacher’s identities, into the present. I thus conclude that the schooling and teacher training systems, the context of poverty in which the teachers work, and the systemic roles (i.e. the structural mechanisms) exist in necessary and logical relation with the ‘intelligibilia’ (i.e. cultural mechanisms) informing the schooling and training system, the systemic roles of teachers articulated through policies prior to 1994, and beliefs about mathematics, learning and teaching, and children. In this chapter I have shown how together, these condition the teacher identities of the four participants in my research.

6.6 CONCLUDING REMARKS

The object of study in my research is *the emergence and expression of teachers’ identities in teaching Foundation Phase mathematics*. Drawing on Archer (2000, 2007a, 2015) I regard teachers’ identities as the manner in which they express their roles as teachers in teaching FP mathematics. In redescribing my data in relation to the expression of teacher identities, I identified four teacher roles. These roles were: teacher as effective communicator, teacher as promoter of dialogue, teacher as knowledge worker, and teacher as connector. While there were several similarities in practice across the four teachers, each teacher expressed these roles in

⁷⁴ I use this term of Archer’s (1996) throughout as it is a generic term for ideas, ideologies, discourses, theories etc.

slightly different ways. I thus attempted to provide a more nuanced presentation of the four teachers' identities with a deeper focus on two of the teachers who participated in my research, namely Nokhaya and Beauty. This focus on two teachers was to limit the length of the narrative of the expression of teachers' identities in teaching Foundation Phase mathematics. Further detail on all four teachers is given in the Empirical Data Booklet.

Through the process of retroduction and the use of transfactual questions, I was able to uncover some of the causal mechanisms giving rise to teachers' identities. These included the material context in which the teachers' live and work, their experiences as school children, student teachers and teachers before 1994, the systemic roles of teachers at that time and the beliefs about children, teaching and learning mathematics and the subject mathematics. These all work together to give rise to the teacher identities of the four teachers in my research.

In this chapter I have provided a systemic argument, by suggesting that teachers' identities have been conditioned by a range of structural and cultural mechanisms. In so doing, I have exposed myself to possible criticism for having done what I dismissed in Chapter One, which is to reduce agency to an epiphenomena of the social and cultural systems. Put differently, the argument constructed in this chapter may be construed as one that positions agency as an effect of structural and cultural mechanisms. As argued in Chapter Three, separating the 'parts' from the 'people' was necessary for analytic purposes. Central to Archer's (1995) thesis is the interplay between structure, culture and agency and the argument that each possesses its own properties and powers, which give rise to teachers' identities. In the next chapter, I reinsert agency into the analysis, by considering its role in the emergence and expression of teacher identities. Specifically, I consider how teachers 'act back' on the aforementioned mechanisms conditioning their teacher identities.

CHAPTER SEVEN

THE ROLE OF AGENCY IN THE EXPRESSION OF TEACHERS' IDENTITIES IN TEACHING FOUNDATION PHASE MATHEMATICS

Agents transform themselves in the process of pursuing social change

(Archer, 2000, p. 268).

7.1 INTRODUCTION

I thought it fitting to start this final data analysis chapter with a quote from Archer (2000) that emphasises the person. This is a thesis that has sought to respond to the question: *What are the conditions that enable or constrain the emergence and expression of teachers' identities in the teaching of Foundation Phase mathematics?* Archer (1995, 1996, 2000, 2015b) provides a theoretical framework which has enabled me to distinguish between structure, culture and agency, and to afford properties and powers to each. In this way, her framework has enabled me to identify the structural, cultural and agential mechanisms that have given rise to teachers' identities and their expression in teaching Foundation Phase mathematics. In contending that it is through the (inter)actions of persons that structural emergent properties (SEP) and cultural emergent properties (CEP) are triggered and thus act to enable or constrain the projects of agents, Archer avoids reification of the agent. In other words, it is through the process of teaching Foundation Phase mathematics that structural and/or cultural mechanisms are triggered and constrain and/or enable teacher identities.

In Chapter Six I identified, described and analysed four dominant roles that the participant teachers expressed in teaching mathematics. Having presented these roles, I analysed the structural and cultural mechanisms that conditioned their emergence and expression. As such, Chapter Six provides only a partial answer to the main question of my research: firstly, because it has not considered the new systemic roles articulated through policy after 1994, and the extent to which these roles enabled or constrained the teacher identities of the four participant teachers; and secondly, agency is obscure in the Chapter Six narrative, as is the manner in which each of the teachers reacted to these structural and cultural constraints.

I thus begin this chapter at T1, after 1994, and consider the *new* systemic roles of teachers as expressed through various post-1994 policies. These include: Curriculum 2005 (C2005), Curriculum and Assessment Policy Statements (CAPS) and the Norms and Standard for Educators. I show that the new systemic roles of teachers are at variance with the old systemic roles and that despite three new curriculum iterations since the onset of formal democracy in South Africa, the systemic roles of teachers prior to 1994 still dominate their teaching of Foundation Phase mathematics. The schooling and teacher training systems coupled with apartheid ideology and its inscription in the teacher training curriculum, have conditioned the teacher identities of the participants in my research. This is not to suggest that I subscribe to the argument that we are products of the social and cultural systems and devoid of agency. On the contrary, central to my study is the concept of reflexivity, a personal emergent property (PEP) of agents. It is the teachers' modes of reflexivity, and their agency, that I elaborate on later in this chapter in order to provide a fuller story and thus a robust response to the central question of this research study.

In this next section I focus on post-1994 curricula and the Norms and Standards for Educators (SA.DoE, 2000b). I draw the seven roles of the teacher as defined in the Norms and Standards for Educators (SA.DoE, 2000b). These roles are generic across all learning areas. With regards to post-1994 curricula, I examine the roles specifically in relation to mathematics. In this regard, I have specifically selected Curriculum 2005 (C2005) (SA.DoE, 1997a) and the Curriculum and Assessment Policy Statements (CAPS) (SA.DBE, 2011b, 2011c). I have chosen C2005 for two reasons: firstly, this was the first curriculum post democracy in 1994; and secondly, this curriculum was radically different to the pre-1994 curricula. CAPS is the current curriculum and was introduced the year in which I did my observations in the four participant teachers' classrooms. These respective policy documents define 'new' systemic roles for teachers and prescribed conceptions of mathematics.

7.2 STRUCTURAL AND CULTURAL CONSTRAINTS CONDITIONING TEACHER IDENTITIES

Three key policy documents have brought about a significant shift in the systemic roles of Foundation Phase teachers, and as such, the official teacher identities. The phrase *official teacher identities* is used to denote the systemic roles of teachers as expressed through policy. I am aware that Bernstein (1999) coined the phrase "official pedagogic identities" (p. 271).

However, I am not drawing on Bernstein's work despite my suggesting in Chapter Two that some of his work is consistent with a social realist orientation. These key policy documents were Curriculum 2005 (SA.DBE, 1997a, 1997b), the Norms and Standards for Educators (SA.DBE, 2000b) and the Curriculum and Assessment Policy Statement (CAPS) (SA.DBE, 2011b, 2011c). C2005 was the first school post-1994 curriculum and CAPS is the current school curriculum. The Norms and Standards for Educators provided a core curriculum for teacher education institutions and an explanation of the systemic roles of teachers. I begin this section with an examination of the systemic roles of teachers, particularly in relation to the teaching of Foundation Phase mathematics after 1994.

Since 1997, the curriculum has been changed three times. Three of the participant teachers, Nokhaya, Beauty and Nomsa, expressed frustration with the numerous recent curricula. Beauty said, "The curriculum changes, they frustrate me. ... You must change all your ways of teaching. You must change" (Beauty, LHI1, tt.280-282). Both Nokhaya and Nomsa told me that the constant changes made teaching difficult for them. Nomsa said one of her biggest challenges was lesson planning, which stems from all the curriculum changes.

Yho, lesson plan. It's challenging. ... I think it's like a problem to lots of teachers' lesson plans. The problem, even if you have moderation, is how to do a complete lesson plan. A good lesson plan is difficult. And also the changing of there was OBE, RNCS, NCS⁷⁵ now CAPs that is making it a little bit difficult. (Nomsa, LHI1, tt. 258-260)

Nokhaya concurred with Nomsa, saying that changes "makes you not sure about what you are doing" (Nokhaya, LHI1, t.226).

I now consider C2005 (SA.DoE, 1997a, 1997b), the first curriculum post election of the democratic government, and then CAPS (SA.DBE, 2011b, 2011c), the current curriculum. In particular, I examine the shifts in the nature of mathematical knowledge, the orientation to mathematics and the role of the teacher of mathematics, because these are structural and cultural mechanisms which have the potential to condition the expression of teachers' identities in teaching Foundation Phase mathematics. I juxtapose this with the four teachers' identities as narrated in Chapter Six. Included in this section is the Norms and Standards for Educators (SA.DoE, 2000a) which puts forward the seven generic roles of the teacher (across all grades and learning areas) as: learning mediator; interpreter and designer of learning programmes and

⁷⁵ The National Curriculum Statement (NCS) was the curriculum for Grade 10 - 12 introduced soon after C2005.

materials; leader, administrator and manager; scholar, researcher and lifelong learner; community, citizenship and pastoral role; assessor; and learning area and phase specialist. I have chosen not to focus on all seven roles, but rather those pertaining directly to the teaching of mathematics in this thesis.

The first post-1994 curriculum, C2005 (SA.DoE, 1997a, 1997b), was explicitly political; it was viewed as the opportunity for South African schooling to right the injustices of the past (Chisholm et al., 2000; Jansen, 2001; Hoadley, 2011). The intention was to develop a society based on social, economic, political and environmental justice, creating equitable access to high levels of knowledge and skills for all learners thereby disrupting the unequal relations of power and control (Naidoo & Parker, 2005; Parker, 2006).

The new curriculum renamed ‘Mathematics’ as Mathematics Literacy, Mathematics, and Mathematics Sciences (MLMMS), which was represented as a product that had both epistemological and social justice aims. With the overarching goal the transformation of society, it was a social-reconstructionist curriculum (Naidoo & Parker, 2005). Eight of the nine suggested ways in which mathematics could empower people focused on utilitarian and social-reconstructionist aims, for example: “empower people to participate in their communities in a democratic, non-sexist and non-racist manner” (SA.DoE, 1997a, p. 2; Naidoo & Parker, 2005). Later, on the occasion of the adoption of the RNCS (SA.DBE, 2002a, 2002b) and the ensuing introduction of CAPS (SA.DBE, 2011b, 2011c), MLMMS was changed back to Mathematics. While the transformation agenda was still explicitly stated as one of the principles of the RNCS (SA.DBE, 2002a, 2002b) and CAPS (SA.DBE, 2011b, 2011c), a tighter classification of and emphasis on knowledge was foregrounded in these curricula (Pausigere & Graven, 2013).

CAPS (2011b, 2011c) aims to “give expression to the knowledge, skills and values” (p. 4) which children are expected to acquire and apply in a manner that is meaningful to their lives. While the principles informing C2005 (SA.DoE, 1997a) and CAPS (SA.DBE, 2011b, 2011c) have remained consistent, there is far more emphasis placed on inclusivity, progression and quality in education in CAPS. Inclusivity is viewed in CAPS (2011c) as the driver of “organisation, planning and teaching” (p. 5). The Norms and Standards for Educators (SA.DoE, 2000a) which expresses the roles of South African teachers, is replete with references to the principle of inclusion. These references stress that teachers differentiate their pedagogy, assessment and the opportunities children have for learning. While there has been a shift in

the foregrounding of aims in CAPS (SA.DBE, 2011b, 2011c), the perspectives on the nature of mathematics have remained principally the same. In Table 7.1 I include the respective perspectives of mathematics as defined in C2005 and CAPS.

Table 7.1: Definitions of the nature of mathematics in C2005 and CAPS

MLMMS in C2005 was defined as:	Mathematics in CAPS is defined as:
“The construction of knowledge that deals with qualitative and quantitative relationships of space and time. It is a human activity that deals with patterns, problem-solving, logical thinking etc., in an attempt to understand the world and make use of that understanding. This understanding is expressed, developed and contested through language, symbols and social interaction” (SA.DoE, 1997b, p. 3).	“Mathematics is a language that makes use of symbols and notations for describing numerical, geometric and graphical relationships. It is a human activity that involves observing, representing and investigating patterns and qualitative relationships in physical and social phenomena and between mathematical objects themselves. It helps to develop mental processes that enhance logical and critical thinking, accuracy and problem-solving that will contribute to decision-making” (SA.DBE, 2011c, p. 8).

In MLMMS, mathematics was viewed as “culture-bound and value-laden” (Naidoo & Parker, 2005, p. 59), with knowledge regarded as contested rather than objective, thus indicating a move away from the absolutist conceptions of knowledge articulated in pre-1994 curricula (Ernest, 1991; Graven, 2002a). This view of mathematics as a human construct has been sustained in CAPS (SA.DBE, 2011b, 2011c).

Graven (2002a) identifies four different orientations in MLMMS in C2005 relating to the nature of school mathematics. School mathematics should promote critical democratic citizenship, have utilitarian value, emphasise mathematical thinking and induct children into the work of mathematicians, and develop the “conventions, skills and algorithms” (p. 6) that children are required to learn. New roles of teachers were thus required alongside these new orientations to school mathematics. Thenceforth, teachers were expected to prepare children through mathematics for democratic citizenship. For example, specific outcome 4 in MLMMS required children to “critically analyse how mathematical relationships are used in social, political and economic relations” (SA.DoE, 1997a, p. 3). Naidoo and Parker (2005) maintain that this radical shift required all teachers “to build a new identity that redefined their position in society as social agents that seek the transformation of the overall social structure. In addition to subject knowledge and skills, teachers are also expected to teach socially desirable values and attitudes” (p. 54).

Teachers were also required to develop learning programmes that related to the children's everyday lives and that encouraged problem-solving. In designing learning programmes, Foundation Phase teachers were expected to integrate across and within learning areas, drawing on the everyday knowledge and personal experiences of their learners, thus enabling learners to see the interconnectedness of knowledge in the world (SA.DoE, 1997a; SA.DBE, 2000a; Pausigere & Graven, 2013). In addition, teachers had to select content which they would sequence and pace in accordance with the diverse needs of the learners (SA.DBE, 2000a). Instead of simply adhering to a prescribed curriculum, teachers were required to make decisions about *what* and *how to teach* (SA.DoE, 2000b). As such, C2005 (SA.DoE, 1997a, 1997b) was largely an understipulated curriculum (i.e. with little guidance in terms of content) (Young & Muller, 2010), as teachers were informed they could “choose any content and use a wide range of teaching methods as long as these develop citizens who displayed the agreed upon critical outcomes⁷⁶” (Chisholm et al., 2000, p. 19). In this sense, teachers had to choose content that would enable children to learn the “conventions, skills and algorithms” (Graven, 2000a) relating to mathematics and develop children's mathematical thinking. Furthermore, as defined in the Norms and Standards (SA.DoE, 2000a), teachers were expected to be mediators of learning and designers of learning programmes and life-long scholars, who would study and research their own learning area (i.e. subject).

C2005 was however far removed from the experiences and training of the participant teachers (Chapter Six). Jonathan Jansen (1999) argues that the policy imperatives of C2005 bears no relation to the current realities of the classroom. Having been regarded as passive implementers of a prescribed curriculum, teachers “lacked the knowledge base to interpret Curriculum 2005” (Hoadley, 2011) which was a curriculum with insufficient detail on how and what to teach (Muller, 2000; Young, 2007). The little content that there was, was phase specific, as opposed to grade specific, meaning that teachers had little guidance about specific content that should be taught to each grade. Furthermore, some of the content was new to teachers. For example, in the FP, a broader view of geometry (i.e. beyond recognition of two-dimensional objects (2-D)) was included in specific outcome 7⁷⁷; and teachers were required to teach three-dimensional (3-D) objects from Grade R. While this broader geometry content has remained constant through the three curriculum iterations, both Beauty and Nomsa told me that they did

⁷⁶ The critical outcomes were generic outcomes that it was deemed every citizen in South Africa should demonstrate (e.g. the ability to solve problems, communicate effectively, work collaboratively).

⁷⁷ The MLMMS learning area had 10 specific outcomes.

not like teaching 3-D shapes. Nomsa explained that she was not confident with her knowledge of shapes. “Yhu, 3-D shapes, 2-D shapes. Yho, I don’t know. Sometimes I don’t understand them myself” (Nomsa, MHI, t.98). As noted in Chapter Six, Beauty taught a lesson on shapes during the time I was observing her. The lesson was of low cognitive demand as she focused on the identification of 2-D shapes and asked children where they could see examples of these shapes in their everyday lives. The examples the children gave however, were of 3-D objects. It was apparent from my observations and interview data that all four teachers tended to avoid teaching content that they are not comfortable with. At the time of the introduction of C2005, commentators raised concerns about whether teachers had the conceptual knowledge within the various disciplines to “ensure that the everyday approach prescribed by the new curriculum will result in learners developing sound conceptual frameworks” (Taylor & Vinjevold, 1999, p. 230). Furthermore, it was argued that despite teachers trying to implement forms of learner-centred pedagogy (e.g. group work), little learning was actually occurring (Hoadley, 2011).

Persistently poor learner performance in mathematics and the above criticisms, led to replacing C2005 with the Revised National Curriculum Statement (RNCS) and CAPS. The latter two curricula placed far more emphasis on knowledge (Hoadley, 2011) and grade specified progression. CAPS “deliberately attempts to define curriculum in terms of a specialisation of ‘the what’ of knowledge, and the organisation and structuring thereof, removing the past emphasis on knowers and knowing” (Hoadley, 2011, p. 153). Number sense, the development of conceptual understanding of key concepts combined with operational fluency, is developed through mental mathematics, calculations and word problems (SA.DBE, 2011c). The emphasis on key concepts resulted in the stipulation of content (i.e. the knowledge and skills) to be taught with detailed instructions for pacing and sequencing of the content (SA.DBE, 2011b, 2011c). Pausigere (2014b) suggests that CAPS promotes a “strong instructional discourse” (p. 123) by providing clear guidance on progression and time allocation, formal assessment tasks and examinations. The role of the teacher thus shifted back to resemble what the participant teachers were familiar with, that is, teaching Foundation Phase mathematics content, skills and procedures, according to a prescribed curriculum. While the emphasis on teaching specified content marked a significant shift from C2005 to CAPS, the pedagogy promoted remained largely consistent.

CAPS continues to promote learner-centeredness and social constructivism (SA.DBE, 2011c) but with minimal integration across learning areas. Teachers are required to use methods that

encourage participation, activity-based learning and sense-making, rather than rote learning (Chisholm, 2004). Small group learning is encouraged and children are expected to demonstrate, record and share their thinking (SA.DBE, 2011c). Teachers are viewed as mediators of learning, who facilitate rather than transmit knowledge to children (SA.DoE, 1997a; SA.DoE, 2000b). Teachers are expected to mediate learning “in a manner which is sensitive to the diverse needs of learners”, which is specified as contextually relevant and motivating, and effectively communicated (SA.DBE, 2000a).

The Norms and Standards for Educators (SA.DoE, 2000a) and the CAPs (SA.DBE, 2011b, 2011c) curriculum portrays “a primary mathematics teacher who supports learners, to master fundamental mathematics concepts, and assess and test learners’ understanding of these” (Pausigere & Graven, 2013, p. 22). In summary, I provide a list of the roles of the teacher of mathematics that were sustained from C2005 (SA.DoE, 1997a, 1997b) into CAPS (SA.DBE, 2011b, 2011c). In other words, this list represents the current systemic roles for teachers. Teachers are required to:

- work towards the transformation of society;
- follow a prescribed curriculum (CAPS) that placed emphasis on knowledge and the sequencing and pacing thereof;
- mediate learning by promoting learner-centred and constructivist pedagogies (i.e. they should encourage participation, activity-based learning, and sense-making);
- design learning programmes that promoted problem-solving linked to children’s everyday life experiences;
- create environments for children to do mathematics, to share their ideas, and record their thinking;
- create opportunities for all children to learn by differentiating their curriculum according to the varying needs of the children in their class; and
- assess and test children’s learning.

As Jansen (1999) notes, the post-1994 pedagogical expectations and new roles of teachers were vastly different from those the teachers were familiar with. As shown in Chapter Six, this reality is still evident in the classrooms where I conducted my research, despite 15 years of curriculum change. In fact, the teachers expressed significant frustration with all the curriculum changes that occurred in the past 15 years (1997 - 2012).

For example, Beauty captures how the changes impact on the way she teaches.

You must change all your ways of teaching, you must change. And the resources that they give us is not right. Even reading books, we are suffering, we don't have reading books. What must we teach? You must be sure that the children can read. It's difficult to get reading books that we were getting by the old time. We were reading lots of reading books by that old time. But now reading books we don't get them. (Beauty, LHI1, tt.270-272)

Moreover, during one of the lessons I observed, Beauty told me that she wishes that the department could pension her off and that she was tired of all these curriculum changes (Beauty, FN, p.7). Part of the frustration that the four teachers experience with the curriculum changes appears to be a lack of support in dealing with them. For example, Nomsa (LHI1, t.268) told me that teachers received *three days of training* related to the introduction of CAPS. This limited support makes it difficult for teachers to take up new roles.

In Table 7.2 I provide a contrast of the emerging distinctions in the systemic roles of teachers before and after 1994. This table is useful for two reasons: firstly, it provides a summary of the systemic roles of teachers before 1994 and after 1994. This is significant in my study as these systemic roles, which are part of the social system (i.e. structures) and the 'intelligibilia' (e.g. constructivism) informing these roles are part of the cultural system (CS). Both condition the (inter)actions of teachers. Drawing on Archer's (1995) morphogenetic approach, these mechanisms (T1) condition teachers' identities (T2-T3). Secondly, the pre-1994 roles of the teacher listed in this table connect directly with the narrative of the four participant teacher's roles in Chapter Six. These are precisely the roles that the participant teachers in my research continue to express and perform in teaching Foundation Phase mathematics. As such, these roles are continually reproduced, resulting in morphostasis of these systemic roles. In addition, through the reproduction of pre-1994 roles, teacher identities and the social and cultural systems are reproduced resulting in a *double morphostasis* (i.e. morphostasis of the pre-1994 social and cultural systems and of the agent).

Table 7.2: The official teacher roles pre-1994 contrasted with those post-1994

Roles of the teacher pre-1994	Roles of the teacher post 1994 (C2005, RNCS, CAPS)
Teachers are expected to discipline the body and mind.	Teachers work towards the transformation of society.
Teachers promote subject content knowledge by teaching set procedures that produce correct answers.	Teachers design learning programmes that promote problem-solving linked to children's everyday life experiences.
Teachers are the authority and impart/transmit 'objective' mathematical knowledge.	Teachers create an environment for children to do mathematics, to share their ideas, and record their thinking.
Teachers use whole class teaching and independent completion of tasks.	Teachers are mediators of learning who promote learner-centred and constructivist pedagogies (i.o.w. they encourage participation, activity-based learning, and sense-making)
Teachers implement a clearly structured and prescribed curriculum.	Teachers follow a prescribed curriculum (CAPS) that places emphasis on sequencing and pacing.
Teachers promote competition to motivate children.	Teachers create opportunities for all children to learn by differentiating their curriculum according to the varied children's needs.
Teachers promote a view of mathematics as abstract and based on 'objective' knowledge.	Teachers promote a view of mathematics as a human construct, and thus, continually open to review.
Teachers use tests and exams as summative assessment of children's learning.	Teachers use formative and summative assessments to test children's learning.

The contrast between the pre-1994 and post-1994 systemic roles of teachers is highlighted in table 7.2. Together with the narrative of Chapter Six it becomes clear that the participant teachers continue to express pre-1994 roles as teachers of foundation phase mathematics. These roles are structured predominantly by the schooling and teacher education systems, the context of poverty, and the systemic roles at the structural level, and by the pre-1994 'intelligibilia' (e.g. Fundamental Pedagogics) informing the systemic roles, and beliefs about mathematics, learning and teaching, and children.

I now turn my attention to the role of agency in the emergence of teacher identities. I begin by considering the *situational logics* (Chapter 3) created by the introduction of the new education policies, premised on progressive pedagogies. I examine how each of the participant teachers responded to the structural and cultural mechanisms and the situational logic created by drawing on their *modes of reflexivity*. I then draw this chapter to a close by providing an explanation for how it is that despite 20 years of democracy and a number of curricula changes, teachers continue to express roles learned prior to 1994. In other words, based on my analysis

of data presented, I reflect on why we are not seeing a change in teachers' identities and morphostasis prevails.

7.3 TEACHERS 'ACT BACK' ON THE STRUCTURAL AND CULTURAL CONDITIONS

In Chapter Six I presented evidence of the teachers' identities, particularly in relation to the dominant roles expressed through their teaching of mathematics. Further, I illuminated above that the post 1994 roles differ vastly from those advocated and learned through the teachers' experiences as school children, student teachers, and teachers prior to 1994. The inconsistency between the systemic roles of teachers prior to 1994 and post 1994, has created a "*situational logic of contradiction*" (Williams, 2012, p. 306) for the four teachers in my research. What I have shown in Chapters Six and in this chapter is that the pre-1994 roles of teachers and post-1994 are incongruous and thus create a situational logic of contradiction to which the teachers react.

Teachers respond to this situational logic in different ways. I suggest that the teacher's responses are based on their mode of reflexivity. Archer (2003) contends that everyone is a reflexive being; that we are able to "deliberate about our circumstance in relation to ourselves and, in the light of these deliberations, we determine our own personal courses of action in society" (p. 167). Agents who find themselves in a situational logic of contradiction can 'act back' in one of three different ways: firstly, they can continue to *subscribe* to the conflicting roles as reflected in pre- and post-1994 curricula dogmatically; secondly, they can choose to *eliminate* one of the conflicting roles; or thirdly, they can act to *correct* this inconsistency (Williams, 2012). I suggest that Nokhaya and Nomsa *evade* the new roles of teachers in teaching FP mathematics, while Veliswa and Beauty simply *eliminate* them. This assertion is in keeping with the stances adopted by both communicative and autonomous reflexives as argued in Chapter Five.

I draw on the teachers' modes of reflexivity to examine the manner in which each of the participant teachers have responded to this situational logic of contradiction in terms of the systemic roles of teachers after 1994. These prevailing modes of reflexivity practiced by the teachers are not psychologically moulded, rather it is the structural and cultural context that the teachers in my research were born into and in which they live and work, that is closely

associated with their mode of reflexivity (Archer, 2012). In Chapter Five, I established that Nokhaya and Nomsa are communicative reflexives and Veliswa and Nomsa are autonomous reflexives. Tables 7.3 and 7.4 provides a summary of the descriptors of each of these two modes of reflexivity, in relation to the participant teachers.

Table 7.3: Descriptors of the communicative mode of reflexivity

COMMUNICATIVE REFLEXIVES		
Biographical and geographical continuity	Nokhaya	Lived in a rural village in the Transkei. Went to school, teacher training college and got a teaching post at a school very close to her home. Parents in a long-standing relationship even though her father worked for six months at a time about 500km from their home.
	Nomsa	Lived on a farm that her parents and grandparents had lived on all their lives. All her schooling and teaching experiences have been in a 100km radius from where she was born.
Externalisation of internal conversations with trusted conversers	Nokhaya	Her mother is the person she shares her internal conversations with into her adult life. Her mother decided which schools she should go to and which of the two teaching posts that she was offered, she should take. Stable family environment. Lived in one house on the farm with her parents, siblings, grandparents, aunts, uncles and cousins.
	Nomsa	Her sister is her trusted interlocutor. She admired her older sister and was inspired by her becoming a professional. Her sister decided she should become a teacher and that she should join her at the same school in Lwandle.
Easy dovetailing of concerns in the world	Nokhaya	Her concerns were driven by her family's financial needs. Her concern is the social order (relationships with family). She had decisions made on her behalf. Her parents decided she should become a teacher and the SMT decided she should move to the FP.
	Nomsa	Her concerns were related to the family's financial situation. Her boyfriend offered to pay for her studies to become a teacher.
Contentment	Nokhaya	She loves teaching and the children she teaches.
	Nomsa	She wants to apply for promotion posts within the profession.

As noted in table 7.3, generally speaking, communicate reflexives externalise their internal dialogue to confirm their reflexive deliberations with significant others, they lead lives of relative biographical, geographical and occupational continuity, they have relative ease in dovetailing their concerns in the world, and they are content with the decisions they make.

7.3.1 Nomsa and Nokhaya as communicative reflexives

By and large, communicative reflexives seek contentment and thus avoid constraints. As shown in Chapter Five, Nokhaya and Nomsa are content with their respective decisions to become

teachers. Although Nokhaya did not appear to have a choice, she managed to make teaching her concern in relation to the work of work. Nomsa followed in her sister's footsteps and became a teacher once her then boyfriend offered to support her financially. While Nokhaya is close to retirement and remains satisfied with teaching, Nomsa is more ambitious. She envisages progressing in the teaching profession, to the point of becoming a Head of Department (like her sister) and then the principal of a school. Satisfaction with their careers mean that their ultimate concern in relation to work does not provoke constraints or enablements, rather it entrenches the contextual continuity that both Nokhaya and Nomsa experienced growing up.

Since Nokhaya and Nomsa started teaching, there has been an extension of their biographical and occupation continuity. Nokhaya has taught Grade 5 in only two schools for 32 years. The first school was close to her home village in the then Transkei. In 1988 she moved to Lwandle in the Eastern Cape and taught Grade 5 at Sontonga Primary School until the end of 2010 when she moved to the Foundation Phase at the request of the SMT. Nomsa taught in two schools in Port Elizabeth between 2001 and 2007. Half way through 2007, she moved to Phambili Public School to take up a post that her sister had found her. For the five years before I met Nomsa, she had been teaching Grade 3 at Phambili Public School.

Contextual continuity, the seemingly smooth dovetailing of concerns achieved by voluntarily reducing the importance of subordinate concerns and aspirations, and contentment with their concerns in relation to work enabled Nokhaya and Nomsa to *evade* constraining powers (Archer, 2003). Archer (2003) argues that for communicative reflexives in "structural terms, the life practices constitutive of their *modi vivendi* are *stable* and *sustainable*" (Archer, 2003, p. 202). The stability of their long established patterns continue and they are not at risk of systemic constraints (Archer, 2003). The manner in which Nokhaya and Nomsa express their teacher identities in teaching FP mathematics has been established and practiced over an extended period of time. "No enablements are invoked which would entail a change of practice, because an exceptionally high degree of 'contextual continuity' was found to be part of the make-up of the 'communicative reflexive'" (Archer, 2003, p. 202). Furthermore, the sustainability of these established practices is not threatened by constraints. As such, both Nokhaya and Nomsa are able to *evade* the constraints and enablements emerging from the situation logic of contradiction and thereby continue to express the roles of teachers defined prior to 1994, rather than take up new roles required by subsequent policy changes. For

Nokhaya and Nomsa there has been no change in modes of reflexivity, from childhood into the present. As a result, they sustain and reproduce teachers' roles and thus their teacher identities.

Autonomous reflexives, unlike communicative reflexives, have experienced lives of contextual discontinuity. As such they are more self-reliant and independent.

Table 7.4: Descriptors of the autonomous mode of reflexivity

AUTONOMOUS REFLEXIVES		
Ease with moving away from their natal context	Veliswa	Had a disrupted start in life when her father left her mother. Her mother agreed that her teacher take her away from Lwandle to Alice so that she could continue with her schooling. She attended five different schools in and across South Africa and the Ciskei from Grade 1 to 12.
	Beauty	Beauty moved between living with her mom and stepfather and her grandmother. She attended five different schools in and across South Africa and the Ciskei from Grade 1 to 12.
Unproblematic dovetailing of concerns in the world	Veliswa	Determined to get her Grade 12 qualification as she had aspirations to improve her economic situation. She had to get a bursary for further studies so teaching became her career choice.
	Beauty	Motivated to "become someone" so that she could move towards economic advantage. She had to get a bursary to study further which is how she ended up at teachers' training college.
Individualism	Veliswa	Developed self-reliance at an early age and the ability to adapt and fend for herself (e.g. when moving to a new school). Developed trust in her own PEP of reflexivity.
	Beauty	Developed self-dependence at an early age and trust in her own decisions. Ill health forced her to leave school in her Grade 12 year, but she returned later obtaining her Grade 12 certificate at age 24.

In contrast to Nokhaya and Nomsa, Veliswa and Beauty both developed autonomous modes of reflexivity growing up. Here I elaborate on their modes of reflexivity currently and the implications of this in terms of their response to the structural and cultural constraints and enablements conditioning their teacher identities.

7.3.2 Veliswa and Beauty as autonomous reflexives

Unlike Nokhaya and Nomsa, I provide a more detailed narrative for Veliswa and Beauty as their experiences and ultimate concerns have, in some respects, shifted since they made the decision to become teachers.

7.3.2.1 From contextual discontinuity to contextual continuity

Both Veliswa and Beauty experienced significant contextual discontinuity growing up (Chapter Five). Both moved between provinces in search of better schooling opportunities. However, once Veliswa and Beauty became Foundation Phase teachers, their lives have become ones of geographical and occupational consistency. After completing her Junior Primary Teachers' Diploma in 1992, Beauty started teaching at Phambili Public School in 1993. "This school was new. I'm part of the people who founded this school. The school started in 1993 January. So I started in 1993, January. At that time we were seven, no five, five teachers" (Beauty, LHI, t.236). In other words, Beauty has taught in only one school since she started teaching. Since it was a new school with a limited number of staff, Beauty was required to teach across a variety of grades. However, by the time I met her in 2012, she had been teaching Grade 3 for over 10 years. Similarly, Veliswa had been teaching at Sontonga Primary School since 1992. While she did teach at two farm schools straight after graduating with her Junior Primary Teachers' Diploma, this lasted for four years only (1986-1989). Veliswa has been teaching in the Foundation Phase for over 20 years.

Both Veliswa and Beauty lived at some point of their lives in Lwandle whilst growing up, and both have lived in Lwandle (or in Veliswa's case, the vicinity of Lwandle) since they started teaching. While Archer (2002, 2007a) argues that contextual continuity is a hallmark of communicative reflexives, neither Veliswa nor Beauty became communicative reflexives since both have experienced discontent with the occupational decisions they made. To recap, neither Veliswa nor Beauty wanted to become teachers. For Veliswa, teaching was her third choice, and for Beauty, her second. Furthermore, when they decided to become teachers, neither wanted to become Foundation Phase teachers. I referred to this in Chapter Five as their *double non-intention*.

7.3.2.2 Smooth dovetailing of their ultimate concerns

During the first life history interview with Beauty I asked her "What makes you stay. I know you said you want them to pension you off, but what makes you stay in teaching?" She laughed and said "thinking of my kids and they say if I take early pension, a big percentage is going to be deducted and my kids are still young" (Beauty, LHI1, tt.337-338). While Beauty's aspirations to move out of a context of disadvantage motivated her decision to become a teacher, she does not find her job gratifying which is why she wishes to be 'pensioned off'. While her aspiration for economic stability remains, her ultimate concern is no longer teaching

but the needs of her own children. Her children attend a quintile 5 school in a more affluent area, where parents are expected to pay school fees. It is this that keeps Beauty in teaching, as she needs the steady income. As Archer (2007a) explains, not all autonomous reflexives give primacy to their careers and work, at the exclusion of family or the social (i.e. expecting family to fit in with their work ambitions). Beauty is an example of an autonomous reflexive who has a more accommodating approach to the needs and requirements of her family.

When I asked her what the highlights of her teaching career have been to date, Veliswa expressed her discontent with teaching. She responded “There’s none yet. Because in this environment, we are not given a chance to show the people above us what we can do. Even if you do something, like now I’m helping as an HoD; here doing sometimes the principal’s work but there’s nothing to show gratitude towards” (Veliswa, LHI, t.320). Whereas Veliswa expressed no highlights after 26 years in the profession, she was eager to talk about the disappointments and resentment. She told me that there has been no recognition for the contribution she makes. Despite always “availing herself” when the SMT ask her to act as Head of Department (HoD), she expressed frustration at not being appointed into this position permanently. I include this lengthy excerpt as it captures Veliswa’s (LHI, tt.286-292) frustrations in this regard.

286.	Veliswa	I always avail myself. And when Mrs Tyali retired so I offered myself again.
287.	<i>Lise</i>	Now when did you become HoD?
288.	Veliswa	I’m just acting as a HoD. I’m just helping. At first Mrs Budaza retired from the FP phase, yho, the IP phase. So they asked me to act as HoD. And when Mrs Tyali went away, they asked me to help again.
289.	<i>Lise</i>	And is the post going to become permanent?
290.	Veliswa	No. They don’t want to give me the post, but they do want me to help them. Because we are still waiting for a person to take her place. And they are not paying me. I just help them.
291.	<i>Lise</i>	Where will you go then?
292.	Veliswa	I don’t know. Because there is a teacher here who is going to retire next year, Mrs Ndlamisi. I think they want me to replace her or stay here and the HoD will go there. I’m not sure.

The lack of recognition and her health concerns led to a shift in Veliswa’s ultimate concern. It appears that her ultimate concern has shifted to the natural order, in that her concern is primarily her health. On a number of occasions during the time that I was with her in the classroom, she mentioned to me that she was worried about her memory loss and diabetes. In her life history interview she expressed concern about her memory on three different occasions. She elaborated on this with reference to her not completing her Bachelor of Education (Honours) qualification.

“I’d like to go back to finishing the B Ed (Honours). But I’m afraid the memory is not so good. I’ve inherited something bad from my grandmother, the one of losing memory. I’d like to go back and have a chance” (Veliswa, LHI, t.352). In addition to her concerns about her memory, she is also a diabetic. During the 16 days that I was at Sontonga Primary School, Veliswa missed three days of school as a result of health issues. On one of the days I went to the school, I wrote in my field notes:

As I walk to the Grade 3 teachers classrooms I see Veliswa talking to a teacher outside her classroom. She comes to me. We greet and exchange pleasantries about the weekend. She tells me she is sick. She is diabetic and needs to get some medication. She has to go to the doctor first. She has an appointment for 4pm. ... She then asked me not to visit her today as she was not feeling well enough to teach a maths lesson for me. (Veliswa, FN, p.7)

Like Beauty, Veliswa is also concerned about her financial situation. While she and Beauty thought that teaching would provide them with the financial resources needed to live ‘a good life’, both expressed financial concerns. Their need for financial security leads them to ‘stay put’ despite Beauty not enjoying her work and Veliswa being concerned about the toll of her work on her health. Archer (2003, 2007a) maintains that autonomous reflexives are inclined to embrace a range of ultimate concerns throughout their lives as a result of learning about themselves in society, and to fulfil their social mobility aspirations. However, both Beauty and Veliswa have resigned themselves to teaching. To ease the emotional strain that comes with such resignation, both appear to approach their work in a strategic manner. By that I mean that they realise that teaching provides the necessary income to attend to their respective ultimate concerns. Strategic career planning is not solely the unfolding of a long-term project, it can also be a deliberative response to constraints and enablements that shape the situations people find themselves in (Archer, 2007a). For both teachers, one of the constraints conditioning the situation in which they find themselves, is the need for financial stability. While neither of the teachers is particularly vested in teaching anymore, teaching provides the financial stability they require in relation to their ultimate concerns.

7.3.2.3 Strong independent individualists

As an autonomous reflexive, Beauty is typically individualist and prefers individual pursuits. Her preference to work on her own (rather than in groups) is expressed in her teaching in many ways. For example, unlike Nokhaya and Veliswa, Beauty and Nomsa taught different mathematics topics from one another every day that I observed them. Beauty told me that they do not plan together because “my children are not as good as Nomsa’s. Nomsa’s children are

brighter than mine” (Beauty, PI1, t.132), yet I noted that there was little interaction between Beauty and Nomsa about their teaching and that the two teachers worked independently from each other.

In some respects Veliswa is arguably now less independent than she was when she decided to become a teacher. I noticed when I observed her that she was quite dependent on Nokhaya. Nokhaya had to take her class when she was ill or called out of the class by the principal or an official from the Department of Basic Education. She relied on Nokhaya to tell her what she was required to teach and in some instances, to provide her with the necessary resources. Nokhaya told me “because it’s the same grade, when the other one is absent, the one that is left combines the classes so that they cannot be left behind” (Nokhaya, PI1, t.14).

Nokhaya initially told me that she and Veliswa planned together: “We do our planning on Wednesdays from one o’ clock because Wednesday is the sports day” (Nokhaya, PI1, t.2). While Veliswa confirmed this, it later became evident that she was not familiar with the textbooks Nokhaya told me that she used for planning. In reference to a ‘grey book’ Nokhaya had referred to, Veliswa said “No, I don’t know. I only know that green book” (Veliswa, PI, t.2). In my field notes. I wrote that Veliswa uses Nokhaya’s resources, such as her calendar, the counting chart and the addition cards that Nokhaya had made. “While sitting in Nokhaya’s class a child from Veliswa’s comes in and puts the addition cards and the children’s work on the table” (Veliswa, FN, p.6).

The stance of autonomous reflexives is strategic. Their search for opportunities makes their concerns easy to accomplish. They try to anticipate constraints in an effort to achieve their goals. “The formula [thus] for good strategy is to keep a careful weather eye upon both and then to weigh them judiciously against one another” (Archer, 2007, p. 215). As in the case of Nokhaya and Nomsa, one of the obstacles that Beauty and Veliswa confront as teachers is the situational logic of contradiction. As established earlier, this situational logic emerged with the new systemic roles for teachers, articulated in post 1994 policies.

Veliswa and Beauty have engaged reflexively with how to act in the situation in which they find themselves, namely a situation where the pre-1994 systemic roles of teachers that have enabled the expression of their teacher identities stand in contradiction with the post-1994 systemic roles of teachers. In order to avoid any constraints in the manner in which they express

their roles as teachers in teaching mathematics, Beauty and Veliswa actively *eliminate* the contradiction by not changing their roles as teachers. For them, teaching is mostly a means to an end; they have little interest in the detail or substance of the means (i.e. teaching) outside of the requirement for financial security. It is not surprising that their initial *double non-intention* to become teachers remains with them today.

7.3.3 Teacher agency and morphostasis of the roles of teachers

I wrote in Chapters One and Two that an emphasis on agency is particularly important in the South African context for two reasons: firstly, it challenges the deficit discourses about teachers (i.e. that teachers have poor subject knowledge and outdated teaching practices); and secondly, it challenges the view that teachers are simply products of social structures or discourses (e.g. teacher education and schooling systems as noted in Chapter 1). In adopting Archer's framework, my emphasis on agency regards teachers as persons who are able to reflexively engage with their situations. It is this perspective that I interrogated further by drawing on Archer's conception of persons, and in particular agency.

Two key concepts which Archer (2000) identifies in relation to agency are *primary agents* and *corporate agents* (Chapter Three). All four teachers in my research are primary agents, by virtue of the fact that they are all individual teachers. As teachers, they are part of "collectives with the same life chances" (Archer, 2000, p. 261). As noted in Chapter Five, all four teachers are black, female, isiXhosa home language speakers, who grew up in an environment of political violence, poverty and limited opportunity. Their life chances and thus their primary agency were conditioned by this context (Chapter Five). Being teachers now, they all belong to various collectives associated with this career choices; for example: they are teachers, black female teachers and black female Foundation Phase teachers. These collectives on their own have no more than an aggregate impact in society generally and in relation to their profession (Williams, 2012). While primary agency does have the *potential* to bring about structural and cultural morphogenesis, it is primarily passive.

As primary agents, teachers who wish to bring about an elaboration of the structural and cultural system (T4), need to move beyond their aggregate status and work towards committed and directed *collective action*. It is through the establishment of collective interest groups, at T2-T3, that teachers can generate PEP that can potentially enable them to bring about an elaboration of the social and cultural system at T4. Such groups are *corporate agents*. These

are agents with vested interests and concerns, committed to bringing about change in the education system. For example, the teachers in my research expressed frustration at having to teach mathematics in isiXhosa (Chapter Seven), yet this is expected in terms of the Language in Education Policy (LiEP) and the Department of Basic Education (DBE). If teachers resolve to change the LiEP so that it represents the complexity of language use in the classroom (e.g. children use English for number words, time, etc. in their homes) they would need to become corporate agents. Archer (2000) explains that corporate agents have “capacities for articulating shared interest, organising for collective action, generating social movements, and exercising corporate influence in decision making” (p. 266). In this sense, corporate agency would enable teachers to no longer be collectives that things happen to, but rather collectives that *make things happen*.

During the course of the life history interviews, I asked the teachers if they belong to any professional bodies. All four teachers indicated that they were members of the largest teachers’ union, the South African Democratic Teachers’ Union. Nomsa is the only teacher who is active in the union. “I have to attend conferences and then come back and report to the BEC, that is Branch Executive Committee members, and then after that to the whole members of SADTU in the Lwandle branch (Nomsa, LHI1, t.346). She explained that one of her roles is to organise workshops. “So like last, no this year, we had a reading workshop, and what else, ja⁷⁸, we’ve got a reading workshop. Also awareness, ja” (Nomsa, LHI1, t.350). Beauty confirmed SADTU’s role in creating awareness as she mentioned that SADTU was “just about information for teachers” (Beauty, LHI1, t.334). Nokhaya and Veliswa also mentioned that there was a computer workshop organised by SADTU. Beauty mentioned that “sometimes they do have [workshops], but the people like Nomsa, they go for workshops. Those people who are on the executive” (Beauty, LHI1, t.336). Beauty asserted that these workshops were not for ‘ordinary’ teachers, but rather for people on the SADTU executive, like Nomsa. From my observation, the teachers received limited support from the union in relation to their general teaching practice or their teaching of Foundation Phase mathematics.

From its inception in the 1980s, SADTU has been orientated to national level politics and as such “mirrored the broader political, economic and ‘cultural dynamics’ of South Africa’s transition pre- and post-1994” (Govender, 2004). Around the time of the transition to

⁷⁸ ‘Ja’ is the Afrikaans word for ‘yes’.

democracy, it played a significant role in promoting both social and educational change. Unlike the other more professionally-inclined unions⁷⁹ (Govender, 2004), SADTU carries ‘political clout’ (Govender, 2004, p. 285). It has used this clout to influence and inform a number of government policies, including the South African Schools Act of 1996, the South African Council of Educators Act in 2000, and the various curriculum policies noted earlier in this chapter. It has also engaged in advocacy work, lobbying “teachers, political parties and civil society organisations” (Govender, 2004, p. 286).

SADTU has had much criticism levelled at it. As noted in Chapter One, Taylor et al. (2011) suggest that SADTU, the largest teachers’ union in South Africa, has been destructive within the schooling sector, largely as a result of its established “culture of patronage” (Taylor, 2011, p. 3). Westaway (2015) contends that as beneficiaries of education patronage, it is not surprising that teachers and bureaucrats through “the institutional mechanisms of the South African Democratic Teachers’ union (SADTU) work together to sustain the status quo (because it is in their interest to do so)” (p. 11). He argues that this, “involves three main types of work, namely advocating for the improvement of benefits for its members, the prevention of progressive reforms (e.g. blocking proposals to assess the subject knowledge of teachers) and the promotion of the ruling party” (Westaway, 2015, pp. 11-12). Because of its undue political influence it has become virtually impossible for the state to “fire any of its members, whether for absence from work, non-performance or sexual harassment of children” (Westaway, 2015, p. 12). Hence Jansen (as cited in Westaway, 2015) refers negatively to the teaching profession as “the biggest job protection racket in South Africa” (p. 12).

It is in relation to this concern about the impetus of SADTU in transforming the schooling system and in particular schools labelled ‘dysfunctional’ (i.e. mainly quintile 1 – 3 schools) (Chapter One), that I hold that it is necessary for teachers to develop corporate agency outside of the union. With none of the four teachers belonging to any other education-related organisations and associations, nor any professional learning communities, it is unlikely that there will be change in their teacher identities. I thus contend that structural, cultural and agential morphogenesis, which Archer (2000) refers to as a double morphogenesis (Chapter Three), will only occur in the schooling system, if teachers develop their corporate agency and

⁷⁹ The National and Professional Teachers Organisation in South Africa (NAPTOSA) and Suid-Afrikaanse Onderwys Unie (SAOU) a largely Afrikaans- based union. The English translation would be the South Africa Teachers Union.

the will to bring about change, beyond SADTU. Like Graven (2003), Nel (2012), Chauraya (2013) and Pausigere (2014a), I concur that participation in communities of practice or professional learning communities can alter teachers' sense of belonging and strengthen their professional teacher identities (Graven, 2003; Nel, 2012; Pausigere, 2014a), on condition that these spaces provide the opportunities for teachers to develop their corporate agency. In addition, I would suggest that greater participation in mathematics associations like the Association for Mathematics in South Africa (AMESA) and opportunities for collaboration with colleagues in schools and across schools, may assist in developing teachers' corporate agency. I elaborate on the implications for this in Chapter Eight.

7.4 CONCLUDING REMARKS

The redescription of the narrative through a social realist lens in Chapter Five to Seven is based on Archer's (1995, 1996) morphogenetic approach in relation to structure, culture and agency. I focused on T1 of her morphogenetic approach across two time periods. In Chapter Five, I analysed the decision the participants made to become teachers. In so doing, I uncovered the structural, cultural and agential mechanisms giving rise to the emergence of their personal identities. Poverty was identified as the key structural mechanism conditioning the career choices of all four participants in my research. Thereafter I analysed their modes of reflexivity and considered how their internal conversations enabled them both to 'act back' on the conditioning mechanisms and to identify their ultimate concern and develop projects in relation to this, hereby acquiring their personal identities.

The emphasis in Chapter Six and Seven shifted to the second time period, that is, when I observed the teachers in their classrooms. My interest here was the emergence and expression of their social identities. In this regard I equated teacher identities with social identities, while simultaneously realising that teacher identities emerge from personal identities and a sense of self. In Chapter Six, through my analysis of the empirical data, I identified four dominant roles across the participant teachers. These are: the teacher as effective communicator, teacher as promoter of dialogue, teacher as knowledge worker, and teacher as connector.

Through the process of retroduction I uncovered the structural and cultural mechanisms giving rise to the teachers' identities and the expression thereof. The mechanisms that I have identified are not a full itemised list. Rather, these are the mechanisms that appear to be dominant across

the participant teachers, and that work together in a necessary and logical relation to condition teacher identities.

The identified structural level mechanisms that have given rise to teachers' identities include:

- The schooling system;
- the teacher training system;
- the systemic roles of teachers as expressed through the pre-1994 curricula; and
- the material context in which the teachers live and teach.

At the cultural level, the participant teachers' expression of their teacher identities is conditioned by:

- The ideologies of Christian National Education (CNE) and Fundamental Pedagogics, and the view of teaching as a science; and
- beliefs about mathematics, learning and teaching, and children.

Each of these mechanisms exist in a necessary and logical relation with each other. When the four participant teachers teach, these mechanisms are activated and condition the emergence and expression of their roles in the teaching of Foundation Phase mathematics.

In Chapter Seven I have shown that the systemic roles of teachers expressed in post-1994 policy documents stand in direct contradiction to the pre-1994 roles. I have argued that this creates a *situational logic of contradiction*. With reference to the teachers' modes of reflexivity (i.e. their personal emergent property and power) I explain how each of the four teachers engage with this quandary. I establish that teachers respond to the situational logic of contradiction by either *evading* the systemic roles expressed in policies after 1994 (i.e. Nokhaya and Nomsa) or by *eliminating* them (i.e. Veliswa and Beauty). In other words, the stance taken in relation to the new post 1994 systemic roles is influenced by the teachers' modes of reflexivity.

Finally, I maintain that the dominant structural, cultural and agential mechanisms conditioning teachers' identities provides a rationale for why teachers' identities have generally not changed since 1994. In combination with an absence of corporate agency beyond SADTU, this results in teachers remaining essentially primary agents who are by and large passive. In this respect their situation is *doubly non-conducive* to change.

While my research focused on four teachers, the circumstances of these teachers (i.e. black, growing up in a context of poverty and white supremacy, with limited career and funding

opportunities for further studies) are relevant to the majority of current South African teachers. So these findings speak more broadly to the persistence of pre-1994 teaching practices and lack of transformation of education generally and primary education in particular (Fleisch, 2008; Schollar, 2008). This is precisely the advantage of drawing on a framework that enables one to uncover the structural, cultural and agential preconditions that give rise to teachers' identities.

CHAPTER EIGHT

FINAL REMARKS

8.1 RESEARCH CLAIMS

What are the conditions that enable or constrain the emergence and expression of teachers' identities in the teaching of Foundation Phase mathematics?

This is the question that guided my research process and the presentation of this thesis. I noted that it is a typically realist question in that it seeks to uncover the structural, cultural and agential conditions that give rise to teachers' identities and the expression thereof in teaching mathematics in the foundation phase. My interest was not to identify what teachers are 'not doing' or 'cannot do' in relation to the current systemic roles advanced in post-1994 policies, rather I wanted to ascertain the basic conditions for why teachers do what they do.

In Chapter One I made three claims about the potential significance of my research. The first was to understand the emergence and expression of teacher identities in the teaching of Foundation Phase mathematics. The second was to extend current research on teacher identity within the field of mathematics education. In particular, I sought to develop and advance new explanations for the dominance and persistence of so-called 'traditional' teaching practices through a focus on teacher identities from a novel perspective. The third was to explore the extent to which Archer's morphogenetic approach can be used to generate knowledge and understanding of teacher identities, and to develop insights which may be useful to teacher educators and researchers within the field of mathematics education and more broadly.

With reference to the first claim, I explained how the teacher identities of the participants in my research, emerged (Chapter Five) and are expressed, in teaching Foundation Phase mathematics (Chapter Six and Seven). Using Archer's social realism and in particular her morphogenetic approach, I have been able to move beyond a hermeneutic explanation. I examined the structural, cultural and agential mechanisms and the interplay between them, and illuminated how these conditions have given rise to teachers' identities and their expression.

In relation to the second claim, I have offered insights that go beyond what teachers know and believe, to examine how this plays out in the classroom (Schoenfield, 2013), particularly in low socio-economic contexts in South Africa. With regards to the third claim, using Archer's morphogenetic approach and conceptualisation of persons, I have shown that while teacher identities are conditioned by a range of structural and cultural mechanisms, teachers have the capacity to engage with these through their personal properties and powers of reflexivity and agency. In addition, I maintain that what teachers care about in the world also influences their teacher identities in the classroom. I thus put forward a conception of teacher identity that considers the whole person.

A clear finding of this research is that the teachers in my study have maintained the status quo in most respects. This stasis has occurred despite there being a disruption of the synchrony (Archer, 2000) between the schooling system, teacher education system, curriculum and pedagogy, pre-1994 and post-1994. By that I mean that the participants have continued to express their roles as teachers after 1994, in the same way that was expected prior to 1994. This finding concurs with a wide range of literature on the continuity of pre-1994 mathematics teacher practices in the primary mathematics classroom, after the onset of formal democracy in South Africa (e.g. Fleisch, 2008; Hoadley, 2010). While a range of explanations have been posited for why this is the case, no one had provided an explanation based on South African teachers' modes of reflexivity, prior to this work.

This study shows how the structures and 'intelligibilia' (i.e. the ideas, theories, discourses) (Archer, 1996) of the pre-1994 social and cultural systems continue to condition teachers' identities, despite a situational logic of contradiction created by these systems, after 1994. In offering an explanation for this that extends beyond a structuralist argument, I suggest that the modes of reflexivity of the teachers in my research, perpetuate the reproduction of the systemic roles of teachers, pre-1994. This is done by either evading or eliminating the structures and 'intelligibilia' informing the new roles of teachers in teaching mathematics and has led to morphostasis of the social system, cultural system and agents. I posit that the lack of corporate agency beyond the unions, further entrenches morphostasis. I argue therefore that it is necessary for researchers and teacher educators to consider how teachers' corporate agency can be developed.

8.2 ARCHER'S SOCIAL REALISM AS MY THEORETICAL FRAMEWORK

My research used a novel framework for analysing and explaining the emergence and expression of teachers' identities, and as such, I reflect here on the insights that this framework has enabled.

Archer's social realism and in particular her morphogenetic approach, have enabled tight coherence and strong alignment throughout this work. My overarching research question demanded a framework that would assist me to examine the basic conditions (i.e. structure, culture and agency) giving rise to the phenomenon I studied. After reading some of the work of Bourdieu, Foucault and Giddens, I realised that none of these theorists could assist me to examine the interplay between structure, culture and agency. This limitation led me to look elsewhere and in this journey I came across Archer's social realism which proved helpful in examining the extent to which structure, culture and agency condition teachers' identities.

The ontologically realist and epistemological relativist stance of social realism resonated with me and the work I do, as teacher educator. My research sought to identify the basic conditions, at the level of the real (e.g. systemic roles of teachers). Bhaskar's (1978, 2008) concept of a stratified reality has been particularly useful in identifying the structural and cultural mechanisms at the level of the real, that give rise to events in the world (e.g. teaching), and persons' experiences of those events. In addition, Archer's social realism provided me with the methodological tools to uncover the causal mechanisms at the level of the real that enable or constrain the emergence and expression of teachers' identities. As Danermark et al. (2002) argues, "social science analysis is essentially a matter of using theories and frames of interpretation to gain a deeper knowledge of social meanings, structures and mechanisms. In this way we build up knowledge that cannot be reduced to empirical facts" (p. 92).

Three key concepts underpinning social (and critical) realism, were useful for my research. These were analytic dualism, emergence and temporality. The concept of *analytic dualism* enabled me to separate the 'parts' from the 'people'. This allowed me to move beyond the conflationary theorising evident in much of the social constructionist research on teacher identity, as presented in Chapter Two. The concept of *emergence* provided me with the lens to identify the structural and cultural mechanisms that give rise to teachers' identities and the

expression thereof, in teaching Foundation Phase mathematics. The concept of emergence is based on the premise that when two or more objects give rise to a phenomenon, this phenomenon is not necessarily reducible to the original objects (Sayer, 2000). In this thesis, the schooling system and teacher training system give rise to particular teacher identities, but I have demonstrated that these cannot be reduced to the aforementioned objects.

While structure, culture and agency are real, interdependent and interact with one another, structural properties are emergent from and dependent on the (inter)actions of agents and exercise their structural powers through agency (Archer, 1995, 2000; Zeuner, 1999; Benton & Craib, 2001). In this context, the concept of *temporality* enabled me to recognise that structural and cultural mechanisms predate the actions of agents and elaborations thereof postdates the actions of agents. Put simply, this is the premise of Archer's morphogenetic approach. Temporality was thus important not only in understanding the emergence of teacher identities and the extent to which teachers' identities are reproduced or change, but also in that I was able to analyse my data across two different time periods or morphogenetic/morphostatic cycles. The first morphogenetic/morphostatic cycle was associated with the decision of the participants in my research to become teachers (Chapter Five) and the second, with their being in the classroom (Chapters Six and Seven).

As mentioned above, two of the key explanatory tools used in my research, were Archer's morphogenetic approach and her stratified view of persons. The morphogenetic approach provided me with an explanation that did not render agency an epiphenomenon of the social and cultural systems. Rather, it assisted me to explain both how agency is conditioned by the social and cultural systems, and how it can contribute to the elaboration or reproduction of these systems. Agency has its own properties and powers (e.g. reflexivity), meaning that it can transform structure, culture and itself in the process. I drew on Archer's notion of reflexivity in general and on the modes of reflexivity of each of the teachers in my research in particular, to explain how teachers 'act back' on the cultural and social systems. In addition, Archer's explanation of agency, that is the delineation between primary and corporate agency, was useful in ruminating about the absence of teacher change and what is required to promote a change in teachers' identities.

In order to move beyond an analysis of data that focused on the empirical, I used the critical realist thought process of retrodution. This is the process of moving from an empirical

observation of an event (e.g. teaching) to a consideration of the conditions that have given rise to that event (Danermark et al., 2002). Central to this thought process is the asking of transfactual questions. These questions allowed me to uncover the conditions that made teachers' identities. Danermark et al. (2002) contend that the critical and social realist conceptions of generality refer to transfactual conditions (i.e. the conditions giving rise to something: e.g. the schooling system, Fundamental Pedagogics, systemic roles of teachers). They suggest that these *are close to universal preconditions* for 'who the teacher is'. In Bhaskar's (1978) words "scientifically significant generality does not lie on the face of the world, but in the hidden essence of things" (p. 227). It was through the process of retroduction, that I both uncovered some of the conditions giving rise to teachers' identities and the expression thereof, and surfaced some of the drivers of morphostasis of the four teachers' practices and morphostasis of mathematics teachers' practices nationally. Although my research was a case study of four teachers, I contend that the findings are generalisable to teachers with similar backgrounds and experiences (e.g. growing up as a black person in apartheid South Africa and in a context of poverty, being schooled and trained as a teacher prior to 1994) because they refer to fairly generic preconditions (Bhaskar, 1978) that apply to many teachers in South Africa.

8.3 LIMITATIONS IN USING ARCHER'S THEORETICAL FRAMEWORK

While I have noted the use of Archer's framework as novel in the South African context and thus a contribution to the field, the paucity of research on micro-level contexts such as the classroom was a challenge. While Archer's own Doctorate in Philosophy (PhD) research was in the field of education, her focus was the *education system* in France. While there appears to be a significant amount of social realist research emerging within the Higher Education sector, there is no research that examines the emergence and expression of teacher identities in the classroom, to my knowledge. This suggests that the potential of Archer's work for research that focuses on how teacher identities play out in the classroom, and in particular Foundation Phase mathematics classrooms, has not been realised. In my attempt to do this, I found it challenging navigating new territory and applying the variety of explanatory and analytic tools in new contexts and novel ways.

Benton (2007) and Caetano (2014) express concern about Archer's emphasis on the internal conversation and its role in mediating structure, culture and agency. They maintain that more credence should be given to external conversations. While I suggested in Chapter Three that Archer acknowledges the role that external conversations play in mediating structure, culture and agency in relation to the communicative reflexive, it is apparent in Chapter Seven that in a highly interactional profession like teaching, Benton and Caetano's concern may be warranted. For example, Veliswa was often out of the classroom because of her responsibilities as head of department and her health concerns. While Nokhaya may have become a trusted interlocutor for her, Veliswa did not become a communicative reflexive who 'tests' ideas with trusted people. Yet, testing ideas in a profession like teaching and learning from colleagues, should be central to the work teachers do.

As I indicated in Chapter Three, Archer has been criticised for her rejection of Bourdieu's concept of habitus. There are two arguments she makes that I wish to address from the basis of my research findings. The first is the idea that Bourdieu's habitus offers a deterministic account of the formation of identity, as he ignores the role of reflexivity in the emergence of identity (Sayer, 2009). The second is her contention that in late modernity, the notion of habitus has limited value. She argues that the constant state of flux in social life does allow for the formation of unconscious, embodied dispositions (Archer, 2012). While I agree that Bourdieu (2010) places little emphasis on the role of reflexivity in the formation of the habitus, suggesting that it is a process of unconscious adaptation, I contend that teachers' roles can become internalised and habituated through repetitive (inter)actions and practices. In contrast to Archer's claim against Bourdieu's concept of the habituation of practices, I argue that it does not necessitate that one ignore the internal conversations of actors and the role reflexivity plays in mediating the structural and cultural mechanisms that constrain or enable the practices of agents. Like Elder-Vass (2007, 2010) I posit that the two are not necessarily mutually exclusive. Ways of being in the classroom can become habitual; I have demonstrated this here through the illustration of the use of the initiate-respond-evaluate (IRE) structure in all four teachers' classrooms.

8.4 KEY FINDINGS FROM MY RESEARCH

I now report on some of the key findings that have emerged from my research. Perhaps the most significant finding of this work, is that research on teacher identities should consider

persons holistically. Little prior research on teacher identity considers *who the teacher* is, beyond teacher development courses or the classroom. In my research, it is clear that teachers' experiences growing up, condition their concerns in the world and their *modus vivendi*, and that their *modus vivendi* in turn, influences the manner in which they express their social roles as teachers. Teaching was not the initial choice of any of the teachers in my study. Poverty was a significant structural mechanism, conditioning their respective personal identities. It was the personal aspirations of Beauty and Veliswa to move beyond their context of economic disadvantage that led them ultimately to becoming teachers. When Beauty and Veliswa made the choice to become teachers, they did not intend to become Foundation Phase teachers. This *double non-intention* is likely an experience of more than just Beauty and Veliswa. This issue may be worthy of further research.

In this study I identified and analysed the following *structures* amongst others, that condition the emergence and expression of teachers' identities: (1) poverty; (2) the schooling system; (3) the teacher training system; and the systemic roles of teachers. Embedded with these systems and roles are a set of 'intelligibilia' (Archer, 1996). In my research, these included the principles of Christian National Education and Fundamental Pedagogics, and beliefs about mathematics, learning and teaching and children. The post-1994 roles were a radical departure from the pre-1994 roles of teachers: from a philosophical point of view they required a reconceptualisation of the nature of mathematics and what is entailed; pedagogically, teachers' conceptions of learning and teaching were challenged; and the entire purpose of education shifted from a focus on teaching specific knowledge and skills to social, political and economic redress and transformation.

My research shows that the roles expressed by the participant teachers, cohere with those promoted prior to 1994 and are at variance with those promoted after 1994. This is consistent with research conducted by Jita and Vanderyar (2006), Adler and Pillay (2007), and Velupillai, Harding and Englebrecht (2008). However, these researchers make an assumption that as the systemic roles change, so do the occupants of those roles change. This was not the case in my research. The systemic roles of teachers as defined through post-1994 policies, did not map onto their social roles as teachers. Instead, the discrepancy between the 'intelligibilia' conditioning the expression of teachers' roles pre-1994 and the 'intelligibilia' after 1994 as articulated through various policy documents, has created a *situational logic of contradiction*.

Emergent from my research, is a need for teachers and researchers to reconsider what is meant by mathematics content knowledge, appropriate for the Foundation Phase. Teachers appear to have knowledge of the products of the discipline of mathematics (in other words, they are able to add, subtract, read the time), but they lack an adequate understanding of the principles that generate the products of the discipline (i.e. reasoning, generalisation). Venkat (2013) refers to this as “mathematical modes of enquiry” which Young (2011) regards as “powerful knowledge” (p. 13). Nokhaya and Nomsa were the only two teachers who showed some evidence, albeit limited, of pushing their children’s thinking by requiring them to reason and to justify their thinking.

Researchers around the world are concerned with inert public responses to curricula reform (Jita & Vanderyar, 2006; Adler & Pillay, 2007; Velupillai, Harding, & Englebrecht, 2008; Beauchamp & Thomas, 2009). In the South African context, Jansen (1999) notes that the pedagogical expectations and the new roles of teachers evident in Curriculum 2005 (C2005) were far removed from those the teachers were familiar with. More generally, the three curriculum iterations since 1994 have led to mounting frustration on the part of the teachers. Policy developers should consider who the teachers are when designing policies and subsequent support interventions for the implementation of those policies.

Bourdieu (as cited in Maton, 2008) argues that the choices persons make, are dependent on the options available to them, their dispositions (*habitus*) and their experiences. In this research, I have shown that the choices that teachers make are framed by the options available to them and by their successive experiences as school children, student-teachers and teachers. Where I depart from Bourdieu (1990) in this research, is in relation to the influence of dispositions. For him, the “principles embodied [as *habitus*] are placed beyond the grasp of consciousness, and hence cannot be touched by voluntary, deliberate transformation” (p. 76). By contrast, here I show that it is the personal emergent property (PEP) and power of reflexivity, that guides the *choices* teachers make, rather than their *habitus* (Archer, 1995, 2000, 2003, 2007a, 2012). In other words, I suggest that choices are conscious actions mediated through the internal conversation, and as such, are not habituated.

Many researchers (e.g. Graven, 2014, 2016) have suggested that teachers in South Africa are trapped by a culture of compliance. They argue that this leads to a lack of substantive engagement with mathematics learning. By contrast, I have shown that this compliance by

teachers is far more nuanced. While teachers may comply with the superficialities of post-1994 expectations (e.g. getting their children to write in the national workbooks and teaching the stipulated ‘breaking down and building up’ method) there is evidence to suggest that they subvert the new, in terms of the old. Furthermore, if teachers were simply compliant, how would one explain the fact that the teachers in my research have not taken on the post-1994 systemic roles of teachers? I suggest that teachers’ modes of reflexivity and their limited agency, beyond primary agency, is a more appropriate explanation for the reproduction of their roles as teachers (than the compliance argument). I would extend this to suggest that teachers, through their continuing to express pre-1994 roles as teachers of Foundation Phase mathematics, are complicit (rather than compliant) in reproducing and normalising these roles and ways of being in the classroom. In my research, teachers actively evaded or eliminated the new roles as a means of responding to the situational logic of contradiction. Referring to Archer (2000), I suggest that in the process of normalising the pre-1994 roles for teachers, these are continually reproduced as systemic roles.

Furthermore, my research has highlighted that the internal conversation requires support, if morphostasis is to be overcome. In my research, teachers’ modes of reflexivity were either communicative or autonomous. Communicative reflexives attempt to maintain the status quo by avoiding structural and cultural constraints. Nokhaya and Nomsa, both communicative reflexives, responded to the situational logic of contradiction by *evading* the ‘intelligibilia’ informing policies post-1994. Veliswa and Beauty, both autonomous reflexives, ‘act back’ on the ‘intelligibilia’ informing policies, post-1994. They confront the situational logic of contradiction by *eliminating* these ‘intelligibilia’ and continuing to express the roles as teachers of Foundation Phase mathematics, conditioned by their schooling and teacher training systems. A larger study could examine whether the majority of teachers are communicative and autonomous reflexives, as opposed to meta- and fractured reflexives, and explore the implication of this with regards to teacher education and development.

My research shows that teachers have not managed to convert their *primary agency* into *corporate agency*. Teachers’ corporate agency appears to be limited to their engagement in union affairs. This is problematic because the unions’ attention is generally focused on the conditions of employment of teachers, often at the exclusion of the children they teach and the quality of the education they receive. Noted in my research, was a concern about using isiXhosa mathematics terminology, when the children are accustomed to the English terminology. In

order for teachers to challenge and change the language policy with regards to the use of English and isiXhosa in supporting children's mathematical learning, they would need to establish themselves as a collective of effective corporate agents. Techniques such as communicating with colleagues, participating in communities of practice and professional learning communities, joining organisations and associations, attending conferences and so on, may assist in developing teachers' corporate agency.

8.5 SOME INSIGHTS EMERGING FROM MY RESEARCH

In this penultimate section I briefly consider some insights emerging from my research that may be of use to teacher educators, with an explicit interest in promoting a change in teachers' identities.

My findings point to the need for opportunities for "rich deliberations" (Spillane, as cited in Hodgen & Askew, 2007, p. 483) between teachers, to make explicit their understandings and beliefs about the subject of mathematics, the purpose of teaching mathematics, the process of learning mathematics, and the concomitant approach to teaching mathematics. In addition, they should be encouraged to debate and discuss these ideas and beliefs in order to understand the cultural system. While I realise that the manner in which teachers describe their practice is often different to how it is in the classroom, a space needs to be created where teachers will not feel judged for doing what they do.

Government, policy makers and teacher educators, need to consider what structures and processes should be put in place to support teachers. Presently, it appears that the Department of Basic Education performs a semblance of a monitoring function when it comes to teachers; for example, it checks that they use national workbooks. This is largely ineffectual. To improve the situation, teachers should be consulted about the kinds of support they need, to assist them in teaching Foundation Phase mathematics. Nomsa, for example, told me that she was confused with lesson planning. Careful thought would need to be given to the creation of enabling environments for teachers to learn and to shift their teacher identities.

Teacher agency can play a key role in transforming the teaching of Foundation Phase mathematics. Teacher education institutions should develop in-service courses that recognise the teachers, their current teacher identities, and work together with them to modify their

teacher identities. Careful consideration should be given to teachers' modes of reflexivity and whether it is possible to shift the stance of teachers towards the systemic roles, promoted in post-1994 policies. In saying this, it does not mean that I agree that teachers should simply accept and 'take on' the new systemic roles articulated through the various policy documents. Rather, teachers should drive an exploration of what works in the context in which they teach, through their corporate agency and in collaboration with researchers.

Opportunities should be created for teachers to communicate about their teaching with colleagues in their schools and across schools, with teacher educators, researchers and government Departments of Education. Teachers should be encouraged to develop communities of practice and become part of professional learning communities. Opportunities should be created for teachers to join associations (e.g. the Association for Mathematics Education in South Africa), read journals and stories of teachers' teaching, and participate in conferences, particularly with the view to teachers becoming lifelong learners. Developing teachers' corporate agency, is a pre-requisite for bringing about systemic change within the schooling system.

8.6 A FINAL WORD

A strength of this research, is the manner in which I have ensured theoretical consistency across both the research process and chapters in this thesis. It has been challenging but rewarding, to have had the opportunity to read widely, research and think deeply, and interact broadly, that has all been integral to the work involved in producing this thesis. It has been a singular privilege to have had the opportunity for PhD research at this stage of my biological and professional life.

The privilege extends beyond professional dimensions. I am acutely aware of advantages and benefits accorded to me, by virtue of my race and class. Yet, the four participant teachers, all black and from working class backgrounds, graciously and generously gave me access to their lives and classrooms. The context in which this act of Ubuntu took place was dysfunctional public schooling, where young working class black South Africans are subjected to an unacceptable educational experience. In no small part, this reproduces the very race and class structure that privileges me.

As much as I have appreciated the professional opportunity and the grace of my research participants, the intellectual and moral process has constantly challenged and unsettled me. My identity has been called into question. It has thus been a deeply reflexive process on a personal level. Yet, I am also confident that the work that has been produced contributes to the thinking that will be required to bring about much-needed systemic transformation of public schooling in South Africa.

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APPENDICES

APPENDIX 1

Imagine that I was going to write a book about your life titled 'X, the story of a Foundation Phase teacher in the Eastern Cape'

What would the key events and experiences that you would want in this book be?

In deciding on these, keep the title in the back of your mind. This is a story of you and (1) the events and experiences that gave rise to you becoming a Foundation Phase teacher; and (2) what it means to be a Foundation Phase teacher.

What are the significant events in your life story that led to you becoming a Foundation Phase teacher? (I'm trying to get broad 'brush strokes' of the teachers' lives here.)

General probes for all questions to get more detail if necessary:

- What happened?
- Where did it happen?
- Who was involved?
- What did you do?
- What did you think and feel?
- How has this experience impacted on you?
- What do you think this experience says about who you were then?
- What do you think this experience says about who you are now?

Childhood:

What was your childhood like?

- Where did you grow up?
- Who were the influential people in your life?
- What was the community like where you lived?
- What was your everyday home life like?
- What did you do for fun? Who did you play with? What games did you play?

School Years:

What was your schooling like? (I will focus on both primary and secondary)

- What were your relationships like with your teachers and peers in your class?
- Who was your favourite teacher? Why?
- Who was your worst teacher? Why?
- What subjects did you enjoy? Why?
- How did you do in your school work through the years?
- Who were your friends and what sorts of things did you do with them?

Post school Education (including college / university):

Tell me about your education after leaving school.

- Why did you decide to become a teacher?
- Where did you study? What did you study?
- What was college / university like for you?
- What courses did you do? Why?
- What courses did you not enjoy? Why?
- What aspects of your initial teacher education have influenced your teaching the most?

Working life:

Tell me about your working life as a teacher

- Where have you taught?
- Describe yourself as a teacher:
 - What kind of teacher are you?
 - What do you value most?
 - What do you believe about learning (in other words, how children learn)?
 - What are your biggest challenges?
- What influence have professional development courses you have attended, had on your life as a teacher?
- What do you find most satisfying about being a teacher? Why?
- What do you find least satisfying about being a teacher? Why?
- Describe a significant moment in your working career.
- Are you a member of any professional bodies?
- How have these professional bodies contributed to your teaching life?
- What makes you stay in the teaching profession?
- What are the biggest constraints in your work?

General:

- Who has been the biggest influence on your life? What lessons did that person teach you?
- What are the most important lessons you've learned about teaching? Where did you learn them?
- Where do you see yourself in five/ten years' time?

Is there something that you would like to add to your life story that we haven't discussed?

APPENDIX 2

MATHEMATICS HISTORY INTERVIEW

Main question

Tell me your mathematics history. What have been some of the critical events in your mathematics history?

Probe questions:

1. Can you remember a mathematics experience from your childhood / adolescence / teacher education / adult life / teaching that had a significant impact on you? These can be positive or negative. Tell me:
 - What happened?
 - Where did it happen?
 - Who was involved?
 - What you did?
 - What were you thinking and feeling?
 - How this experience may have impacted on you?
 - What does this experience say about who you were then?
 - What does this experience say about you now as a teacher?
2. Were there any positive experiences in your mathematics history?
3. Were there any negative experiences in your mathematics history?
4. Can you describe a time where your attitude to mathematics changed?
5. What has been the single most challenging experience you've had in your mathematics history? Tell me:
 - How did you handle this challenge?
 - Were there other people that helped you in dealing with this challenge experience? Who? What did they do? What did they say?
 - What impact did this challenging experience have on you?
 - How did it affect the way you view(ed) mathematics?
6. Who or which institution / organisation has had the greatest positive influence on your perspective of mathematics?
7. Who or which institution / organisation has had the greatest negative influence on your perspective of mathematics?
8. If you could have changed any aspects of your mathematics history, what would they have been? Why?
9. What goals and dreams do you have about your mathematics future? How do you think you could make those goals and dreams happen?
10. What are your worst fears about your mathematics future?

APPENDIX 3

PRACTICES INTERVIEW

These differed from teacher to teacher especially in terms of the stimulated-recall interview. While there were generic questions, many of the questions emerged out of conversations with teachers and my observations.

General information that I tried to obtain related to:

1. Planning

Describe to me how you go about planning your maths lessons? (Probe for yearly, termly, weekly, daily).

- a. How do you plan?
- b. How often do you plan?
- c. What influences the way you plan your lessons?
- d. Which books inform your planning? Which textbooks / workbooks do you use in your class?
- e. What resources do you use in your lessons? Why?
- f. Who do you plan with?

2. Assessment

What is your assessment strategy?

- a. Please could you explain the various strategies you use to assess your learners?
- b. What has influenced your assessment strategy?
- c. What do you do with the information gained from these assessments?
- d. How do you record the information gained from these assessments?
- e. Where does this idea of walking around the class and marking while the children are working come from?
- f. The children bring their work to you at your table to mark. How do you ensure that you have marked every child's book?

3. Lesson structure

I see there is a set routine to the way in which you organise your lessons. Can you take me through that?

- a. Counting / mental maths
 - i. Why do you start your lesson with counting?
 - ii. Why do you do mental maths?
- b. Independent work
 - i. I notice the children do the independent work individually. Is this how you normally do it?
 - ii. I noticed that the children do very few exercises in their books. Why is this?
 - iii. I noticed that you always read through the worksheet with the children. Why do you do this?
 - iv. Once the children have completed their independent work and it has been marked, I see they sit at their desks. Why do they wait for everyone to finish?

4. Mathematics

- a. What mathematics content do you see as essential in the Foundation Phase?
- b. Methods of calculating
 - i. Where did this method for solving subtraction problems come from?
 $215 - 95$
 $(200) + (10 - 90) + (5 - 5)$
I asked all the teachers about using the 'breaking down and building up' method for subtraction with regrouping.
 - ii. Specific to Nokhaya: When the children were doing page 64 of the green book, one of the questions required them to decompose the number '309'. A child wrote ' $309 = 300 + 0 + 9$ ' which was not the answer you wanted. What did you want him to write? Why? Where does this idea come from?
- c. Specific questions were asked in relation to the stimulated-recall interview.

5. Children

How do you organise the children in your class?

- a. How do you decide which children to put into each group?
- b. The children are seated in ability groups. What is the basis for these groups? How do you make the decision in terms of who should sit where?
- c. Why are the weakest children placed at the back of the class?
- d. Why do the children not ask questions?
- e. I see the children use their fingers to calculate simple sums. Is this 'normal'?
- f. Everyone tells me the children are slow. Why is this?
- g. You mentioned the children like to copy. Why is this the case?

6. Reflecting on teaching in general

- a. What concerns you most about your teaching?
- b. What support do you get from the school, parents, district office?
- c. Yesterday you told me your approach to teaching has changed. What did you mean by this?

7. Language use in the classroom

- a. Explain what influences your decision to use isiXhosa and/or English in your maths lessons? Why is this the case?
- b. I notice that you encourage your learners when counting or answering questions to use the isiXhosa number names. Can you explain what has helped you make this decision?

An example of a stimulated recall interview

I've taken this example from Beauty (PI1, tt1-62).

We watch her lesson on multiplication and division (VRL1) and I stop the recording from time-to-time to ask her various questions. These include:

- What did you tell the children before you gave them the sum ' 5×6 '?
- Why did you choose to draw lines (i.e. tallies)?
- So you wouldn't just write ' $5+5+5$... six times'?
- Is this an introduction to multiplication?
- When you counted them (i.e. the tallies) I noticed you counted in ones. Is this how you would normally do it?

- Take me through this section on '10X10'?
- Why do you change from times to divide and back to times?
- I see that after the lesson you gave them a mental maths exercise to do in their jotters. Why is that? (This evolves into a discussion on why she likes to do mental mathematics with the children in her class regularly).
- This child added '7X2' and got '9'. What did you say to him?
- How will children know that we are adding when we multiply except its '7+7' and not '7+2'? Do you think the children understood this?
- Do you normally teach multiplication and division together?

APPENDIX 4

My intention as noted in Chapter Four was to spend three weeks in each of the four teachers' classrooms observing their mathematics lessons. However, schools are dynamic spaces and teachers and researchers have to be flexible.

Nokhaya

While I had planned to observe Nokhaya teaching 15 lessons, this was not the case. As illustrated in Table 4.1, Nokhaya:

- Taught seven full lessons:
 - time (two on calendar time and one on analogue time);
 - addition of two three-digit numbers;
 - subtraction of two three-digit numbers;
 - place value; and
 - counting and number patterns.
- Did an assessment of the mathematics content the children had learned;
- had the children complete an ANA exemplar; and
- had three revision lessons after the children had written the ANA.

Table 4.1: Research opportunities in Nokhaya's classroom

Month	Mon	Tues	Wed	Thurs	Fri
JULY / AUG	30 Time: Calendar	31 Time: Calendar	AUG 1 VIDEO Number: place value & addition	2 Number: counting & subtraction	3 Assessment on week's work
AUG	6 Number: place value & addition of 2 three-digit numbers using HTU	7 No lesson: concerned that her learners would get too far ahead of Veliswa's class	8 VIDEO Number: counting & number patterns	9 Public holiday	10 School Holiday
AUG	13 Children practising ANA exemplar	14 Children practising ANA exemplar	15 Children practising ANA exemplar	16 ANA revision: bigger than, smaller than and equals; plus doubling & halving	17 No lesson: cleaning the classroom
AUG	20 ANA revision: money & number names	21 ANA revision: time	22 VIDEO Measurement: time	23	24

Veliswa

Veliswa, apart from being a class teacher is also an acting Head of Department (HoD). The implication of this is that she is often called out of the classroom by the principal, the district office and the teachers' union, SADTU. While at Sontonga Primary School, I managed to observe Veliswa teaching four full lessons:

- Two on calendar time;
- one on addition of two-digit and three-digit numbers; and
- one on division and multiplication.

In addition to that, I observed children writing the ANA exemplar and a number of revision lessons. There were three such 'lessons', which included counting, number concept development, addition of two two-digit numbers, money and time. These are all noted in Table 4.2 below.

Table 4.2: Research opportunities in Veliswa's classroom

Month	Mon	Tues	Wed	Thurs	Fri
JULY / AUG	30 Time: Calendar	31 No lesson: called out of the class by an official from the national DBE	AUGUST 1 VIDEO Time: Calendar	2 No lesson: principal required her to write the agenda for the staff meeting	3 Number: counting, number concept development, addition of 2 two-digit numbers & 2 three-digit numbers
AUG	6 No lesson: ill; (although she was at school)	7 No lesson: ill (absent from school)	8 No lesson: ill (absent from school)	9 Public holiday	10 School Holiday
AUG	13 Children practising ANA exemplar	14 Children practising ANA exemplar	15 Children practising ANA exemplar	16 No lesson: children were required to complete the isiXhosa home language exemplar	17 ANA revision: counting, number concept development & subtraction of 2 two-digit numbers
AUG	20 ANA revision: counting & money	21 ANA revision: time	22 VIDEO Number: counting, division & multiplication	23	24

I only managed to video-record two of Veliswa's lessons: a lesson on time and a lesson on division (although the focus appeared to change to multiplication during the lesson). The rest of the lessons that I observed were written as field notes.

Beauty

Beauty is one of two Grade 3 teachers at Phambili Public School. During my time with her I managed to observe:

- Eight lessons:
 - Two on multiplication and division of single digit numbers;
 - one on addition of two three-digit numbers;
 - one on subtraction of two three-digit numbers;
 - Two lessons on fractions;
 - one lessons on shape; and
 - one lesson on shapes and fractions.
- One formal assessment.

These lessons are referred to below in Table 4.3.

Table 4.3: Research opportunities in Beauty's class

Month	Mon	Tues	Wed	Thurs	Fri
OCT		9 No lesson: asked us to come back tomorrow	10 Number: counting, mental maths, multiplication & division	11 VIDEO Number: counting, mental maths, multiplication & division	12
OCT	15 Number: counting, mental maths & addition of 2 three-digit numbers	16 No lesson: Beauty absent	17 Number: mental maths & subtraction of 2 three-digit numbers (no regrouping)	18 No lesson: heavy rains and thus there were very few children at school	19 No lesson: heavy rains and thus there were very few children at school
OCT	22 No lesson: flooding	23 No lesson: flooding	24 No lesson: class outing (but it had to be cancelled)	25 VIDEO Geometry: 2-D shapes	26 Number & geometry: counting, mental maths, shapes & fractions
OCT / NOV	29 Number: counting & fractions	30 Number: counting & fractions	31 No lesson: preparation for the Grade 7 farewell	1	2 VIDEO Formal Assessment Task (FAT)

Nomsa

Nomsa also teaches at Phambili Public School. During the time that I spent with Nomsa, I observed a total of seven lessons. These included:

- One lesson on time;
- one fractions lesson;
- two measurement lessons focusing on mass; and
- three lessons on addition and subtraction of two three-digit numbers with regrouping.

The lessons observed are in Table 4.4 below.

Table 4.4: Research opportunities in Nomsa's class

Month	Mon	Tues	Wed	Thurs	Fri
OCT		9 No lesson: asked us to come back tomorrow	10 Measuring: time	11 VIDEO Number: fractions	12
OCT	15 No lesson	16 No lesson: looking after Beauty's class	17 No lesson	18 No lesson: heavy rains and thus there were very few children at school	19 VIDEO Measurement: mass (g, kg)
OCT	22 No lesson: flooding	23 No lesson: flooding	24 No lesson: class outing (but it had to be cancelled)	25 Number: addition & subtraction of 2 three-digit numbers (with regrouping)	26 Number: addition & subtraction of 2 three-digit numbers (with regrouping)
OCT / NOV	29 Number: addition & subtraction of 2 three-digit numbers (with regrouping)	30 No lesson	31 Measurement: mass (kg and g)	1	2 No lesson: she did it while I was with Beauty

APPENDIX 5

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08 January 2012

Professor JM Baxen

27 Fitzroy Street

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6139

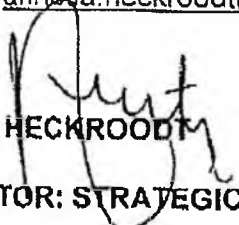
Dear Prof Baxen

**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;



- 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



APPENDIX 6

Attestation of agreement and confidentiality

I, Lise Westaway (the researcher) do hereby declare that all information obtained in this research will be treated with the strictest confidentiality and that this information will only be seen by my translator and supervisor.

Signed: _____ Date: _____

I, _____ (research participant) do hereby grant permission for this research to be conducted. I accept that I have received written information on the nature, method and purpose of this research. I have been informed that all data will be treated confidentially and that my identity will remain anonymous except to the researcher, translator and supervisor of the research.

Signed: _____ Date: _____

APPENDIX 7

Nokhaya

Classroom Observation, Video 1, 1 August 2012

In this transcript instead of writing ‘twenty-eight’ for ‘ngamashumi mabini anesibhozo’ (t.1), I have kept the initial translation of ‘two tens with an eight’ which is a direct translation of the isiXhosa. The reason for doing this with Nokhaya and Veliswa’s transcripts is that both required the children to add ‘awananto’ (‘with nothing’) at the end of the decuple (multiples of 10) (Wright, 2013). In other words ‘ngamashumi mathathu’ means ‘thirty’ or ‘three tens’ but ‘ngamashumi mathathu awanato’ means ‘thirty with nothing’ or ‘three tens with nothing’. The latter phrase is more in keeping with the sentiment that ‘zero’ is the same as ‘nothing’.

1.	LL	[The children are in the front of the class facing the board. They are counting in unison] ...ngamashumi mabini anesibhozo, ngamashumi mabini anesithoba ,ngamashumi mathathu awananto, ngama ...	[The children are in the front of the class facing the board. They are counting in unison] ... two tens with an eight; two tens with a nine; three tens with nothing, tens ...
2.	Nokhaya	Enkosi. Enkosi. [She writes the number ‘28’ on the board.] Ngubani elinani? Uza kuphakamisa isandla akuzo kusuka uthethe. [She points to a learner] Ngubani?	Thank you. Thank you. [She writes the number ‘28’ on the board.] What is this number? Raise your hand to get a chance to speak. [She points to a learner] What is it?
3.	L	Ngamashumi mabini anesibhozo	Two tens with an eight
4.	Nokhaya	Sonke	All of us together
5.	LL	Ngamashumi mabini anesibhozo	Two tens with an eight
6.	Nokhaya	Heh?	Huh?
7.	LL	Ngamashumi mabini anesibhozo	Two tens with an eight
8.	Nokhaya	Ngubani eli inani? [Writes the number ‘130’ on the board.]	What is this number? [Writes the number ‘130’ on the board.]
9.	L	Likhulu linye linamashumi mathathu awananto	One hundred three tens with nothing
10.	Nokhaya	Sonke	All of us, together
11.	LL	Likhulu linye linamashumi mathathu awananto	One hundred three tens with nothing
12.	Nokhaya	Sonke	All of us together
13.	LL	Likhululinye linamashumimathathu awananto	One hundred three tens with nothing
14.	Nokhaya	Ngubani ixabiso leli nani? [She writes the number ‘130’ on the board and underlines the ‘1’.] Ngubani umntu onozokundibhalela apha ebhodini ixabiso lela nani?	What is the value of this number? [She writes the number ‘130’ on the board and underlines the ‘1’.] Who can write the answer on the board for me?

15. L	[A child writes the number '100' on the board.]	[A child writes the number '100' on the board.]
16. Nokhaya	Ngubani ixabiso leli nani?	What is the value of this number?
17. LL	Likhulu linye alinanto	One hundred with nothing
18. Nokhaya	Ngubani ixabiso leli nani?	What is the value of this number?
19. LL	Likhulu linye alinanto	One hundred with nothing
20. Nokhaya	[She writes 170 on the board and underlines the '7' in the number 1 <u>7</u> 0.] Ngubani ixabiso leli nani? [She looks around and repeats] Ngubani ixabiso leli nani? [The teacher selects a child to write on the board. He writes 7.]	[She writes 170 on the board and underlines the '7' in the number 1 <u>7</u> 0.] What is the value of this number? [She looks around and repeats] What is the value of this number? [The teacher selects a child to write on the board. He writes 7.]
21. Nokhaya	Ngubani?	What is it?
22. LL	Ngamashumi asixhenxe awananto	It is seven tens with nothing.
23. Nokhaya	Ngubani?	What is it?
24. LL	Ngamashumi asixhenxe awananto	It is seven tens with nothing.
25. Nokhaya	Ngubani ixabiso leli nani? [She writes '9' on the board.] Ngubani ixabiso leli nani?	What is the value of this number? [She writes '9' on the board.] What is the value of this number?
26. LL	[A child comes to the board and writes the number '9'.]	[A child comes to the board and writes the number '9'.]
27. Nokhaya	Ngubani ixabiso leli nani?	What is the value of this number?
28. LL	Sisithoba.	It is nine.
29. Nokhaya	Sisithoba. Ndifuna ke ngoku undixelele, undibhalele apha e bhodini ngamakhulu mabini aneshumi linye linesihlanu. Ngamakhulu mabini aneshumi linye linesihlanu.	It is nine. I want one of you to write this number on the board two hundreds, one ten with five. Two hundreds, one ten with five. Two hundreds, one ten with five.
30. L	[A girl runs up to the teacher and takes the chalk from her. She looks at the teacher.] Ngamakhulu mabini aneshumi linye linesihlanu. [The teacher shakes her head indicating that that is correct. The girl writes the number '215' on the board.]	[A girl runs up to the teacher and takes the chalk from her. She looks at the teacher.] Two hundreds, one ten with five. [The teacher shakes her head indicating that that is correct. The girl writes the number '215' on the board.]
31. Nokhaya	[Asks the class] Ngubani ela nani?	[Asks the class] What is the number?
32. LL	Ngamakhulu mabini aneshumi linye linesihlanu.	Two hundreds, one ten with five.
33. Nokhaya	Ngubani?	What is it?
34. LL	Ngamakhulu mabini aneshumi linye linesihlanu.	Two hundreds, one ten with five.
35. Nokhaya	Ngubani eli inani? [Writes the number '401' on the board.] Ngubani eli inani? [Looks at the learners] Ngubani eli inani?	What number is this? [Writes the number '401' on the board.] What number is this? [Looks at the learners] What number is this?
36. L	Ngamakhulu mane aneshumi.	Four hundred and ten.

37. Nokhaya	[Asks again] Mh? Ngubani ela nani? Kutheni kuphakamisa umntu omnye? Mabaphakamise izandla kaloku nabanye abantu. Luthando, ngubani ela nani?	[Asks again] Mh? What number is this? Why is there only one hand up? Raise your hands and answer; I don't want to get the answers from the same people all the time. Luthando, what number is this?
38. L	[Luthando answers] Ngamashumi mane ananye.	[Luthando answers] Four tens and one.
39. Nokhaya	Unyanisile?	Is he correct?
40. LL	[They answer in English] No Miss	[They answer in English] No Miss
41. L	[Luthando answers again] Ngamakhulu mane ananye.	[Luthando answers again] Four hundreds and one.
42. Nokhaya	Unyanisile?	Is he correct?
43. LL	[They answer in English] Yes Miss	[They answer in English] Yes Miss
44. Nokhaya	Ja, unyanisile. Ngamakhulu mane ananye. Ngubani?	Yes, he is correct. Four hundreds and one. What is the number?
45. LL	Ngamakhulu mane ananye.	Four hundreds and one.
46. Nokhaya	Ngubani?	What is it?
47. LL	Ngamakhulu mane ananye.	Four hundreds and one.
48. Nokhaya	Ndifuna umntu oza ndibhalela amakhulu mabini anamashumi mahlanu anesithandathu. [A learner takes the chalk from the teacher and goes to the board to write. The teacher repeats the number to the class] Amakhulu mabini anamashumi mahlanu anesithandathu. [A learner writes '256' on the board.]	I want one of you to come and write the number two hundreds, five tens and six on the board. [A learner takes the chalk from the teacher and goes to the board to write. The teacher repeats the number to the class] Two hundred, five tens and six. [A learner writes '256' on the board.]
49. LL	[The learners clap hands in applause and read the number] Ngamakhulu mabini anamashumi mahlanu anesithandathu.	[The learners clap hands in applause and read the number] Two hundred, five tens and six.
50. Nokhaya	Ndiza kucela amakhwenkwe; amakhwenkwe awezi; umntu oza ndibhalela: likhulu linye linamashumi asithoba anesibini; l ikhulu linye linamashumi asithoba anesibini.	I'll ask one of the boys; the boys are not coming forward; one person to come and write this number for me: one hundred, nine tens and two; one hundred, nine tens and two.
51. LL	[A boy volunteers. He stops and looks at the teacher when he is at the board. She looks at the class and they repeat the number] Likhulu linye linamashumi asithoba anesibini.	[A boy volunteers. He stops and looks at the teacher when he is at the board. She looks at the class and they repeat the number] One hundred, nine tens and two.
52. L	[The boy writes the number '192' on the board.]	[The boy writes the number '192' on the board.]
53. Nokhaya	Ngubani?	What is it?
54. LL	Likhulu linye linamashumi asithoba anesibini.	One hundred, nine tens and two.

55. Nokhaya	Kweli nani likaKamva ndifuna undibhalele ixabiso leli nani. [She underlines the '2' in 19 <u>2</u> . Some of the girls rush up to the board.] Bendithe umntu makaphakamise isandla. Bendithe makathini?	From the number that Kamva has written, I want one of you to write down the value of this number [She underlines the '2' in 19 <u>2</u> . Some of the girls rush up to the board.] Raise your hands if you want to come and write the answer. What did I say?																				
56. L	Makaphakamise isandla.	Lift up hands.																				
57. Nokhaya	Makaphakamise isandla. Ixabiso leli nani?	Lift up hands. The value of this number?																				
58. L	[The teacher chooses a learner and he writes '200' on the board.]	[The teacher chooses a learner and he writes '200' on the board.]																				
59. Nokhaya	Urayiti?	Is he correct?																				
60. LL	[They answer in English] No Miss	[They answer in English] No Miss																				
61. Nokhaya	Isandla! Isandla! Ixabiso leli nani?	Hands! Hands! The value of this number?																				
62. L	[She chooses another boy. He writes '2'.]	[She chooses another boy. He writes '2'.]																				
63. Nokhaya	Urayiti?	Is he correct?																				
64. L	[They answer in English] Yes Miss! [They all clap for him.]	[They answer in English] Yes Miss! [They all clap for him.]																				
65. Nokhaya	Ndifuna ke ngoku umntu... Buya umva ume kweza ndawo bendithe yiba kuzo. Ndifuna umntu ozazoku ndibalela ngohlobo lwakhe aza kubala ngalo. [She writes '128 + 113' on the board.]Ndifuna umntu oza thi andibalele la sum. Bendithe umntu makaphakamise isandla. Umntu oza ndibalela phaya. [She chooses a girl.]	I now want someone... Move back and stand where I said you must stand. I want somebody to come and work this sum out as he/she wants to work it out. [She writes '128 + 113' on the board.] I want someone to work this sum out. I said the person must raise a hand. Someone to work this one here. [She chooses a girl.]																				
66. L	[The girl writes on the following on the board].	[The girl writes on the following on the board].																				
The girl decomposes 128 first writing the 100 then 20 then 8 underneath each other. Then she decomposes the 113 in the same way. Then she adds the '+' signs and solves each equation. Someone reminds her to put in the '=' signs.		<table><tr><td>100</td><td>+</td><td>100</td><td>=</td><td>200</td></tr><tr><td>20</td><td>+</td><td>10</td><td>=</td><td>200</td></tr><tr><td>8</td><td>+</td><td>3</td><td>=</td><td>11</td></tr><tr><td colspan="5">=241</td></tr></table>	100	+	100	=	200	20	+	10	=	200	8	+	3	=	11	=241				
100	+	100	=	200																		
20	+	10	=	200																		
8	+	3	=	11																		
=241																						
[The highlighted sections were done by a second child as the first got stuck on the second equation (20 + 10 = 30).]		[The highlighted sections were done by a second child as the first got stuck on the second equation (20 + 10 = 30).]																				

67. L	[Another girl addresses the learner who is writing on the board] Zenza? [The girl writing on the board puts in the equal sign. She puts in all the equals signs. She then writes the answer to '100 + 100' which is 200. She takes a long time to work out '20 + 10'. She writes a three digit number.]	[Another girl addresses the learner who is writing on the board] Makes? [The girl writing on the board puts in the equal sign. She puts in all the equals signs. She then writes the answer to '100 + 100' which is 200. She takes a long time to work out '20 + 10'. She writes a three digit number.]					
68. L	Hayi, hayi bo! Ayikulungi. [Referring to the girl who is writing on the board. The girl rubs out her answer.]	No. No. Still wrong. [Referring to the girl who is writing on the board. The girl rubs out her answer.]					
69. Nokhaya	Ukhona omnye umntu ofuna ukumnceda?	Is there one of you who would like to help?					
70. LL	[Some girls put their hands up] Ndim Miss. Ndim Miss.	[Some girls put their hands up] It's me Miss. It's me Miss					
71. Nokhaya	Imakulondawo ukuyo uphakamise isandla. Yiza bhuti. [Looking at the first volunteer] Alright ke. Ndiza kujonga xabeyenza.	Stand where you are and raise your hand. Come boy. [Looking at the first volunteer] Alright, please observe as the others work others do the sum.					
72. LL	[This boy solves the rest of the problem quickly; putting in the answer to '20 + 10' and '8 + 3'. He then writes '= 241' and looks at the teacher.]	[This boy solves the rest of the problem quickly; putting in the answer to '20 + 10' and '8 + 3'. He then writes '= 241' and looks at the teacher.]					
73. Nokhaya	[Addressing the class] Nyan'sile?	[Addressing the class] Is it correct?					
74. LL	[They answer in English.] Yes Miss [They all clap.]	[They answer in English.] Yes Miss [They all clap.]					
75. Nokhaya	Omnye onondibalela ngolunye uhlobo kwala sum inye?	Can any one of you who can work out the same sum differently?					
76. L	[A girl comes up to the board and writes starts solving the problem]	[A girl comes up to the board and writes starts solving the problem]					
77.	<table><tr><td>$100 + 100 + 20 + 10 + 8 + 3$  </td><td rowspan="4">When this child starts adding, he starts with the 8 + 3, then 20 + 10 and then 100 + 100. He uses the HTU method to work out the final answer. He then rubs out the HTU except for the answer.</td></tr><tr><td>$200 + 30 + 11$</td></tr><tr><td>$\begin{array}{r} 200 \\ 30 \\ \underline{11} \\ 241 \end{array}$</td></tr><tr><td></td></tr></table>		$100 + 100 + 20 + 10 + 8 + 3$ 	When this child starts adding, he starts with the 8 + 3, then 20 + 10 and then 100 + 100. He uses the HTU method to work out the final answer. He then rubs out the HTU except for the answer.	$200 + 30 + 11$	$\begin{array}{r} 200 \\ 30 \\ \underline{11} \\ 241 \end{array}$	
$100 + 100 + 20 + 10 + 8 + 3$ 	When this child starts adding, he starts with the 8 + 3, then 20 + 10 and then 100 + 100. He uses the HTU method to work out the final answer. He then rubs out the HTU except for the answer.						
$200 + 30 + 11$							
$\begin{array}{r} 200 \\ 30 \\ \underline{11} \\ 241 \end{array}$							
78. LL	[The class claps indicating that she is correct.]	[The class claps indicating that she is correct.]					

79. L	[Another learner comes to the board to solve the sum in a different way.]	[Another learner comes to the board to solve the sum in a different way.]
80. Nokhaya	Bhala phaya. [The teacher shows the girl where to write.]	Write there. [The teacher shows the girl where to write.]
81. L	[The learner solves the sum]	
$(100 + 100) + (20 + 10) + (8 + 3)$ $200 \quad + \quad 30 \quad + \quad 11 \quad \text{He puts the two '+' signs in before calculating}$ $=241$		
82. LL	[The class claps.]	[The class claps.]
83. Nokhaya	Alright, alright. Enkosi.	Alright, alright. Thank you.
84. LL	[Some girls come up and clean the board.]	[Some girls come up and clean the board.]
85. Nokhaya	Ndiza zonyulela umntu ozazo kubala, ndiza zikhethela ke ngoku ke, ndifuna ke ngoku umntu oza zondibalela. [She writes '215 + 90' on the board] Ndiza zonyulela ngoku, buya umva, khawuze Dudu.	I am now going to nominate one of you to work out this sum for me. [She writes '215 + 90' on the board] You must all stand back while I decide who will do this one for me. Come and work this one out, Dudu.
86. L	[A girl comes up and solves the problem.]	
$(200) + (10 + 90) + (5 + 0)$ $200 + 100 + 5 \text{ (the '+' signs are added in afterwards)}$		She took some time to figure out if something should go next to the 200, and to write the 90 in the same bracket as the 10
87. Nokhaya	Masimxeleleni.	Let's help her out.
88. LL	[They give the answer in English] Three hundred and five.	[They give the answer in English] Three hundred and five.
89. Nokhaya	Hayi, niyakhumsha ngoku.	No, you are using English.
90. LL	Ngamakhulu mathathu anesihlanu.	Three hundreds and five.
91. Nokhaya	Masimxeleleni ukuba ufanele abeke bani phaya.	Let us tell her what to place there.
92. LL	[They say it in English] Zero. [She writes 305 and the class all clap hands.]	[They say it in English] Zero. [She writes 305 and the class all clap hands.]
93. Nokhaya	All right.Hlalani phantsi, nithathe incwadi zenu nibhale idate yanamhlanje umntu ndiza mnika isum aza' y'bhala.	All right. Now sit down, take out your books and write down today's date. I'll give each one of you a sum to work out.
94. L	Siza kuyibhala phi Miss? Ezincwadini? Kweyakho?	Where are we going to write Miss? In the books? Yours?
95. Nokhaya	Ewe, kweyakho incwadi.	Yes, your own book.
96. L	Incwadi yantoni?	From which book?
97. Nokhaya	eyeMaths. EyeZibalo?	Maths. Maths?

98. LL	[They answer in English] Maths. [The class starts to settle down at their desks and the teacher starts to hand out some cards with sums written on them. The cards are made out of cereal boxes which have been cut into strips. On the back of each strip is a single addition equation.]	[They answer in English] Maths. [The class starts to settle down at their desks and the teacher starts to hand out some cards with sums written on them. The cards are made out of cereal boxes which have been cut into strips. On the back of each strip is a single addition equation.]
99. Nokhaya	Wonke umntu ulifumene icard?	Have you all got your cards?
100. LL	[They all answer in English] Yes Miss.	[They all answer in English] Yes Miss.
101. Nokhaya	Namahlanje. Umhla wanamhlanje yintoni?	Today. What is today's date?
102. LL	EyeThupha.	August
103. Nokhaya	EyeThupha [She writes it on the board.]	August [She writes it on the board.]
104. Nokhaya	[The teacher walks around the class checking that everyone is settled and working. The learners are each working quietly on their equation. The teacher stops to assist an individual learner who is seated at the 'weak' table.]	[The teacher walks around the class checking that everyone is settled and working. The learners are each working quietly on their equation. The teacher stops to assist an individual learner who is seated at the 'weak' table.]

105. Nokhaya	Ogqibe ukubhala yaba right ke siza kumqhwabela. [The teacher goes to a child who is finished, marks her work and holds the book up in the air. The class claps] (...) (...) [Another child puts up her hand and the teacher goes to her. She does not have the correct answer. The teacher interacts briefly with her and then moves on to another child. Each time a child has solved the equation correctly, the class claps. The child has fixed her error. As the children finish, they sit quietly at their desks waiting for the others to complete their equation. Addressing one of the learners] Ngamakhulu amangaphi la? Uza kuwadibanisa njani la makhulu? Yinto yokuba uyawakhumsha la manani. Bhala amakhulu apha, namashumi apha nemivo yakho apha, ubale ke ngoku (...) (...) Igqibile le group. Igqibile nale? Masiziqhwabele! Nigqibile nani? Le igroup yona ayikagqibi? Kusekho umntu ongekagqibi apha?	We'll clap hands for the early finishers who have the correct answers. [The teacher goes to a child who is finished, marks her work and holds the book up in the air. The class claps] (...) (...) [Another child puts up her hand and the teacher goes to her. She does not have the correct answer. The teacher interacts briefly with her and then moves on to another child. Each time a child has solved the equation correctly, the class claps. The child has fixed her error. As the children finish, they sit quietly at their desks waiting for the others to complete their equation. Addressing one of the learners] What number is this? How many hundreds do you have here? How are you going to add these numbers? You are saying these numbers in a foreign language. Remember to write your hundreds here, your tens here and your units here (...) (...) This group has now finished their work. Has this group also finished? Let's clap hands for them. Is there someone who is still busy here? We have also finished Miss.
106. L	Sigqibile nathi Miss	

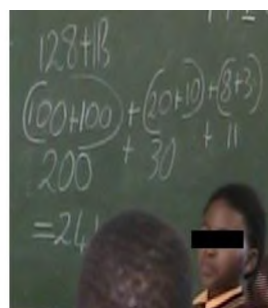
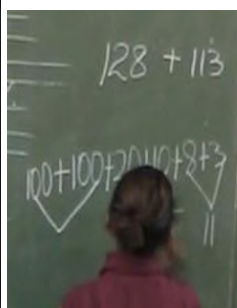
APPENDIX 8

Empirical data of Nokhaya's mathematics pedagogical practices

As mentioned in Chapter Five, Nokhaya teaches Grade 3 at Sontonga Public School. Nokhaya, despite having taught for 33 years, had only been teaching in the Foundation Phase for 18 months when I met her. I video-recorded three of the lessons Nokhaya taught and wrote observation notes for eight lessons. I also observed the children doing the ANA exemplar for maths. I provide a short description of each of the three video-recorded lessons below as I draw primarily on these in the presentation of empirical data in Chapter Six. The first lesson was on number development and addition of multi-digit numbers; the second focused on counting and number patterns; and the third lesson was on clock time.

Lesson summary 8.1: Addition of two three-digit numbers (video-recorded lesson 1):

The children stand in the front of the class facing the chalkboard. This lesson (appendix 7) begins with the children counting in unison. They are counting forwards in 1s. Nokhaya stops them to begin the number concept work. She writes two numbers on the board (28, 130) and asks the children to read the numbers. She underlines different digits in various numbers (130, 170, 9) and asks the children the value of each of the digits. She then gives the children numbers orally (215, 401, 256, 192) and they are required to write the numbers on the board. Using the last number (192) Nokhaya checks if the children understand the value of the digits. The lesson moves to addition of two three-digit numbers. Nokhaya writes two sums⁸⁰ ($128 + 113$, $215 + 90$) on the board, one at a time, and asks individual children to solve them on the board. After one of the children has solved the first sum, she asks the children if there is a different way of working out this sum. The video snapshots below show the two representations of the 'breaking down and building up' method used by two girls in the class.



The 'breaking down and building up' is the dominant method, with the majority of the learners inserting brackets around the hundreds, tens and units as shown in CAPS (2011c).

The children all take out their books and are given individual cards with sums written on them to calculate. The sums are written onto rectangular pieces of card made out of cereal boxes, e.g:

$$216 + 103 =$$

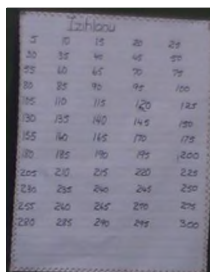
$$327 + 96 =$$

As the children complete a sum they take another card. Nokhaya walks around the class observing and marking the children's work.

⁸⁰ I use the word 'sum' for calculations involving all of the number operations (i.e. addition, subtraction, multiplication and division) as this is the term used by teachers in South Africa.

Lesson summary 8.2: Counting in 5s (video-recorded lesson 2):

The children stand at the front of the class facing the board. They begin the lesson counting in 5s from 90 to 300. Nokhaya puts a counting chart on the chalkboard and gives instructions to the children for counting in 5s.



5	10	15	20	25
30	35	40	45	50
55	60	65	70	75
80	85	90	95	100
105	110	115	120	125
130	135	140	145	150
155	160	165	170	175
180	185	190	195	200
205	210	215	220	225
230	235	240	245	250
255	260	265	270	275
280	285	290	295	300

The children count in 5s:

- from 65 to 120 (The whole class count in unison);
- from 50 to 195 (An individual child is asked to count. Before the child counts, Nokhaya points to 150 on the chart and asks the child who is about to count to point to 195);
- from 100 to 70 (An individual child is asked to count).

Nokhaya asks the children if the counting is forwards or backwards.

Counting continues with:

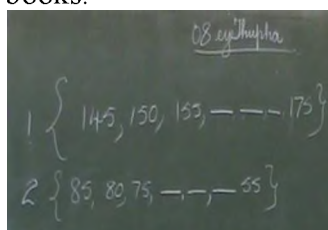
- an individual child counting from 170 to 140 (before the child counts a learner points to 170 and another to 140 on the chart);
- the whole class counts in unison from 110 to 5.

Nokhaya asks the children if the counting is forwards or backwards.

Once the children have counted verbally in unison and as individuals, Nokhaya asks individual children to write various counting sequences on the board. These include:

- from 80 to 90;
- from 60 to 80;
- from 65 to 50;
- from 220 to 180.

The children are asked to go back to their desks and take out their mathematics books. Nokhaya writes two counting sequences on the board. All involve counting in 5s which the children do in their mathematics books.



Nokhaya walks around the class observing and marking their work.

Lesson summary 8.3: Reading analogue time (video-recorded lesson 3):

The children are at the front of the class. The lesson (Appendix 12) begins with Nokhaya asking the children to imagine they are a clock and their arms represent the hands of the clock. Focusing on 'before' and 'after' she gets the children to wave the appropriate arm when she calls out 'before' or 'after'. The children chorus the words 'after' or 'before' depending on the arm they are waving.

Using a clock with movable hands, she explains to the children that when the minute hand moves down the right-side of the clock (i.e. as you look at it) we use the word 'after', and as the minute hand moves up the left side of the clock (i.e. as you look at it), we use the word 'before'. The children repeat the words 'after' and 'before' after her.

Still using the clock, Nokhaya gets the children to see that the minute hand is 'moving forwards/up' when it is 'before' and 'moving downwards/down' when it is 'after'.

Nokhaya sets the clock to different times and asks the children to tell her what the time is and write the time on the board. These include:

- 07:15 (She gets the children to realise that '15 minutes after' is the same as 'quarter past', and she encourages them to count in 5's to 15);
- 08:35 (She explores '35 mins past' and '25 mins to' with the children, and she lets the children count in 5s backwards from 60 to 35 using the clock);
- 08:55.

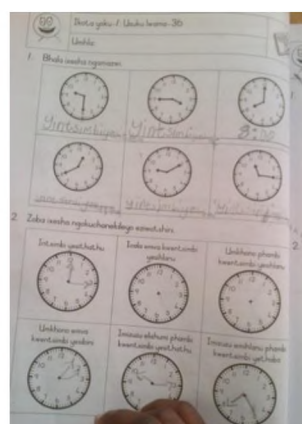
Nokhaya asks a child to set a time on the clock. She asks for:

- 01:20 (She asks another child to write the time on the board);
- 02:05 (She asks another child to write the time on the board. The child write 2:5 and is corrected by another child);
- 12:00 (She asks another child to write the time on the board);
- 09:30 (She asks another child to write the time on the board).

Nokhaya reminds the children that they need to count the minutes in 5's to work out the time. She continues asking children to set the time on the clock:

- 10:00;
- 06:45 (She expresses it as 'quarter to seven'. She asks if there is another way of saying 'quarter to seven' and while some children know it is '15 minutes to', there is confusion as to whether it is 15 minutes to 7, 8 or 9).

The children go back to their desks. They take out their textbooks and complete an exercise on time.



Nokhaya walks around the class observing and marking their work.

The excerpts that I have chosen as typical of Nokhaya's mathematics pedagogical practice are both from the third video-recorded lesson that is the lesson on clock time. I have broken them into two sections for ease of reading and reference. The children have just finished waving their right arms when hearing the word 'emva' (after) and their left arms on hearing the word 'phambi' (before). This Nokhaya has done to mimic the side of the clock that is 'before' and the side that shows 'after'.

Excerpt 8.1: Nokhaya's lesson on time (explanation of 'before' and 'after'):

(Nokhaya, VRL3, tt.34-72)

34.	Nokhaya	[The teacher holds the wall-clock up] Nantsi le wotshi. Ime njengani nale wotshi. Ithi le wotshi 'emva' [The teacher moves her hand down the right side of the clock-face, as you look at it]. Ithini?	[The teacher holds the wall-clock up] Here is this clock. It is positioned the same way as you are standing. This clock says 'after' [The teacher moves her hand down the right side of the clock-face, as you look at it]. <i>What does it say?</i>
35.	LL	Emva [Some the children spontaneously put their arms up]	After [Some the children spontaneously put their arms up]
36.	Nokhaya	Ithini?	<i>What does it say?</i>
37.	LL	Emva	After
38.	Nokhaya	[The teacher moves her hand up the left side, as you look at it, of the wall-clock] Ithi kweli cala 'phambi', 'phambi', 'phambi' [repeating for the children]	[The teacher moves her hand up the left side, as you look at it, of the wall-clock] This side it says 'before'; 'before'; 'before' [repeating for the children]
39.	LL	Phambi [The children change arms]	Before [The children change arms]
40.	Nokhaya	Phambi	Before
41.	LL	Phambi	Before
42.	Nokhaya	Ndiyakhomba ke ngoku... Uz' undixelele ukuba njengokuba ndikhomba nje uqaphele ntoni. Ndithi 'emva' [The teacher moves her hand down the right side, as you look at it, of the clock] Uyabona? Ndithi emva. Undibonile? Ndiz' othi 'phambi', 'phambi' [The teacher moves her hand up the left side, as you look at it, of the clock]. Uqaphele ntoni? Ndithi 'emva' [Moving her hand down the right side, as you look at it, of the clock]. Nibonile neh?	I am pointing now... You must tell me what you are observing as I point. I say 'after' [The teacher moves her hand down the right side, as you look at it, of the clock] <i>Do you see?</i> I say 'after'. <i>Have you seen me?</i> I'm going to say 'before', 'before' [The teacher moves her hand up the left side, as you look at it, of the clock]. <i>What have you noticed?</i> I say 'after' [Moving her hand down the right side, as you look at it, of the clock]. <i>You have seen, hey?</i>

43.	LL	Yes Miss.	Yes Miss!
44.	Nokhaya	Ndithi 'emva' ndiz' othi ke ngoku 'phambi'. Uqaphele ntoni? Heh? Ubonile? Isandla sam ndiyasehlisa xa ndisithi 'emva' [Moving her hand down the right side, as you look at it, of the clock]. Ubonile neh? Ndiz' othi 'phambi' [Moving her hand up the left side, as you look at it, of the clock] ndisithini?	I say 'after' and then I am now going to say 'before'. What have you noticed? Huh? Have you observed? I move my hand down when I say 'after' [Moving her hand down the right side, as you look at it, of the clock], have you noticed? Huh? I am going to say 'before' [Moving her hand up the left side, as you look at it, of the clock], and what will I do (with my hand)?
45.	L	Usinyuse.	Move it up.
46.	Nokhaya	Inoba kutheni ndisenza loo nto?	Why do I do that?
47.	L	Uya phambili.	You are moving forward.
48.	Nokhaya	Heh?	Huh?
49.	L	Uya phambili.	You are moving forward.
50.	Nokhaya	Inoba kutheni ndisenza loo nto? Ndinyuka ngapha, heh? Ngapha ndehlise isandla, ndathi 'emva'. [Moving her hand down on the right side, as you look at it, of the clock]. Ndathi 'emva'. Undibonile? Ngapha ndasonyusa [moving her hand up the left side, as you look at it, of the clock], inoba kutheni? Heh? Inoba kuthen? Heh?	Why am I doing that? I move my hand up this side, huh? On this side I moved my hand down and said 'after'. [Moving her hand down on the right side, as you look at it, of the clock]. I said 'after'. Have you observed? On this side [moving her hand up the left side, as you look at it, of the clock], I moved it (my hand) up. Why? Huh? Why? Huh?
51.	L	Uya phambili, usiba luyehla.	You are moving forward. The clock-hand is moving downwards.
52.	L	Ndiyalazi ixesha.	I know the time.
53.	Nokhaya	[To the first child] Heh? Kha uphinde uthethe le nto ubuyithetha!	[To the first child] Huh? Repeat what you just said!
54.	L	Olu siba luyehla.	The clock-hand is moving down.
55.	Nokhaya	Kweli cala lingapha usiba luyathini? [Moving her hand up the left side, as you look at it, of the clock]	On this side, the clock-hand is doing what? [Moving her hand up the left side, as you look at it, of the clock]
56.	L	Luyenyuka.	It is moving up.
57.	Nokhaya	Very good! Luyenyuka. [Moving her hand up the left side, as you look at it, of the clock] Luyenyuka. Yiyo le nto isandla ndisenyusa. Ndisithi luyathini?	Very good! It is moving up. [Moving her hand up the left side, as you look at it, of the clock] It's moving up. That is why I move my hand up. It is doing what?
58.	LL	Luyenyuka.	It is moving up.
59.	Nokhaya	Kweli cala lingapha luyehla [moving her hand down the right	On this side it is moving down [moving her hand down the right

		side, as you look at it, of the clock]. Luyathini?	side, as you look at it, of the clock]. It is doing what?
60.	LL	Luyehla.	It is moving down.
61.	Nokhaya	Kweli cala lingapha luyenyuka. [Moving her hand down the right side, as you look at it, of the clock] Kweli cal lingapha luyathini?	On this side it is moving up. [Moving her hand down the right side, as you look at it, of the clock] On this side it is doing what?
62.	LL	Luyehla.	It is moving down.
63.	Nokhaya	Yiyo le nto ndithe 'emva' [moving her hand down the right side, as you look at it, of the clock]. Ndathi ngapha 'phambi' [moving her hand up the left side, as you look at it, of the clock] Ndenyuka. Ndifuna ke ngoku undixelele ixesha. [Waves her left arm out in the direction of the door i.e. the right side of the clock as you look at it] Ukhumbule ukuba bendithe kweli cala ngubani? [Moving the minute-hand to her left].	That is why I said 'after' and moved it down [moving her hand down the right side, as you look at it, of the clock]. I then said 'before' and moved it up this side [moving her hand up the left side, as you look at it, of the clock] It is moving up. I now want you to tell me the time. [Waves her left arm out in the direction of the door i.e. the right side of the clock as you look at it]. You must remember that I said. On this side is what? [Moving the minute-hand to her left].
64.	LL	Emva [A few children wave their right arm in the direction of the door]	After [A few children wave their right arm in the direction of the door]
65.	Nokhaya	Kweli cala ngubani? Moving the minute-hand to her right].	On this side is what? Moving the minute-hand to her right].
66.	LL	Emva [A few children wave their right arm in the direction of the door]	After [A few children wave their right arm in the direction of the door]
67.	Nokhaya	Ngubani?	What is it?
68.	LL	Emva [A few children wave their right arm in the direction of the door].	After [A few children wave their right arm in the direction of the door].
69.	Nokhaya	[Waving her right arm, now the left side of the clock as one faces it, to the windows] Ngubani?	[Waving her right arm, now the left side of the clock as one faces it, to the windows] What is it?
70.	LL	Phambi [A few children wave their left arm in the direction of the window]	Before [A few children wave their left arm in the direction of the window]
71.	Nokhaya	Ngubani?	What?
72.	LL	Phambi [A few children wave their left arm in the direction of the window]	Before [A few children wave their left arm in the direction of the window]

Excerpt 8.2: Nokhaya's lesson on time (setting the time):

(Nokhaya, VRL3, tt. 74-111)

74.	Nokhaya	[The teacher moves the hands of the clock to set the time. She sets it to 07h15 and holds it up for the children to see] Ngubani xesha? Ukhumbule ke xa uzaw' ndixelela eli xesha.	[The teacher moves the hands of the clock to set the time. She sets it to 07h15 and holds it up for the children to see] What is the time? Remember what I've told you. What is the time?
75.	L	Ngumkhono emva kwentsimbi yesixhenxe.	It is a quarter past seven.
76.	Nokhaya	Ewe! Ngubani ixesha ke?	Yes! What is the time?
77.	LL	Ngumkhono emva kwentsimbi yesixhenxe.	It is a quarter past seven.
78.	Nokhaya	Ngumkhono emva kwentsimbi yesixhenxe. Ngumkhono emva kwentsimbi yesixhenxe. Xa singafuni ukuthi ngumkhono emva kwentsimbi yesixhenxe, siza kuthi ngubani ixesha?	It is a quarter past seven. It is a quarter past seven. If we do not want to say it is a quarter past seven, what are we going to say the time is?
79.	L	Quarter past seven.	Quarter past seven.
80.	Nokhaya	Ewe. Xa singafuni ukutsho siza kuthi ngubani?	Yes. When we don't want to say that, what are we going to say it is?
81.	L	Quarter past	Quarter past
82.	Nokhaya	Saw'thi ngubani? Phakamis' isandla. Saw' thi ngubani xa singafuni ukutsho?	What'll we say it is? Raise your hand. What'll we say it is when we don't want to say that?
83.	L	Quarter past	Quarter past
84.	Nokhaya	Heh?	Huh?
85.	L	Quarter past seven	Quarter past seven
86.	Nokhaya	Besetitshilo kaloku. Xa singafuni ukutsho saw' thini? Xa singafuniyo ukutsho sakuthi ... yimizuzu [She moves her finger from the '12' to the '3'].	Huh? We've said that already. When we do not want to say that what'll we say? When we do not want to, we'll say it is ... minutes [She moves her finger from the '12' to the '3'].
87.	LL	Phambi	Before
88.	Nokhaya	Heh?	Huh?
89.	LL	Yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	It is fifteen minutes after the hour of seven.
90.	Nokhaya	Kwakhona!	Again!
91.	LL	Yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	It is fifteen minutes after the hour of seven.
92.	Nokhaya	Kwakhona!	Again!

93.	LL	Yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	It is fifteen minutes after the hour of seven.
94.	Nokhaya	Uyazi njani ukuba ilishumi elinesihlanu laa mizuzu? Le mizuzu uyazi njani ukuba ilishumi elinesihlanu? [Pointing her finger to that side of the clock].	How do you know that this is fifteen minutes? How do you know that this is fifteen minutes? [Pointing her finger to that side of the clock].
95.	L	Ubala ngezihlanu	You count in fives.
96.	Nokhaya	Ubale ngantoni?	You counted in what?
97.	LL	Ngezihlanu	In fives
98.	Nokhaya	Ubale ngantoni?	You counted in what?
99.	LL	Ngezihlanu	In fives
100.	Nokhaya	Masizibale ke ezi zihlanu. [She moves her hand over the 15-minute-past-7 space on the clock-face].	Let us count these fives. [She moves her hand over the 15-minute-past-7 space on the clock-face].
101.	LL	Ntlanu, shumi, lishumi elinesihlanu.	Five, ten, fifteen.
102.	Nokhaya	Imizuzu mingaphi ke?	How many minutes?
103.	LL	Lishumi elinesihlanu emva kwentsimbi yesixhenxe.	Fifteen minutes after the hour of seven.
104.	Nokhaya	Kwakhona!	Again!
105.	LL	Lishumi elinesihlanu emva kwentsimbi yesixhenxe.	Fifteen minutes after the hour of seven.
106.	Nokhaya	Sithe kuqala 'ngumkhono emva kwentsimbi yesixhenxe', ngoku sithi 'yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe'. Uyayibona' ba zininzi iindlela zokuyibiza, andithi?	We first said it is a quarter past seven, we are now saying it is fifteen minutes after seven. Do you see that there are many ways of saying this? Not so?
107.	LL	Yes Miss	Yes Miss!
108.	Nokhaya	Ndifun' ba ngoku umnt' azo kundibhalela apha ebhodini. Yimizuzu ilishumi elinesihlanu emva kwentsimbi yesixhenxe. Ubhale ngokwenani. Imizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	I now want someone to write this on the board for me. It is fifteen minutes after the hour of seven. Write it as a number. Fifteen minutes after the hour of seven.
109.	L	[A child writes 07.15 on the board].	[A child writes 07.15 on the board].
110.	Nokhaya	Unyanisile?	Is that true?
111.	LL	Yes Miss [They clap].	Yes Miss [They clap].

Vignettes:

I have included two vignettes, 8.1 and 8.2 as representations of Nokhaya's teaching of foundation phase mathematics. My reason for doing this is that the third calculation in vignette 8.1 is, in many respects, dependent on manner in which children are expected to break down numbers with '0 tens' (e.g. 309).

Vignette 8.1: Nokhaya's children using the 'breaking down and building up method' method with brackets:

(Nokhaya, FN, pp.9-10; reformatted for ease of reading)

Nokhaya explains that she is going to write a sum on the board and wants to see who can solve it. She writes '298-147'. A girl who has her hand up goes up to the board and begins to calculate.

She first draws all the brackets on the board and then she puts in the numbers starting with the hundreds:

$$(200 - 100) + (90 - 40) + (8 - 7)$$

She works each 'bracketed' component out first and writes:

$$100 + 50 + 1 = 151$$

The class claps

Nokhaya writes another sum on the board: '215- 95'.

A girl who has her hand up comes to the board and performs the calculation. She also starts by drawing three sets of brackets with the + sign in between each. She writes:

$$(200) + (10 - 90) + (5 - 5).$$

She seems unsure about what to do next so Nokhaya scaffolds this process by asking her what she needs to do and asking one of the other children to assist her.

The girl begins with the '5-5' and tells the class:

$$5 - 5 \text{ is } 0; '10 - 90'$$

She takes '100' from the '200' and puts this with the '10' (i.e. $1^{10} - 90$) [Nokhaya did not appear to pick up that the '100' was written in the incorrect place.]

Nokhaya writes a third calculation on the board: '108- 6'.

Another girl is asked to come to the board and solve it. The process that she uses is the same: brackets first, followed by the addition symbols and the subtraction symbols. The numbers are written last. She writes:

$$(100) + (00 - 60) + (8 - 6)$$

She starts with the '8-6' and writes the answer '2'.

She writes answer '0' for '00-60'.

The teacher asks the class if this is correct and a girl says 'No Miss'.

The girl then goes to the '100' and crosses it out. She writes '0' on top of it. She puts the '1' next to the '00' to make '100'.

$$100 - 60 = 40$$

$$40 + 2 = 42$$

The class claps.

Vignette 8.2 records an instance, which I recorded in my field notes where Nokhaya required the children to write ‘00’ instead of ‘0’ to represent the ‘tens’.

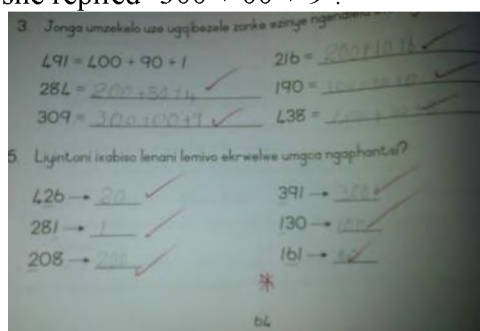
Vignette 8.2: Nokhaya’s expectation for decomposing numbers where the ten is ‘0’

(Nokhaya, FN, p.12; reformatted for ease of reading)

Nokhaya gives the children a worksheet to complete that focuses on the ‘breaking down and building up’ method. She wants the children to ‘break down’ various three-digit numbers.

While the children are completing the worksheet, Nokhaya walks around the class marking their work and assisting where need be.

I observe a boy breaking down ‘309’ in three different ways: ‘ $300 + 0 + 9$ ’, ‘ $300 + 9$ ’, ‘ $300 + 9 + 0$ ’. Each time Nokhaya tells the boy he is incorrect. I asked her what she wants the children to write to which she replied ‘ $300 + 00 + 9$ ’.



I asked Nokhaya why she wanted the children to write the ‘00’. She told me that they need to know that tens consist of 2 digits. She’s concerned that they’re going to get confused if they do not write the ‘00’.

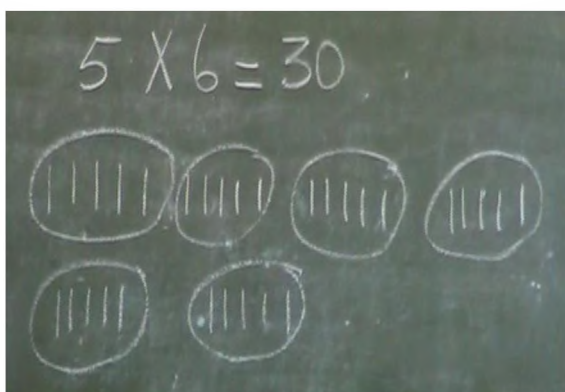
APPENDIX 9

Empirical data related to Beauty's teaching of Foundation Phase mathematics

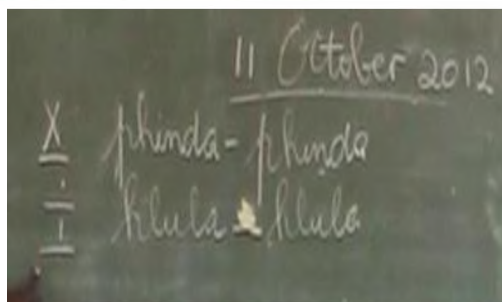
Beauty is one of two Grade 3 teachers at Phambili Public School. During my time with her I observed eight lessons, three of which I video-recorded. The three lessons that I video-recorded included a revision lesson on multiplication and division; a lesson on 2-D shapes; and the formal assessment task that focused on the children's knowledge of fractions. I briefly describe each of the lessons below.

Lesson summary 9.1: Revision of multiplication and division (video-recorded lesson 1):

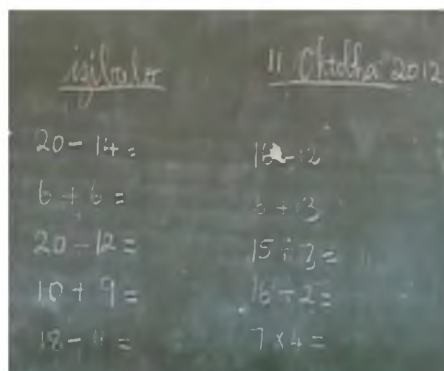
On the board, Beauty has written 'phina-phinda' (multiplication) and the symbol for multiplication. The lesson begins with Beauty explaining to the children that "multiplying can also be adding" (t.1). She explains to the children how to multiply two single-digit numbers. Using the example '5x6', she draws five tallies on the board six times. She counts these and asks the children how many there are.



Her next example is 10x10 and she shows the children how to use their fingers to solve this sum. She poses a few multiplication sums to the class (5x2; 7x3; 10x4). During this time she uses two different expressions for the sums e.g. "seven times three" and "three sevens" (t.15). Towards the end of the lesson she writes the term 'hlula-hlula' (division) on the board and the symbol for division. The lesson shifts to focus on division.



She asks $20 \div 4$. Here she also uses different expressions "twenty divided by four", "how many times does four go into twenty", and "how many fours does twenty have?" (t.23). She explains that division is seeing how many times a number goes into another.



She writes some sums on the board and the children complete them in their books.

Lesson summary 9.2: 2-D shapes (video-recorded lesson 2):

Beauty has written 'imilo' ('shapes') on the board. This lesson begins with the children standing next to their desks and counting back in tens from 500-0 in English. Beauty stops them as they are counting too slowly. They continue at a quicker tempo. They count in ones from 50-100 in isiXhosa. The last counting exercise involves counting in fives from 0-500. This the children do in English.

Beauty introduces the topic of shapes using both the isiXhosa and English terms.

She asks the children what shapes they know and they start naming 2-D figures (triangle, square, circle, and rectangle). As they name the shape, Beauty repeats the name of the shape and provides them with the English term. She writes the names of the shapes on the board in isiXhosa and English. She asks me if I know what 'uxande' (rectangle) is in English (a shape with "two sides that are equal; other sides are long and other ones are short" (t.39)).

She asks the learners what they can tell her about each shape and then for examples of each shape in their everyday lives and in the classroom. This forms the bulk of the lesson. E.g. A circle is round. She gets the children to show that a circle is round using their arms. She sticks an example of a circle on the board next to the shape names. The children give examples of round objects (ball, golf ball, apple, orange, tomato, peach, onion, 'disky' (a small bouncing ball), eye, head, mango, hills (Beauty doesn't accept this one), watch, and marble. She does the same with triangles, squares and rectangles. As she introduces each shape, she shows them an object that represents that shape. Once this is complete she writes the properties of each shape on the board, focusing on the number of sides.



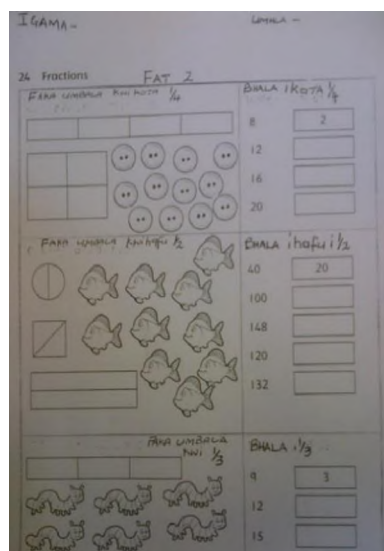
She has two sets of independent work planned; one for the children regarded as 'competent' in mathematics and one for the children who are 'struggling'. The children who are deemed competent, have to draw the shapes on paper and write their names underneath. This task is done individually. The children perceived to be struggling are asked to sort concrete representations of the shapes. They work in groups of four. They count each of the shapes after they have sorted them. One person in the group takes a group of shapes (e.g. squares) and the rest of the group have to tell that child how many were taken.

The lesson ends when the children who are doing the drawing and writing activity are finished.

Lesson summary 9.3: Fractions Formal Assessment Task (video-recorded lesson 3):

The lesson starts with Beauty handing out the worksheet that forms the formal assessment tasks (FAT) for fractions. She asks them to write their names on the worksheet and checks to see if they all have crayons.

She gives the children instructions of what to do in the FAT.



She draws the children's attention to the first instruction which is to colour in a quarter of the rectangle, square and buttons. She emphasises that this must be done in colour. With the example of the buttons she explains that they should count the buttons and ask how many fours go into the number of buttons on the FAT. They need to colour a quarter of the buttons.

She instructs the children to write and explains that they need to be finished in 30 minutes. As the children complete the FAT, they take it to her desk. She marks the FAT and the children return to their desks and wait for everyone to finish.

Beauty's mathematics pedagogical practices differed quite significantly in the three video-recorded lessons. However, I have chosen an excerpt that I regard as typical of Beauty's teaching of Foundation Phase mathematics when compared with the lessons recorded in my field notes. Excerpt 9.1 is from her first video-recorded lesson on multiplication.

Lesson excerpts

Excerpt 9.1: Beauty's lesson on multiplication:

(Beauty, VRL1, tt.1-28)

1.	Beauty	Abantu abayazanga loo nto leyo. Abantu abaninzi apha xa kuphinda-phindwa kwenzeka ntoni? Uphinda-phinda kuyakwazi ba kufane nantoni nokudibanisa. Mhlawumbi bunikwe u five times six [She writes the sum on the board.] Bangaphi aba five?	People didn't know that. What happens when you multiply? Multiplying can also be like adding. Maybe you were given five times six. [She writes the sum on the board.] How many fives are there?
2.	L	Bayi six	They are six
3.	Beauty	Bangaphi?	How many are there?
4.	L	Bayi six	They are six
5.	Beauty	Uyabala: One, two, three, four, five, six [She draws lines on the board.] Ngabokuqala ne? [She continues drawing groups of five lines.] One, two, three, four, five. Ngo five ngapha. [She realises the first one has six instead of five lines so she rubs one out.] One, two, three, four, five. One, two, three, four, five. One, two, three, four, five. One, two, three, four, five. Bangaphi? One, two, three, four [pointing to the number of groups she has drawn]. One, two, three, four, five. One, two, three, four, five. Naba o five bethu [she circles the groups] naba (...) Ngu five phinda phinda ngo six so uzazo fakela ngaphi abayi six. Ukhangele kengoku uba isi phumo sizaba ngubani? [She counts the lines she has drawn on the board in English, pointing to each one as she counts.] One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty, twenty one, twenty two, twenty three, twenty four, twenty five, twenty six, twenty seven, twenty eight, twenty nine, thirty. Ngubani isiphumo? [She writes the answer next to the sum.]	You count: One, two, three, four, five, six [She draws lines on the board.]. It's the first ones, isn't it? [She continues drawing groups of five lines.] One, two, three, four, five. It's fives this side. [She realises the first one has six instead of five lines so she rubs one out. One, two, three, four, five. One, two, three, four, five. One, two, three, four, five. One, two, three, four, five How many are there? One, two, three, four [pointing to the number of groups she has drawn]. One, two, three, four, five. One, two, three, four, five. Here are our fives [she circles the groups] they (...) Its five times six so you will put six. Check, what will the answer be? [She counts the lines she has drawn on the board in English, pointing to each one as she counts.] One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty, twenty one, twenty two, twenty three, twenty four, twenty five, twenty six, twenty seven, twenty eight, twenty nine, thirty. What is the answer? [She writes the answer next to the sum.]

6.	LL	Ngu-thirty	It's thirty
7.	Beauty	Abantu khang bakwazi ukuyiqonda ke lanto leya. Kubuzwa apha kuthiwa lo ten times ten? When oo-ten bebayi ten wawubala apha eminweni yakho. Ubala ngo ten. [She holds up her two hands and uses them to count in 10s in English.] Ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred. So oo-ten abayi ten ngubani?	People didn't understand that. Here we are asked this, ten times ten? When there are ten tens count with your fingers. Count in tens. [She holds up her two hands and uses them to count in 10s in English.] Ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred. So what is equal to ten tens?
8.	L	Ngu-hundred	It's hundred
9.	Beauty	Abantu ke khang bakwazi ukubala. Mabaphakamise abazifumene zonke. Abantu abayazi ne table ka three, abayazi abantu. Izolo besi senza uphinda-phinda nohlula-hlula. [She writes them on the board: times and divide.] Izolo besi senza uphinda-phinda nohlula-hlula. Five times two, hands up, five times two, five times two? (...) Matsabe?	People couldn't count them. Raise your hand if you got them all. People don't even know the table of three. People don't know it. Yesterday we did multiplication and division. [She writes them on the board: times and divide.] Yesterday, we did multiplication and division. Five times two, hands up, five times two, five time two? (...) Matsabe?
10.	L	Seven	Seven
11.	Beauty	Asidibanisi! Five phinda-phinda ngo two. Five times two. Oo-five ababini asidibanisi. Sibusiso?	We are not adding! Five times two. Five times two. Two fives. We are not adding. Sibusiso?
12.	L	Ten	Ten
13.	Beauty	Uright uSibusiso?	Is Sibusiso correct?
14.	LL	Yes	Yes
15.	Beauty	Five times two? Oo-five abangaphi? Ababini. [She counts in English] One, two, three, four, five. [She puts a circle them.] Naba o five bakho bayi two. Ubabale: One, two, three, four, five, six, seven, eight, nine, ten. Five times two. Asidibanisi xa siphinda-phinda. Seven times three? Seven times three? Oo- seven abathathu? Seven times three? Phaphamani?	Five times two? How many fives? Two. [She counts in English] One, two, three, four, five. [She circles them.] Here are your fives; there are two of them. One, two, three, four, five, six, seven, eight, nine, ten. Five times two. We are not adding when we times. Seven times three? Seven times three? Three sevens? Seven times three? Phaphamani?
16.	L	Twenty one	Twenty one
17.	Beauty	Twenty one. Uright ne?	Twenty one. He is correct, right?
18.	LL	Yes	Yes
19.	Beauty	Ten times four? Ten times four? Ten phinda-phinda ngo-four? Ten phinda-phinda ngo four? Xabiso?	Ten times four? Ten times four? Ten times four? Ten times four? Xabiso?
20.	L	Fourteen	Fourteen

21.	Beauty	Uright uXabiso? Uthi fourteen. Uyadibanisa. Siyaphinda-phinda. Sithi oo-ten abayi four ngubani? Nophari, ndikuwe ngoku. Ben?	Is Xabiso right? He says it's fourteen You are adding. We are multiplying. We say four tens are equal to what? Nophari, I'm here at you now. Ben?
22.	L	Ngu-forty	It's forty
23.	Beauty	Ngu-forty. Uright ke uBen. Xa siphinda-phinda; uthatha eli nani ulenze kangangeli nani lingapha. Unikiwe u-ten ngoku kuthwe ten times four. Uzobeka oo-ten babe bangaphi? Babe bayi four. Uthi woqiba ubadibanise kuzophuma isiphumo. Matsana! Saphinda ke sahlula-hlula senza udivision. Kwathwa kuwe phaya twenty hlula-hlula ngo four. Twenty hlula-hlula, uhlula-hlula. Uyabuzwa into yokubana eli nani lingena kangaphi kweli nani? Kuthwa mawulo hlule. Uyabuzwa uzabuza pha ku twenty bangaphi oo-four? Kutwenty, bangaphi o four? Balani bangaphi ofour kutwenty.	It's forty. Ben is right. When we multiply, you take this number and times it with the number on the other side. You were given ten to times by four. How many tens are you going to put here? Four of them. Then add and the answer will come out. Matsana! We then divide using division. It says there twenty divide by four. Twenty divide, you divide. You are asked here, how many times does this number go into this number? It says divide it. You are asked how many times four goes into twenty. How many fours does twenty have? Count how many fours twenty has.
24.	L	Bayi five.	They are five.
25.	Beauty	Bayi five. Unyanisile. [Counts in English] One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty. One, two, three, kukho ufour kuqala. One, two, three, four. One, two, three, four. One, two, three, four [she is counting from the board]. One, two, three, four. One, two, three, four. Bangaphi ke?	They are five. He is correct. [Counts in English] One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty. One, two, three, there is four, first. One, two, three, four. One, two, three, four. One, two, three, four [she is counting from the board]. One, two, three, four. One, two, three, four. How many are there?
26.	LL	Bayi five	They are five
27.	Beauty	Uyabuza xa usahlula-hlula. Nivile, nivile?	You ask yourself how many times a number goes to the other when you divide. Do you hear, do you hear?
28.	LL	Yes	Yes

The second-video recorded lesson is a lesson on 2-D shapes. The lesson begins with the daily counting activity and then progresses to an introduction on 2-D shapes. Excerpt 9.2 is taken from the transcript of this lesson

Excerpt 9.2: Beauty's lesson on shapes:

(Beauty, VRL2,tt19-65)

19.	Beauty	Kubalwa ngo five. Benditheni? Phindani. Five...	You must count in fives. What did I say? Come again. Five....
20.	LL	[The children count in English.] Five, ten, fifteen, twenty, twenty five, thirty, thirty five, forty, forty five, fifty, fifty five, sixty, sixty five, seventy, seventy five, eighty, eighty five, ninety, ninety five, one hundred, one hundred and five, one hundred and ten, one hundred and fifteen, one hundred and twenty, one hundred and twenty five, one hundred and thirty, one hundred and thirty five, one hundred and forty, one and forty five, one hundred and fifty, one hundred and fifty five, one hundred and sixty, one hundred and sixty five, one hundred and seventy, one hundred and seventy five, one hundred and eighty, one hundred and eighty five, one hundred ninety, one hundred and ninety five, two hundred, two hundred and five, two and ten, two hundred and fifteen, two hundred and twenty, two hundred and twenty five, two hundred and thirty, two hundred and thirty five, two hundred and forty, two hundred and forty five, two hundred and fifty, two hundred and fifty five, two hundred and sixty, two hundred and sixty five, two hundred and seventy, two hundred and seventy five, two hundred and eighty, two hundred and eighty five, two hundred and ninety, two hundred and ninety five, three hundred, three hundred and five, three hundred and ten, three hundred and fifteen three hundred and twenty, three hundred and twenty five, three hundred and thirty, three hundred and thirty five, three hundred	[The children count in English.] Five, ten, fifteen, twenty, twenty five, thirty, thirty five, forty, forty five, fifty, fifty five, sixty, sixty five, seventy, seventy five, eighty, eighty five, ninety, ninety five, one hundred, one hundred and five, one hundred and ten, one hundred and fifteen, one hundred and twenty, one hundred and twenty five, one hundred and thirty, one hundred and thirty five, one hundred and forty, one and forty five, one hundred and fifty, one hundred and fifty five, one hundred and sixty, one hundred and sixty five, one hundred and seventy, one hundred and seventy five, one hundred and eighty, one hundred and eighty five, one hundred and ninety, one hundred and ninety five, two hundred, two hundred and five, two and ten, two hundred and fifteen, two hundred and twenty, two hundred and twenty five, two hundred and thirty, two hundred and thirty five, two hundred and forty, two hundred and forty five, two hundred and fifty, two hundred and fifty five, two hundred and sixty, two hundred and sixty five, two hundred and seventy, two hundred and seventy five, two hundred and eighty, two hundred and eighty five, two hundred and ninety, two

		and forty, three hundred and forty five, three hundred and fifty, three hundred and fifty five, three hundred and sixty, three hundred and sixty five, three hundred and seventy, three hundred and seventy five, three hundred and eighty, three hundred and eighty five, three hundred and ninety, three hundred and ninety five, four hundred, four hundred and five, four hundred and ten, four hundred and fifteen, four hundred and twenty, four hundred and twenty five, four hundred and thirty, four hundred and thirty five, four hundred and forty, four hundred and forty five, four hundred and fifty, four hundred and fifty five, four hundred sixty, four hundred and sixty five, four hundred and seventy, four hundred and seventy five, four hundred and eighty, four hundred and eighty five, four hundred and ninety, four hundred and ninety five, five hundred.	hundred and ninety five, three hundred, three hundred and five, three hundred and ten, three hundred and fifteen three hundred and twenty, three hundred and twenty five, three hundred and thirty, three hundred and thirty five, three hundred and forty, three hundred and forty five, three hundred and fifty, three hundred and fifty five, three hundred and sixty, three hundred and sixty five, three hundred and seventy, three hundred and seventy five, three hundred and eighty, three hundred and eighty five, three hundred and ninety, three hundred and ninety five, four hundred, four hundred and five, four hundred and ten, four hundred and fifteen, four hundred and twenty, four hundred and twenty five, four hundred and thirty, four hundred and thirty five, four hundred and forty, four hundred and forty five, four hundred and fifty, four hundred and fifty five, four hundred sixty, four hundred and sixty five, four hundred and seventy, four hundred and seventy five, four hundred and eighty, four hundred and eighty five, four hundred and ninety, four hundred and ninety five, five hundred.
21.	Beauty	Sh, Sh. Stop, stop. You can sit down. Mamela ke sizothetha nge milo namhlanje. Niyazazi imilo zintoni? [The teacher turns her back on the children and talks into the board.]	Sh, sh. Stop, stop. You can sit down. Listen now we are going to talk about shapes today. Do you know what they are? [The teacher turns her back on the children and talks into the board.]
22.	LL	No Miss	No Miss
23.	Beauty	Heh? Siyazazi imilo? [The teacher writes the words ‘Shapes on the board’.]	What? Do we know what shapes are? [The teacher writes the words ‘Shapes on the board’.]

24.	LL	No Miss	No Miss
25.	Beauty	[Using the English term] iShapes? Siyaqala uziva?	[Using the English term] Shapes? Is it the first time we hearing about them?
26.	LL	No	No
27.	Beauty	[The teacher faces the children.] Khandixelele yeyiphi ishape oyaziyo? Uphakamise isandla yeyiphi yeyiphi imilo oyaziyo? [Learners raise their hands.]	[The teacher faces the children.] Tell me which shape do you know? Raise your hand and tell me the shape you know? [Learners raise their hands.]
28.	L	Nxantathu	Triangle
29.	Beauty	Ngunxantathu. [Switching to English] Triangle ne? Yes.	It's a triangle. [Switching to English] Triangle isn't it? Yes.
30.	L	Isikwere	A square
31.	Beauty	Isikwere. [Switching to English] A square	A square. [Switching to English] A square.
32.	L	Isangqa	Circle
33.	Beauty	Isangqa. [Switching to English] Circle.	Circle. [Switching to English] Circle.
34.	L	Uxande	Rectangle
35.	Beauty	Uxande. Nazi imilo zethu. [She writes the names on the board.] Isangqa. Unxantathu. Yintoni enye kanene? [Switching to English.] Square. Ngeyiphi enye ke?	Rectangle. Here are our shapes. [She writes them on the board.] Circle. Triangle. What else? [Switching to English.] Square. What else?
36.	L	Xande	Rectangle
37.	Beauty	Luxande. Yintoni kanene uxande nge English Heh? Isangqa yicircle nge English, ne?	Rectangle. What is uxande in English? Huh? Isangqa is a circle in English, right?
38.	LL	Yes	Yes
39.	Beauty	Unxantathu nge English? (...) [No-one responds. She switches to English.] Triangle. Isikwere? [Gives the answer in English.] Square. [She has her back to the children when she writes on the board.] Uxande nge English, Lise? [She asks me.]	Unxantathu in English? (...) [No-one responds. She switches to English.] Triangle. Isikwere? [Gives the answer in English.] Square. . [She has her back to the children when she writes on the board.] Uxande in English, Lise? [She asks me.]
40.	Lise	[Answered in English.] I don't know 'uxande'. What does it look like? [She moves over to the book on her table.]	[Answered in English.] I don't know 'uxande'. What does it look like? [She moves over to the book on her table.]
41.	Beauty	[Said in English] Two sides are equal; other sides are long and the other ones are short. [I don't correct her.]	[Said in English] Two sides are equal; other sides are long and the other ones are short. [I don't correct her.]
42.	Lise	Rectangle	Rectangle
43.	Beauty	Rectangles	[Repeated in English] Rectangles
44.	Lise	It's got four corners?	It's got four corners?

45.	L	Yes [The teacher finishes writing the names on the board.]	Yes [The teacher finishes writing the names on the board.]
46.	Beauty	Yes irectangle ke uxande ngesiNgesi. [She turns around to face the children.] Sawuqala ke goku sithetha nge sangqa. Simile njani isangqa?	Yes, uxande is a rectangle in English. [She turns around to face the children.] We are going to talk about a circle. How is it shaped?
47.	LL	Siround	It is round.
48.	Beauty	Siround ne? Nge sixhosa uround singqukuva. Sinjani?	It is round, isn't? In Xhosa we say round is ngqukuva. It is round. How is it?
49.	LL	Singqukuva	It is round.
50.	Beauty	Sitheni?	How is it?
51.	LL	Singqukuva	It is round.
52.	Beauty	Isangqa sethu singqukuva ne? Sitheni?	The circle is round, isn't it? How is it?
53.	LL	Singqukuva [The teacher goes to her desk to find a shape to show the class. She holds it up in front of her.]	It is round [The teacher goes to her desk to find a shape to show the class. She holds it up in front of her.]
54.	Beauty	Ngeyiphi enye into engqukuva oyaziyo eround? [A few children put their hands up and she chooses one to answer.]	What else do you know that is round? [A few children put their hands up and she chooses one to answer.]
55.	L	Yibhola [The teacher uses her hands to draw the ball in the air in front of her; showing its roundness.]	A ball [The teacher uses her hands to draw the ball in the air in front of her; showing its roundness.]
56.	Beauty	Ibhola. Ibhola itheni isisangqa ibhola. Itheni iround. Enye, ngeyiphi enye into eround? [She sticks the shape onto the board next to where she has written 'isanqa' and 'circle'. A few children put their hands up and she chooses one] Siyabulela?	A ball. A ball is round, a ball is round. What, what else is round? [She sticks the shape onto the board next to where she has written 'isanqa' and 'circle'. A few children put their hands up and she chooses one.] Siyabulela?
57.	L	Yibhola yegalf	A golf ball
58.	Beauty	Intoni?	What?
59.	L	Ibhola yegalf	A golf ball
60.	Beauty	Igalf ball. Igalf itheni ingqukuva. [She puts her thumb and forefinger together to represent a small ball. More hands go up.] Pikoli? [She points to a child.]	A golf ball. A golf ball is round. [She puts her thumb and forefinger together to represent a small ball More hands go up.] Pikoli? [She points to a child.]
61.	L	Iapile	An apple
62.	Beauty	An apple. [She traces an apple with her fingers in the air.] Iapile litheni lingqukuva. [Hands go up.] Ntozini?	An apple. [She traces an apple with her fingers in the air.] An apple an apple is round. [Hands go up.] Ntozini?
63.	L	Iorange	An orange

64.	Beauty	Iorange li round nayo. [Hands go up.] Yes? [Pointing to a child.]	An orange is also round. Yes? [Pointing to a child.]
65.	L	Itumata	A tomato

Vignette:

Vignette 9.1 below is based on my field notes. Beauty is teaching the children in her class the ‘break down and build up’ method.

Vignette 9.1 Beauty explains to the children how to use the ‘breaking down and building up method’ method:

(Beauty, FN, pp.5-6; reformatted for ease of reading)

Beauty puts a chart on the board. Dibanisa (Add) $239 + 156 = 395$ $(200 + 30 + 9) + (100 + 50 + 6)$ $200 + 100 = 300$ $30 + 50 = 80$ $6 + 9 = 15$ Isiphumo (Equals) = 395 $125 + 234 = 359$ $(100 + 20 + 5) + (200 + 30 + 4)$ $100 + 200 = 300$ $20 + 30 = 50$ $5 + 4 = 9$ Isiphumo (Equals) = 359	
Beauty takes a pointer. She reads the first sum in isiXhosa. She then asks the children to read it. She has to help them as they are not very sure of the isiXhosa number names for ‘239’ and ‘156’. She gets them to repeat the number names in isiXhosa. She then explains the ‘breaking down and building up’ method. She has an isiXhosa word for it, but she checks with me that it is called ‘expanded notation’ in English. Pointing to the ‘200’ in the second line of the first sum, she explains that this comes from the ‘2’ in ‘239’. She explains how she has decomposed the number ‘239’ into ‘ikhulu’ (‘hundreds’), ‘amashumi’ (‘tens’) and ‘imivo’ (‘ones’). Then she shows the children how she adds the hundreds, tens and ones to get the answer. Beauty follows the same procedure with the second sum. The children read the answer ‘359’ in isiXhosa and then in English.	

Beauty writes ' $135 + 141 = \square$ ' on the board. She asks one of the girls in the front to do it on the board. The little girl brings her chair to stand on and completes the calculation as shown below.

$$(100 + 30 + 5) 100 + 40 + 1$$

$$100 + 100 = 200$$

$$30 + 40 = 70$$

$$5 + 1 = \underline{6}$$

$$276$$

She writes 'isiphuma' ('equals') = 276

Beauty has been watching her throughout. When the girl is finished she asks 'uright?' ('Is she correct?') The class says 'yes' and everyone claps.

Beauty writes a second addition sum on the board ' $263 + 223 = \square$ '. She asks another girl to come up and solve the sum. The girl starts the calculation.

$$(200 + 30 + 6)$$

$$200$$

Beauty stops her and says she is not finished and asks her to decompose '223'. She does this and completes the calculation.

$$(200 + 30 + 6) + (200 + 20 + 3).$$

$$200 + 200 = 400$$

$$30 + 20 = 50$$

$$6 + 3 = \underline{9}$$

$$459$$

'Isiphumo' ('equals') = 459

Beauty says 'uright?' ('Is she correct') The children say 'yes' and the class claps.

APPENDIX 10

Empirical evidence of Nomsa's mathematics pedagogical practices

Nomsa, like Beauty, is a Grade 3 teacher at Phambili Public School. During the time that I spent with Nomsa, I observed a total of seven lessons, three of which I video-recorded. These lessons included one on fractions and two on measurement.

Lesson summary 10.1: Fractions (video-recorded lesson 1):

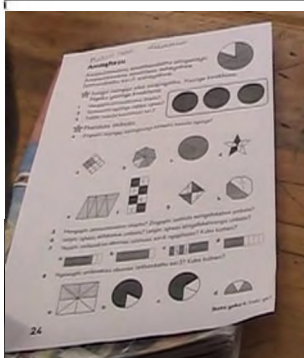
The lesson started with Nomsa explaining they were going to do 'amaqhezu' ('fractions'). She asks the children to name fractions and a child responds 'half'. The class repeat this and Nomsa then says 'one over two' (this is a direct translation of the isiXhosa term). She holds up an apple and asks what each piece will be if she cuts it in two. She asks how many pieces there will be if she cuts the two halves in half again and she asks what each piece is called. She shows them on the fraction wall.



The children introduce two more fractions:
thirds - 'one over three' ('esinye kwisitathu') and the symbol is written on the board.
fifths - 'one over five' and the symbol is written on the board.
She points to the denominator of each and asks how many pieces.
Children are called to the board to draw a shape and cut it in thirds, halves or fifths.



Nomsa directs the children, using the shapes on the board, to calculate with fractions. For example, Nomsa says "Take this (referring to a piece of chalk) and scratch out 'three over five' for me (t.38) After a couple of addition and subtraction examples with fifths, Nomsa moves onto eighths. She draws a circle on the board ('pizza') and divides it into eight pieces. Again she focuses on calculating by getting the children to subtract eighths from the pizza. She does the same with the apple on her desk. This time she calls four children up to the front of the class to assist in sharing the apple. She emphasises that each child receives a quarter of the apple.



A worksheet is given to the children. Nomsa goes through the worksheet with them by getting the children to read each of the questions and then checking if they understand. Once they have completed the worksheet they bring their work to her desk to be marked.

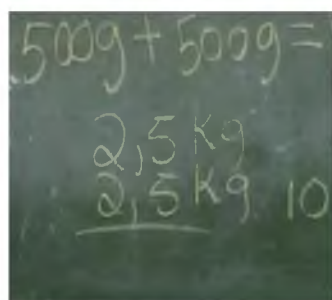
The lesson ends with a paper folding activity that focuses on eighths.



Lesson Summary 10.2: Measurement – kilograms and grams (video-recorded lesson 2):

The lesson begins with the children standing next to their desks and counting in unison. They count in 5s from 1 to 100, in 10s from 200 to 300, in 100s from 1000 to 100, and in 1s from 540 to 555 in English. Nomsa writes some three digit numerals on the board, one at a time, and asks individual children to read them: 150, 347 and 1000. Once an individual child has read the numeral she asks the class to repeat the number. She asks the children to justify why the last numeral is ‘one thousand’. The children have brought packets and tins from home. Nomsa asks the individual children to read out the mass⁸¹ on the packaging of their product: 300g, 1kg, 500g, 2,5kg. Nomsa repeats the mass after each child. One of the children has brought a coke tin of 330ml. Nomsa asks what we measure in millilitres. A child responds ‘water’. The class repeat this. She asks the class what is half of 2l and half of 1l. Then she asks what 500ml plus 500ml is. The children respond to these questions in unison. Nomsa writes ‘grams (g)’ and ‘kilograms (kg)’ on the board. She asks the children to share other things that that we can weigh in kilograms. Individual children answer: flour, sugar and she asks what mass we find these in. She asks “how much sugar will you need to make 5kg of sugar?”(t.84). A child responds two 2,5kg (which she get the children to repeat). She asks the children to add 2,5kg and 2,5kg. She writes it on the board

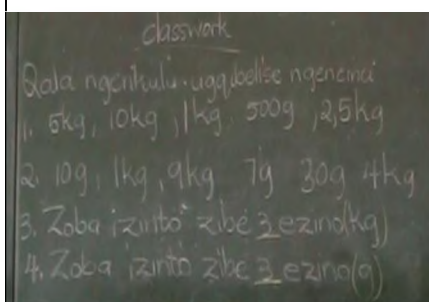
⁸¹ The isixhosa term for ‘weight’ is ‘ubunzima’. There are three words for ‘mass’ in isiXhosa – ‘into’ (‘thing’), ‘imfumba’ (‘pile’) and ‘isambuku’ (‘heap’). Teachers use the term ‘ubunzima’ whether referring to both ‘mass’ and ‘weight’.



The children are not able to solve this so Nomsa solves it for them (see vignette 10.1 below).

The lesson moves to what the children buy when they get sent to the shops: mealie-meal (5kg), rice (5kg) (she asks for the different mass of rice that one can buy).

The children sit and she asks them to take out their jotters. The date is written on the board.



Nomsa writes some measurements on the board. The children are required to arrange them from biggest to smallest and another set of measurements from smallest to biggest. The children are also required to draw three things that can be weighed in kilograms and three that can be weighed in grams. Before the children start their work, they read in unison what is written on the board and Nomsa explains each question to them. The children begin working on the task individually. Nomsa walks up and down the two aisles to ensure that everyone starts the activity. Children come up to the desk once they have completed their work so that she can mark it.

Lesson summary 10.3: Measurement – kilograms and grams (video-recorded lesson 3):

Nomsa begins the lesson by asking the children what measurements they remember – ‘kay gees’, grams, millilitres, litres. She starts assessing what they remember from the previous lesson:

- Which is bigger: kg or grams?
- How many grams in a kg?
- 500g plus 500g is equal to?

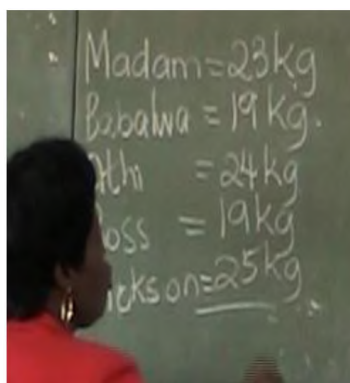
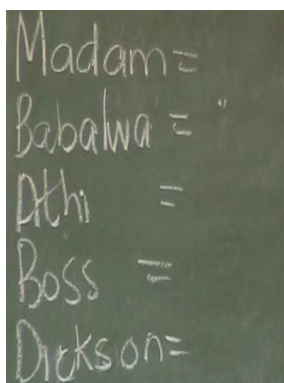
She introduces the children to a bathroom scale explaining that we don’t only measure the mass of food.

A number of children come to the front of the class to be weighed. Nomsa reads the weight⁸² of each child and records these on the board. The class begin to compare the weight of two children.

- The difference between 25kg and 26kg (is done orally)
- The difference between 21kg and 54kg (is done in the children’s jotters)

More children are selected to stand next to the scale. Nomsa writes their names on the board one underneath each other. Each child has a turn to get onto the scale and Nomsa reads their weight and writes it on the board.

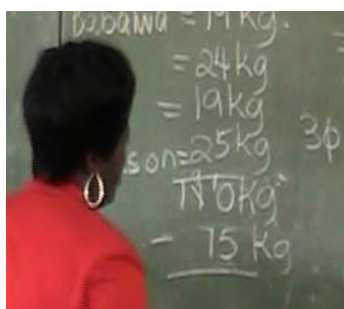
⁸² The isiXhosa term for ‘weight’ is ‘ubunzima’. There are three words for ‘mass’ in isiXhosa – ‘into’ (‘thing’), ‘imfumba’ (‘pile’) and ‘isambuku’ (‘heap’). Thus teachers use the term ‘ubunzima’ whether referring to ‘mass’ or ‘weight’.



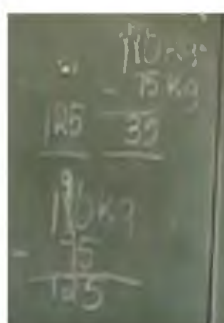
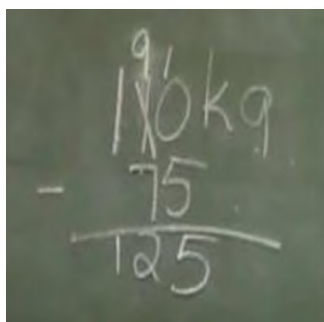
Nomsa assists the children to add up the weights starting with the units and followed by the tens as in the standard vertical algorithm (the answer is 110kg).

They then add the weights of two children from the previous group using the standard vertical algorithm (the answer is 75kg).

She writes the weight of the two girls underneath and asks the children to subtract 75 from the 110kg. This calculation involves 'borrowing' and the children tell her she must 'borrow' from the tens. Nomsa confuses herself as she borrows a ten to add to the units, she writes '9' in the tens column instead of '0'.



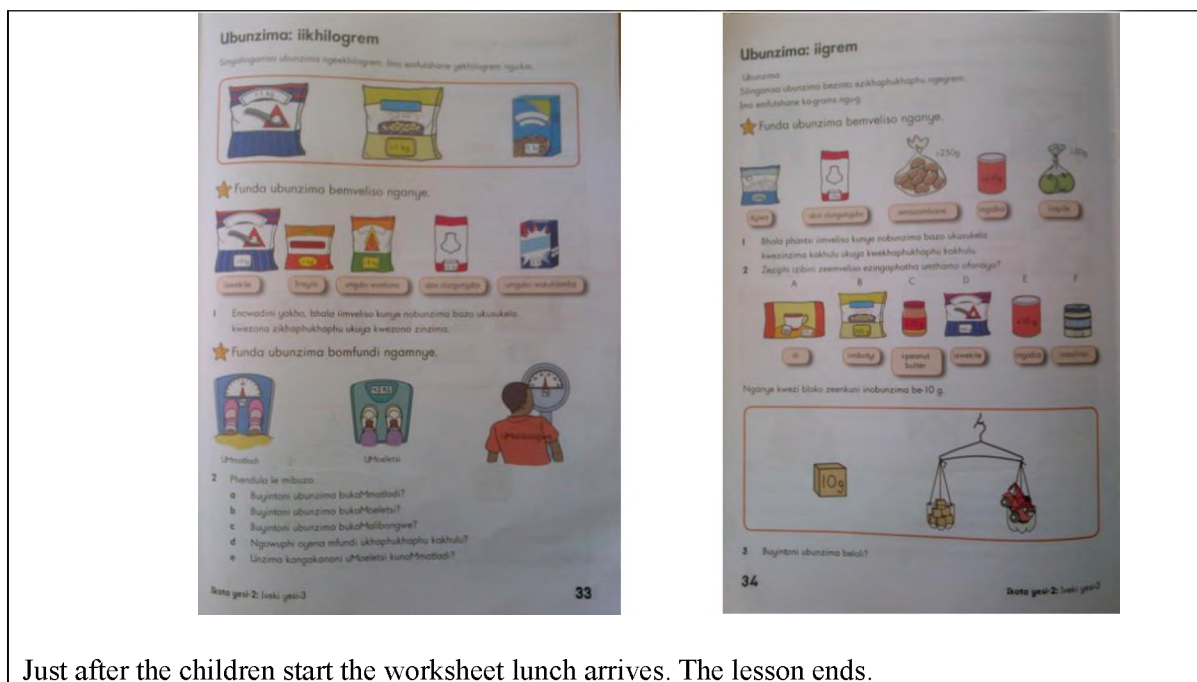
I can see she is confused because she positions herself in front of the board so that I cannot see her. She then asks the children to work it out in their jotters. She continues to stare at the board. The children tell her the answer is '125'. She asks them if this is possible and reminds them they are meant to minus 75 from 110. She realises the children made the same error that she initially did.



She explains to them how they got the answer '125' and then shows them that they should have placed a '0' in the tens column by modelling how the procedure should be done. Having used the standard vertical algorithm to show the children that the answer should be 35, she tells them they could also count up in 5s from 75 to 110. The children count in 5s from 75 to 110. She asks them how much is 'seven fives'. The children tell her it is 35.

Nomsa gets on the scale and shares her weight with the class.

Nomsa hands out two worksheets which she goes through with the class in the usual way. The children read through the questions and she checks they understand. She alerts them to an error on the worksheet.



Just after the children start the worksheet lunch arrives. The lesson ends.

In excerpt 10.1, taken from Nomsa's first video-recorded lesson, she is assessing the children's prior knowledge for fractions.

Excerpt 10.1: Nomsa's lesson on fractions:

(Nomsa, VRL1, tt.1-42)

1.	Nomsa	[The teacher comes into the classroom and stands at the front] Ok. Mamelani ke namhlanje sizo kwenza amagqezu. Yintoni kanene amagqezu nge English? ... [She starts walking down the aisle between her 'top' group and 'middle' group.] Yintoni kanene? ... Ngubani umtu olaziyo igqezu? Khabize igqezu nje libe linye? Ngubani olaziyo? [She stops next to a child] Yes, Babalwa?	[The teacher comes into the classroom and stands at the front] Ok. Listen, today we are going to do fractions. What are 'amagqezu' in English? ... [She starts walking down the aisle between her 'top' group and 'middle' group.] What do we call them? ... Who knows what fractions are? Can you mention one fraction? Who knows what a fraction is? [She stops next to a child] Yes, Babalwa?
2.	L	One over two	One over two [answered in English]
3.	Nomsa	Uthi uBabalwa one over two. U-one over two ngubani kanene? [The teacher walks back to the board.]	Babalwa says one over two. What is one over two? [The teacher walks back to the board.]
4.	LL	Yi half [She write $\frac{1}{2}$ on the board.]	It's a half [She write $\frac{1}{2}$ on the board.]
5.	Nomsa	Yintoni? [She turns round to face the children]	What is it?
6.	LL	Yi half	It's a half

7.	Nomsa	Yi half. Sithi nge English zi fractions, ne? Ngesi xhosa sithi yintoni kanene? [She walks down the aisle between her 'middle' and 'top' groups. Her head is turned towards the 'top' group.]	It's a half. In English we call them fractions, not so? In Xhosa we say they are? [She walks down the aisle between her 'middle' and 'top' groups. Her head is turned towards the 'top' group.]
8.	LL	Ngamagqezu	Fractions
9.	Nomsa	Ngamamgqezu. Right, amagqezu aqala entweni kanene? Aqala kwi half or aqala kwinto egcwelelyo? [She walks back to the front of the class and over to the 'bottom' group.]	Right. It's 'amagqezu' in Xhosa. Fractions start from what? They start from a half or a whole thing? [She walks back to the front of the class and over to the 'bottom' group.]
10.	LL	Aqala kwinto ehalf	They start from a half
11.	Nomsa	Aqala kwinto egcwelelyo, ane? Sithi xana sibiza lanto igcwelelyo yintoni? [She turns round and walks back to the 'top group'.]	They start from a whole thing, isn't it? What do we call that whole thing? [She turns round and walks back to the 'top group'.]
12.	LL	Yi quarter	A quarter
13.	Nomsa	Hayi ayicingi, into egcwelelyo ibeyi quarter? Sithini xana sibiza into egcwelelyo sithi yintoni? ... Sasiyenzile lento moss yi revision lena apha. [She walks over to the A4 fraction wall that is on the board.] Kule fraction wall yethu sine half ezimbini, sithi ihalf ezimbini zenza ntoni xana zidibene? [She looks at the top group.] Zenza into etheni?	No that cannot be. A whole thing be a quarter? What do we call a whole thing? ... We did this before, we are just doing revisions now. [She walks over to the A4 fraction wall that is on the board.] On our fraction wall we have a two halves, what do we say two halves make when they are put together? [She looks at the top group.] They make what?
14.	LL	Egcwelelyo	Whole
15.	Nomsa	Into epheleleyo like umzekelo eli apile sithi xana sibiza eli apile litheni liphelele [She takes an apple from her desk to show the class.]	A whole thing, like for example this apple we say it is what, it's a whole apple. [She takes an apple from her desk to show the class.]
16.	LL	Liphelele	Whole apple
17.	Nomsa	Sithi yi whole. Sithini? [She looks at her 'top' group of learners]	We say the apple is whole. What do we say?
18.	LL	Yi whole	It is whole
19.	Nomsa	So yinto egcwelelyo, yinto epheleleyo ayisikwanga, ne? [She walks across towards the 'bottom group. She is looking at her table.] Andina mela ke but eli apile bendi funa ulisika libe ngama cala amabini ne alinganayo, ne? [She puts the apple on the table and turns around to face the 'top' group]. Sithi yintoni leyo?	So it's a whole thing, it's a whole thing that has not been cut, isn't it? [She walks across towards the 'bottom group. She is looking at her table.] I don't have knife I wanted to cut this apple into two equal sides. [She puts the apple on the table and turns around to face the 'top' group.] What do we call that?
20.	LL	Yi half	It's a half
21.	Nomsa	Amacala amabini alinganayo sithi yintoni leyo?	What do we call two equal sides?
22.	LL	Yi half	It's a half

23.	Nomsa	Yi half. [She walks over to the A4 fraction wall to show the class half.] Nantsi sinayo apha kwi fractions zethu. Sithi yintoni? [She takes the fraction wall of the board.]	It's a half. [She walks over to the A4 fraction wall to show the class half.] Here is it we have it on our fraction wall. What do we call it? [She takes the fraction wall of the board.]
24.	LL	Yi Half	Half
25.	Nomsa	Ngama cala amabini atheni? [She shows the fraction wall to those children in the front of the 'top' group.] Linganayo [She holds the fraction wall behind her back and addresses the 'middle group'.] Heke. Siphinde la half siyo hlule kwakhona (...) Sobane nto ezingaphi?	It is two sides that are what? [She shows the fraction wall to those children in the front of the 'top' group.] That are the same size. [She holds the fraction wall behind her back and addresses the 'middle group'.] That's it we again take that half and split it (...) We will get what?
26.	LL	Eziyi four	Four
27.	Nomsa	[She walks over to the 'bottom group' and down the aisle between the 'bottom' and 'middle' groups.] Eziyi four. Sithi zintoni ezanto ziyi four?	[She walks over to the 'bottom group' and down the aisle between the 'bottom' and 'middle' groups.] Four. What do we call those four things?
28.	LL	Yi quarter	It's a quarter
29.	Nomsa	Yi quarter. Ngeyiphi ke ngoku enkulu iquarter nehalf?	It's a quarter. Which is bigger the half or the quarter?
30.	LL	Yi half	It's the half
31.	Nomsa	Yi half ne? Ngeyiphi ke ngoku enkulu ihalf kunye nento egcweleyo? [She moves between the desks over to the 'top' group.]	It's the half, isn't it? Which one is bigger a half or whole? [She moves between the desks over to the 'top' group.]
32.	LL	Yinto egcweleyo	A whole
33.	Nomsa	Yinto egcweleyo ,very good. Into egcweleyo yenziwa zi half ezingaphi?	It's a whole, very good. A whole is made up of how many halves?
34.	LL	Ezimbini	Two
35.	Nomsa	Eziyi two ne? Ezimbini [She walks up between the 'top' and 'middle groups.] Into egcweleyo yenziwa ziquarter ezingaphi?	Two, isn't it? It is two. [She walks up between the 'top' and 'middle groups.] A whole is made up of how many quarters?
36.	LL	Eziyi four	Four.
37.	Nomsa	Eziyi four, ne? Right, sidlulile ke sasiyenzile iquarter ne half ne? [She turns around at the front of the class.]	It makes four, isn't it? Right, we passed that. We did quarters and halves before, isn't it? [She turns around at the front of the class.]
38.	LL	Yes	Yes
39.	Nomsa	[She starts addressing the 'top' group. She is using her hands rather emphatically as she speaks.] Siyadlula ngoku siza kwenza u-one over three. Sithi ngu one-third xana simbiza okanye sithi sisinye esithathwini, ne?	[She starts addressing the 'top' group. She is using her hands rather emphatically as she speaks.] We are leaving this one behind. We are now going to do one-over-three or one third as it is called, understand?
40.	LL	Yes	Yes
41.	Nomsa	Sithini? [She goes to the board]	We say that is?

42.	LL	Sisinye esithathwini [She writes $\frac{1}{3}$ on the board.]	One over three [She writes $\frac{1}{3}$ on the board.]
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Nomsa begins the lesson in excerpt 10.2 by checking if the children can remember what they did in the previous lesson on mass. Once she has done this, she introduces them to a bathroom scale and the following excerpt follows.

Excerpt 10.2: Nomsa's second lesson on mass: kilograms

(Nomsa, VRL3, tt.21-111)

21.	Nomsa	Sisikali esi, ne? Niyayaz' ba nathi si-mejarishwa nge- kg, ne? Nam bendizi-sikalishile ke, ne? Bendizi jongile mna. Ndiza kuzijonga emveni kokuba nizijongile. Yiza Bhudaza! [Bhudaza walks to the front of the class.] Masikhe sijonge uKhanya. [She puts the scale on the floor.] Nyathela Khanya! Hayi! Uza' zixela uKhanya, uKhanya ngu-jonga so, Khanya! [She gets Khanya to stand up and look ahead while she reads the scale.] uKhanya ngu-twenty-five kg ne?	This is a scale, isn't it? Do you know that our body is also measured in kg's, isn't it? I, too, have weighed myself. I will check my weight again when you are all done with the scale. Come Bhudaza! [Bhudaza walks to the front of the class.] Let's look at Khanya. [She puts the scale on the floor.] Step on the scale Khanya! No! Khanya will tell you herself, Khanya is, look so, Khanya [She gets Khanya to stand up and look ahead while she reads the scale.] Khanya is twenty-five kg, isn't it?
22.	LL	Yes	Yes [answered in English]
23.	Nomsa	uKhanya ngubani?	Khanya is?
24.	LL	Ngu-twenty-five kg.	She is twenty-five kg.
25.	Nomsa	uKhanya is twenty-five kg. [She writes 'Khanya = 25kg' on the board.] Yima ecaleni Khanya. Yiza Bhudaza! [Bhudaza gets onto the scale and Nomsa looks to see how much he weighs.] uBhudaza ngu-twenty-six kg's, ne? [She writes 'Bhudaza = 26kg' on the board.] uBhudaza ngubani?	Khanya is twenty-five kg. [She writes 'Khanya = 25kg' on the board.] Step aside, Khanya. Come Bhudaza! [Bhudaza gets onto the scale and Nomsa looks to see how much he weighs.] Bhudaza is twenty-six kgs, isn't it? [She writes 'Bhudaza = 26kg' on the board.] Bhudaza is?
26.	LL	Ngu-twenty-six kgs	He is twenty-six kgs
27.	Nomsa	Okay. Right! Babulingana ne?	Okay. Right! They are about the same weight, isn't it?
28.	LL	Yes Miss.	Ewe Miss.
29.	Nomsa	Loo nto ithi uBhudaza unobudana kuno Khanya. uBhudaza umde nge kg's ezingaphi ku Khanya?	That says Bhudaza is a bit taller than Khanya. Bhudaza is taller than Khanya with how many kgs?
30.	LL	Eyi-one.	By one.
31.	Nomsa	[She writes '1kg' on the board and underlines it.] And then uBhudaza ulantuka ngee-kg ezingaphi?	[She writes '1kg' on the board and underlines it.] And then by how many kgs does Bhudaza differ?
32.	LL	Oyi-one	By one.
33.	Nomsa	Oyi-one kuno Khanya! Yimani pha, Bhudaza Nokhanya. Yiza Ntabeni.	By one compared to Khanya! Stand there, Bhudaza and Khanya. Come Ntabeni.

34.	LL	[The children turn around and look at Ntabeni. They laugh]	[The children turn around and look at Ntabeni. They laugh]
35.	Nomsa	Yiza, Ntabeni. Sh! Yiza Ntabeni, khwela mtan'am ndibone. [Ntabeni gets onto the scale and Nomsa checks her weight.] uNtabeni ngu-fifty-four! [Nomsa writes 'Ntabeni = 54kg' on the board.]	Come, Ntabeni. Sh! Come Ntabeni, step on to the scale my child. [Ntabeni gets onto the scale and Nomsa checks her weight.] Ntabeni is fifty-four! [Nomsa writes 'Ntabeni = 54kg' on the board.]
36.	LL	Yhu!	Wow!
37.	Nomsa	Yiza S'babalwe, 'khe sijonge [The class is noisy, they are laughing and talking. Sibabalwe comes to the front to of the class and gets onto the scale. [Nomsa checks her weight.] uS'babalwe ngu-twenty-one.	Come S'babalwe, let's us take a look. [The class is noisy, they are laughing and talking. Sibabalwe comes to the front to of the class and gets onto the scale. [Nomsa checks her weight.] She is twenty-one.
38.	LL	Yhu! [More laughter.]	Wow! [More laughter.]
39.	Nomsa	uS'babalwe ngu- twenty-one. [Nomsa writes on the board 'Sibabalwe = 21kg'.] uS'babalwe ngu- twenty-one.	S'babalwe is twenty-one. [Nomsa writes on the board 'Sibabalwe = 21kg'.] S'babalwe is is twenty-one.
40.	LL	Ngu- twenty-one.	She is twenty-one.
41.	Nomsa	Right, masibaleni ke ngoku! Hlalani phantsi ke! uNtabeni mkhulu kangakanani kuno S'babalwe? Bala, umshiya ngabani? [The children start to open their maths jotters.] Masibaleni, umshiya ngabani uNtabeni? Umshiya ngabani? Umshiya ngabani uNtabeni uSibabalwe? Masibaleni! 'funeka sithini? Hayi! 'funeka sithini? Siyadibanisa okanye siyathabatha okanye siya phinda phinda okanye siyohlula? [Nomsa is pointing to the board.]	Right, let us count now! Sit down! How big is Ntabeni compared to S'babalwe? Count, by how much is he bigger than her? [The children start to open their maths jotters.] Let us count, by how much is Ntabeni bigger? By how much? By how much is Ntabeni bigger compared to Sibabalwe? Let us count! What are we supposed to do? No! What are we supposed to do? Should we add or subtract or multiply or divide? [Nomsa is pointing to the board.]
42.	L	Twenty-four thabatha twenty-one.	Twenty-four minus twenty-one.
43.	Nomsa	Sathi 'bani?	What did we say?
44.	LL	Twenty-four thabatha	Twenty-four minus
45.	Nomsa	Hayi! Hayi! Ngubani eli nani? [Nomsa points to '54' on the board.] Ngu-twnety-four lo?	No! No! What number is this? [Nomsa points to '54' on the board.] Is this 24?
46.	LL	Fifty-four thabatha twenty-one.	Fifty-four minus twenty-one.
47.	Nomsa	Thabatha undixelele impendulo! Thabatha undixelele impendulo! [The children start working out the problem in their maths jotters.] (...)Thabatha undixelele impendulo! Yimani ke ngoku! senigqibile? Benithabathile, mos, izolo?	Subtract and give me the answer! Subtract and give me the answer! [The children start working out the problem in their maths jotters.] (...) Subtract and give me the answer! Wait, now! Have you finished? You did subtraction yesterday? It is thirty-three.
48.	LL	Ngu-thirty-three.	What is it?
49.	Nomsa	Ngubani?	It is thirty-three.
50.	LL	Ngu-thirty-three.	It is thirty-three what?
51.	Nomsa	Ngu-thirty-three bani?	It is thirty-three kg.
52.	LL	Ngu-thirty-three kg.	

53.	Nomsa	Ngu-thirty-three kg. [Nomsa writes '33kg' on the board.] Ngubani uNtabeni amshiya ngaye uS'babalwe? Okay, right! Masikhe ke ngoku sijonge, yizapha, aba bafutshane. Hayi, bethuna mabeze! Yiza nawe, Madam. Ndifuna aba bafutshane. [The short children all start coming to the front of the class.]	It is thirty-three kg [Nomsa writes '33kg' on the board.] By what does Ntabeni exceed Sibabalwe? Okay, right! Let us now look at, come here, all the short ones. No, guys, come! Madam you can also come. I want all the short ones. [The short children all start coming to the front of the class.]
54.	LL	Nanku omnye miss.	Here is another one.
55.	Nomsa	Okay, masibale. Aba bayi-five, ne? Mamela ke! Andithi bafutshane bobayi-five? So ngoku sizo dibanisa ubunzima babo, sibone 'ba xana beboyi-five ubunzima babo benza bani, ne? Yima ke! Siqale ngabani? Ngubani owokuqala? Yima ke! Ngu-Madam owokuqala, ne?	Okay, let us count. These ones are five, isn't it? Listen! Aren't all five short? So now we are going to add their weight, and see how much they weigh. The combined weight for all five is? Wait! Who do we start with? Who is the first one? Wait Madam will be the first one, isn't it?
56.	LL	Ewe	Yes
57.	Nomsa	Ibe ngubani owesibini? Yima, ibe nguBabalwa! [Nomsa writes 'Madam =' and 'Babalwa =' on the board.]	Who will the second one be? Wait, it will be Babalwa! [Nomsa writes 'Madam =' and 'Babalwa =' on the board.]
58.	LL	Ibe nguAthi.	Then Athi.
59.	Nomsa	Ibe nguAthi. [Nomsa writes 'Athi =' on the board.] Ibe ngubani omnye?	And then Athi [Nomsa writes 'Athi =' on the board.] And who else?
60.	LL	Ibe ngu-Boss.	And Boss
61.	Nomsa	Ibe ngu-Boss [Nomsa writes 'Boss =' on the board.]	And Boss [Nomsa writes 'Boss =' on the board.]
62.	LL	Ibe ngu-Dickson.	And Dickson.
63.	Nomsa	Ibe ngu-Dickson. [Nomsa writes 'Dickson =' on the board.] Baphelele, ne?	And Dickson. [Nomsa writes 'Dickson =' on the board.] That's all, isn't it?
64.	LL	Ewe Miss.	Yes Miss.
65.	Nomsa	Right! Yiya, Madam, sibone, u-Madam wenza bani? Ngubani u-Madam? Ungubani u-Madam? Ungu-twenty bani Ungu-twenty-three u-Madam. [Madam gets on the scale and Nomsa checks her weight.] uMadam ngu-twenty-three kg! [Nomsa writes '23' on the board next to Madam's name] Yiya Babalwa. Bhekela Madam. [Babalwa gets onto the scale and Nomsa checks her weight.] uBabalwa ngu-nineteen kg.	Right! Go, Madam, let us see, how much does Madam weigh? What does Madam weigh? What does Madam weigh? She is twenty what? [Madam gets on the scale and Nomsa checks her weight.] Madam is twenty-three. Madam is twenty-three kg! [Nomsa writes '23' on the board next to Madam's name.] Go, Babalwa. Step aside, Madam. [Babalwa gets onto the scale and Nomsa checks her weight.] Babalwa is nineteen kg.
66.	LL	Yhu!	Wow!
67.	Nomsa	Ngubani uBabalwa? [Nomsa writes '19' next to Babalwa's name.]	Babalwa is? [Nomsa writes '19' next to Babalwa's name.]
68.	LL	Ngu-nineteen kg.	She is nineteen kg.
69.	Nomsa	Athi [Athi gets onto the scale and Nomsa checks his weight.] Twenty-four	Athi [Athi gets onto the scale and Nomsa checks his weight.] Twenty-four

70.	LL	Twenty-four kg	Twenty-four kg [answered in English]
71.	Nomsa	uAthi ngu-twenty-four kg [Nomsa writes '24kg' next to Athi's name.]	Athi is twenty-four kg [Nomsa writes '24kg' next to Athi's name.]
72.	LL	Nantso ke!	There we go!
73.	Nomsa	Yiya Boss! [Boss gets on the scale and Nomsa reads his weight.] Ngu-nineteen kg [Nomsa writes '19kg' next to Boss's name.]	Go Boss! [Boss gets on the scale and Nomsa reads his weight.] He is nineteen kg [Nomsa writes '19kg' next to Boss's name.]
74.	LL	Yhu!	Wow!
75.	Nomsa	Yiya Dickson! [Dickson gets on the scale and Nomsa reads his weight.] Ngu-twenty-five. [Nomsa writes '25kg' next to Dickson's name.]	Go Dickson! [Dickson gets on the scale and Nomsa reads his weight.] He is twenty-five. [Nomsa writes '25kg' next to Dickson's name.]
76.	LL	Yhu!	Wow!
77.	Nomsa	Right! Masikhe sidibaniseni ke ngoku, khe sijonge ke ngoku, 'ba ubunzima babo ubunzi. Kuthiwa yintoni kanene? Yi-weight, ne? Ithini i-weight yabo, ne?	Right! Let us now add. Let us see what their weight is? Weight. What do we call it again? Weight, isn't it? What is their weight, isn't it?
78.	LL	Yes	Ewe
79.	Nomsa	Sijonge 'ba ithini i-weight yabo; bayi-one, two, three, four, five [She counts the children in the front of the class who have just been weighed.] Masidibaniseni. S'othini xa sidibanisa? [The weights of the children are written underneath each other. She starts in the ones column and points to the 3 and the 9.] Three dibanisa nine, ngubani?	Let us look what their weight is; they are one, two, three, four, five [She counts the children in the front of the class who have just been weighed.] Let us add. What are we going to do when we add? [The weights of the children are written underneath each other. She starts in the ones column and points to the 3 and the 9.] Three plus nine, equals what?
80.	L	Twelve	Twelve [answered in English]
81.	LL	Twelve	Twelve [answered in English]
82.	Nomsa	Twelve dibanisa four? [She points to the 4.]	Twelve plus four? [She points to the 4.]
83.	LL	Sixteen	Sixteen [answered in English]
84.	Nomsa	Sixteen dibanisa nine? [She points to the 9.]	Sixteen plus nine? [She points to the 9.]
85.	LL	Twenty-one	Twenty-one [answered in English]
86.	Nomsa	Asoze!	Never!
87.	LL	Twenty-five	Twenty-five [answered in English]
88.	Nomsa	Ngu-twenty-five.	It's twenty-five
89.	LL	Ngu-twenty-five	It's twenty-five
90.	Nomsa	Twenty-five dibanisa five? [She points to the five.]	Twenty plus five? [She points to the five.]
91.	LL	Thirty	Thirty [answered in English]
92.	Nomsa	Ngu-thirty, ne? [She writes 30 on the side of the sum.] Sithathe u-ziro simbeke apha. [She writes a '0' under the ones column.] Simthini kanene lo-three?	It's thirty, isn't it? [She writes 30 on the side of the sum.] Let's take the zero and put it here. [She writes a '0' under the ones column.] What do we do with the three again?
93.	LL	Simbeke phezu	Put it up here.
94.	Nomsa	Sibeke phezu kobani?	Put it above which number?
95.	LL	Phezu ko-two.	Above the two.

96.	Nomsa	[She writes the '3' from '30' above the '2 tens'.] Phezu ko-two! Sithi three dibanisa three ngubani? [She points to the '3 tens' and '2 tens'.]	[She writes the '3' from '30' above the '2 tens'] Above the two! We say what is three plus three is what? [She points to the '3 tens' and '2 tens'.]
97.	LL	Ngu-five	It's five.
98.	Nomsa	Five dibanisa one? [She points to the '1 ten'.]	Five plus one? [She points to the '1 ten'.]
99.	LL	Six.	Six [answered in English]
100.	Nomsa	Six dibanisa two? [She points to the '2 tens'.]	Six plus two? [She points to the '2 tens'.]
101.	LL	Seven	Seven [answered in English]
102.	Nomsa	Eight dibanisa one? [She points to the '1 ten'.]	Eight plus one? [She points to the '1 ten'.]
103.	LL	Nine	Nine [answered in English]
104.	Nomsa	Nine dibanisa one? [She points to the '1 ten'.]	Nine plus one? [She points to the '1 ten'.]
105.	LL	Eleven	Eleven [answered in English]
106.	Nomsa	Eleven. One hundred and ten kg! Baba bangaphi?	Eleven. One hundred and tenkg! How many are they?
107.	LL	Bo bayi-five.	All five of them.
108.	Nomsa	Bo, ba ngaphi?	All, how many of them?
109.	LL	Bo bayi-five.	All five of them.
110.	Nomsa	Benza bani?	How much do they make?
111.	LL	U-one hundred and ten kg.	One hundred and ten kg

Vignettes:

I have chosen to include two vignettes from Nomsa. Vignette 10.1 below is from Nomsa's third video-recorded lesson (lesson summary 6.1 above). It was the second lesson on measurement that I observed in her class.

Vignette 10.1: A glimpse into Nomsa's class - adding 2,5kg and 2,5kg (Nomsa, FN, pp.10-11; reformatted for ease of reading)

Nomsa holds up an empty 2,5kg packet of sugar which one of the children has brought from home. She asks what this is and the children reply that it is a 2,5kg packet of sugar. She suggests they add two packets of sugar and asks what the answer will be. One of the children says '5kg'. She repeats the question and the children respond in unison '5kg'.

She writes '2,5kg + 2,5 kg' vertically on the board as shown in the column to the right. She wants to check if they are "really going to get 5kg" (t.98). She writes '2,5kg + 2,5kg' using the vertical format.

She asks the class what they must do. There is no response. Eventually a child from the ‘first group⁸³’ comes up to the board and stares at the sum.

Nomsa writes ‘10’ next to the sum and asks what we should do with the ‘0’. The child does not respond so she says “we are going to scratch that zero and put it where?” (t.100) to which another child, from her ‘first group’ replies, “there by the five” (t.101). The child comes to the board and places the ‘0’ under the ‘5’ as shown in the column to the right.

2,5kg	
<u>2,5kg</u>	10
0	

Nomsa asks the children if the ‘1’ represents a ‘ten’ or a ‘unit’. The children respond that they are ‘tens’. Pointing to the ‘2’, she asks the children “what are the tens here?” (t.108) to which the children reply ‘2’. She puts the ‘1’ next to the ‘2’ and asks the children to add. They eventually get to ‘5’. She writes in the ‘5,’ in front of the ‘0’.

¹ 2,5kg	
<u>2,5kg</u>	10
5,0	

Vignette 10.2 is taken from my field notes and refers to a lesson where Nomsa teaches the children in her class two different methods for subtracting a three-digit number from another three-digit number. The calculation requires regrouping.

Vignette 10.2: Nomsa teaching two different methods of calculating
(Nomsa, FN, p.15; reformatted for ease of reading)

Nomsa writes the sum ‘534-157’ on the board using the vertical format. She asks the class how to solve it and no one volunteers. She explains.

She tells the children she’ll take ‘1’ from the ‘3’. She crosses out the ‘3 tens’ from ‘534’ and writes ‘2’ above it. She puts the ‘1’ next to the ‘4’ of ‘534’. She asks: what do I have in the ‘imivo’ (‘ones’)? (She answers her own question - ‘14’). What do I have in the ‘amashumi’ (‘tens’)? (She answers her own question - ‘20’). She then asks what is ‘14-7’ and the children say ‘7’. She writes ‘7’ under the ones column.

She asks the children if she can take ‘5’ from ‘2’. The children say ‘no’. She asks what she must do.

No-one answers so she tells the children. “Go to the ‘5’, ‘5 amakhulu’ (‘hundreds’). I take ‘1’ and put it with the amashumi (‘tens’) to make ‘12’. It’s not ‘12’ it’s ‘120’ but we forget about the ‘0’” she tells them. She asks what ‘12-5’ is and the children say ‘7’. She writes ‘7’ in the tens column. ‘4-1’ and the children say ‘3’. She writes ‘3’ in the hundreds column.

The work on the board looks like this:

$$\begin{array}{r} \overset{4}{5} \overset{12}{3} \overset{14}{4} \\ - \quad 1 \quad 5 \quad 7 \\ \hline 3 \quad 7 \quad 7 \end{array}$$

⁸³ I have used Nomsa’s terminology. The first group are the children in her class who are perceived to be mathematically competent.

Nomsa then moves on to showing the children how to calculate using the ‘breaking down and building up’ method. The sum is the same: ‘534-157’.

She asks if someone can solve it. No-one responds so she tells them to listen.

Start with ‘500-100=’ (she doesn’t write anything, she simply says ‘400’)

‘400-100=300’ (Above the ‘400’ she writes ‘134’ and above the ‘100’ she writes ‘57’)

Then she writes :

‘100-50=50’ (Above the ‘134’ she writes ‘34’ and above the ‘57’ she writes ‘7’)

‘30-5=25’ (Above the ‘34’ she writes ‘4’ and above the ‘7’ she writes ‘2’)

‘4-2=2’

$$\begin{array}{r}
 4 \quad 2 \\
 34 \quad 7 \\
 134 \quad 57 \\
 400 - 100 = 300 \\
 100 - 50 = 50 \\
 30 - 5 = 25 \\
 4 - 2 = 2
 \end{array}$$

She draws a line under the ‘2’. Then she says ‘0+0+5+2’ Ngubani?’ (‘How much?’) The children say ‘7’ and she writes the ‘7’ under the units. ‘0+5+2. Ngubani?’ (‘How much?’) The children say ‘7’ and she writes the ‘7’ under the tens. ‘Ngu-3’ She writes it under the hundreds and says ‘nansti’ (there it is).

She says ‘500-100 = 400’

Her answers are all aligned like this:

$$\begin{array}{r}
 400 - 100 = 300 \\
 100 - 50 = 50 \\
 30 - 5 = 25 \\
 4 - 2 = \underline{2} \\
 377
 \end{array}$$

She asks the class if it is easy and they say ‘Yes’.

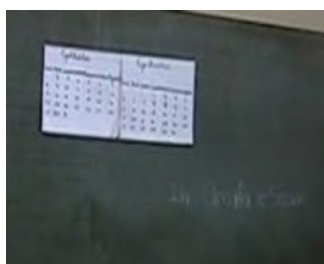
APPENDIX 11

Empirical data of Veliswa's mathematics pedagogical practice

Veliswa, like Nokhaya, teaches at Sontonga Primary School. Apart from being a Grade 3 class teacher, Veliswa, as noted in Chapter Five, is also an acting Head of Department (HoD). The implication of this is that she is often called out of the classroom by the principal, the district office or the teachers' union, SADTU. I only managed to video-record two of Veliswa's lessons: a lesson on time and a lesson on division (although the focus appeared to be the relationship between multiplication and division). I observed an additional five lessons, which I recorded as field notes. In addition, I observed the children writing the ANA exemplar for maths and the ANA maths paper. I provide a short description of each of the two video-recorded lessons below as I draw primarily on these in the presentation of empirical data on the manner in which Veliswa personifies her role as a Foundation Phase teacher of mathematics. The first lesson was on calendar time and the second on the relationship between division and multiplication.

Lesson summary 11.1: Calendar time (video-recorded lesson 1):

The children are standing facing the chalkboard. Veliswa begins the lesson by asking them how many days are in 1 week, 2 weeks and 3 weeks. She puts an example of a calendar for July and August on the board. She has made these herself.



During this process, she asks a child to write the number '14' on the board. She then asks a simple subtraction sum '21-8' and a simple multiplication sum, '7x4', emphasising that the answer to the latter sum is 4 weeks.

The lesson moves to identifying the day and date of Nelson Mandela's birthday which was in July. Focusing on the month of July Veliswa asks the children how many Sundays there are in July. She gets them to list the dates of each of the Sundays and asks them what pattern they observe. They struggle with this and Veliswa then rephrases the question by asking them how many days there are between each of the Sundays (e.g. "what is the difference between sixteen and twenty three" (t.65)).

The lesson continues with Veliswa asking the class:

- how many days there are in July
- the date school closed
- the current month

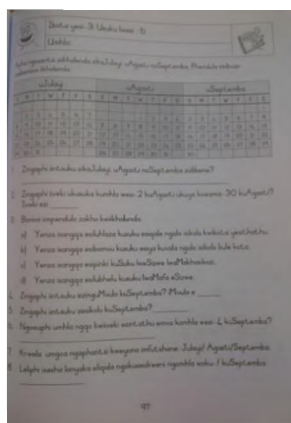
- today's date
- the month
- the number of weeks in August
- the current week
- the date that July ends
- today and tomorrow's date
- the reason for celebrating women's day on the 9th of August

Veliswa ends her lesson by repeating two questions:

- How many days are there in a week?
- How many days are there in July?

The children return to their desks and are given a worksheet on calendar time to complete.

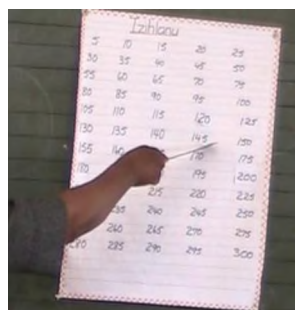
The worksheet is from the textbook.



Lesson summary 11.2: Division and multiplication (video-recorded lesson 2):

The lesson starts with Veliswa taking the children outside to play the game called 'Fire on the Mountain'. They play the game four times. The children stand on one side of the netball court opposite her. She shouts 'fire on the mountain' and they jog towards her. As they are jogging she tells them to get into groups of 5, 10, 15 and 20. Groups that are smaller or bigger than the number required (e.g. 5) are excluded from the game. Once Veliswa has counted to check there are 20 children in the group, they go back to the classroom.

In the classroom, the children count in 5s from 0 – 300. They focus on a counting chart which Veliswa points to as they count.



Veliswa then introduces the focus of the lesson which is division of objects into equal groups. She explains to the children that she will give each desk a collection of counters. They are expected to divide the counters into groups of five in order to see how many groups of five they can make from their counters. As Veliswa moves between the groups giving them counters she interacts with the groups by asking questions. Examples of the questions include:

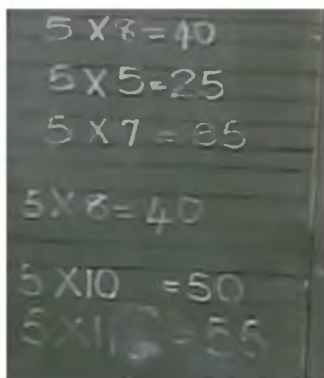
- How many counters do you have?
- How many should be in each group?

Once she has handed out counters to each group, she calls the entire class to attention and begins to ask each of the groups the following questions:

- How many counters do you have?
- How many should be in each group?
- How many groups are there?



Once she has finished asking half of the groups these questions, she begins to write multiplication sums, relating to what the groups tell her, on the board (e.g. ' $5 \times 7 = 35$ '). She asks the children questions about the sums ensuring they know what each number represents.



Once all the groups have had a turn to share their work, they are given paper on which to do their independent task. For the independent task the children are given cards with multiplication sums written on them (e.g. $5 \times \underline{\quad} = 35$). The children take a card, solve the sum, and then take another card. There are counters on the table for the children to use if needed. Veliswa moves around the class observing the children.

I have chosen to use two excerpts from Veliswa's second lesson as typical of practice. Excerpt 11.1, focuses on counting in 5s, which introduces the main part of her lesson which is on multiplication and division by 5.

Excerpt 11.1: Veliswa's lesson multiplication and division (counting in 5s):
(Veliswa, VRL2, tt.90-97)

90.	LL	[The teacher has an A2 poster on the board showing counting in 5s from 0 - 300.] Zintlanu, lishumi, lishumi linesihlanu, ngamashumi mabini awananto, ngamshumi mabin' anesihlanu, ngamashumi mathathu awananto, ngamashumi mathath' anesihlanu, [the teacher uses a ruler to point to the numbers] ngamashumi mane awananto, ngamashumi man' anesihlanu, ngamashumi mahlanu awananto, ngamshumi mahlan' anesihlanu, ngamashumi mathandathu awananto, ngamashumi mathandath' anesihlanu, ngamashumi asixhenxe awananto ... [until] ...ngamakhulu mabini namashumi mathandathu awananto.	[The teacher has an A2 poster on the board showing counting in 5s from 0 - 300.] Five, ten, fifteen, twenty with nothing, twenty-five, thirty with nothing, thirty five [the teacher uses a ruler to point to the numbers], forty with nothing, forty-five, fifty with nothing, fifty-five, sixty with nothing, sixty-five, seventy with nothing ... [until] ... two hundred with six tens with nothing.
91.	Veliswa	Mamela, asithi 'ngamakhulu mabini namashumi mathandathu'. Sithi 'ngamakhulu mabini anamashumi mathandathu' Yithini? [The teacher points to the 260 with the ruler.]	Listen, we do not say 'it is two hundred with six tens'. We say it is 'two hundred and six tens'. We say? [The teacher points to the 260 with the ruler.]
92.	LL	Ngamakhulu mabini anamashumi ... [The teacher counts with the children and points to each number with the ruler] ... [until] ... likhulu linye...	Two hundred and six tens ... [The teacher counts with the children and points to each number with the ruler] ... [until] ... one hundred...
93.	Veliswa	Hayi! Ngamakhulu mangaphi? [Pointing to the 300 on the chart with her finger.]	No! How many hundreds? [Pointing to the 300 on the chart with her finger.]
94.	LL	Ngamakhulu mathathu awananto.	Three hundred with nothing.
95.	Veliswa	Heke. Phaya siphawula ukuba la manani xa uhamba nje, ngolu hlobo atheni? [The teacher is looking at the chart as she speaks. She points to the first row of numbers at the top of the chart.] Kuwe ashiyana ngoozingaphi? Ashiyana ngoozingaphi? [She points to a child to answer.]	Very well! There we note that these numbers, when you move this way what happens? [The teacher is looking at the chart as she speaks. She points to the first row of numbers at the top of the chart.] What is the difference between the numbers? What is it? [She points to a child to answer.]
96.	L	Ngoo-zintlanu.	They are fives

97.	Veliswa	[The teacher is positioned in the class near the board facing the two rows of learners closest to the door.] Ngoo-zintlanu onke! Ithi loo nto la manani onke enza amaqela ka-zintlanu ne? Ukuba ngaba (na) sinokuthi siwohlula-hlule sofumanisa ukuba onke akhonto iza kusala xa uwahlula-hlule ngamaqela ka-zintlanu, ne?	[The teacher is positioned in the class near the board facing the two rows of learners closest to the door.] All of them are fives. This means all these numbers are in groups of fives, neh? If we could divide them we'd find that there will be no remainder; if you divide them in groups of fives, neh?
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In excerpt 11.2, the children have finished counting. Veliswa walks between the groups handing out a different number of counters to each group. She counts them as she hands them out to ensure that each group gets a number that is divisible by 5. As she walks around handing out the counters, she instructs the children on what to do.

Excerpt 11.2: Veliswa's lesson on division and multiplication:

(Veliswa, VRL2, tt.110-139)

110.	Veliswa	Akuliwa apha! Kufuneka ukuba sonke sikhuphe ezi zizihlanu ... Zintlanu ezi? Zikhon' ezipha ngaphakathi zintlanu ezi, Lihle? Zintlanu eziya? Sithe senza amaqela Kabani? Ka-zintlanu! Bezingaphi iziciko zethu zizonke? Mh? Mh? Kaloku nina nilibele kukulwa ngazo ... mazibentlanu ... sifun' ubona u-ntlanu. Sifun' ubona zintlanu bethuna. Zibe ntlanu zonke. Masizibek' apha. Mangaphi amaqela ethu ka-zintlanu?	No fighting here! We must all get the fives ... Are these five? There are some inside there. Are these five, Lihle? Are they five? We said we are grouping into how many? Fives! How many lids did you have in total? Mh? Mh? You are spending your time fighting over them ... they must be five... we want to see a five. We want to see five guys. All of them must be five. Let us put them here. How many groups of five do we have?
111.	L	Ngu-four lona.	This one is four.
112.	Veliswa	(...) Bezingaphi zonke bethuna? Zibaleni, bezingaphi? Zingaphi zonke? Mh?	(...) How many were they guys? Count them. How many were they? What is the total? Mh?
113.	LL	Inye, zimbini, zintathu, zine, zintlanu.	One, two, three, four, five.
114.	Veliswa	Bezingaphi ke zonke? Zizonke? Leli nani nigqib' ulibiza, zingaphi? Bezingamashum' amangaphi? Ngamashumi mahlanu. Nabeka ke ngoku amaqela ka-zintlanu phumileyo kwela nani. Mangaphi?	How many were they all? In total? It is the number you have just said, how many? How many tens? Fifty! You then got groups of five from that number. How many?
115.	LL	[Counting] Alishumi.	[Counting] Ten

116.	Veliswa	Alishumi. Amaqela ka-zintlanu aphumayo kumashumi amahlanu mangaphi? He?	Ten. How many groups of 5 did you get from that number? Hey?
117.	L	Alishumi.	Ten.
118.	Veliswa	Alishumi. Mamela. Sigqibile sonke, ne? [She moves to the front to address the entire class.] Ha-a singazidibanisi izinto zethu. Masithule ke ngoku. Sonke sigqibile. Ndicela umntu abe mnye e-groupini, asixelele izinto zabo u'ba bezingaphi. NguLihle oza' siqalela apha. Bezingaphi izinto zenu, Lihle?	Ten. Listen. We have all finished, isn't it? [She moves to the front to address the entire class.] N-no let us not undo the groups. Let us keep quiet now. We have all finished. I want one person from each group to tell us how many things they had. Lihle will start for us. How many things did you have, Lihle?
119.	L	Beziyi-one.	They were one.
120.	Veliswa	Hayi siqala apha kuqala, kule-group. [She points her ruler to the group in front of her.] Thetha Lihle. Ukhwaze. Mamela.	No, we are starting here, with this group. [She points her ruler to the group in front of her.] Speak Lihle. Loud. Listen.
121.	L	Zilishumi.	They are ten.
122.	Veliswa	Zizonke ii-cube zethu bezingaphi? Mamela wethu Sive. Mamela! Bezingaphi?	How many cubes did you have in total? Listen here Sive. Listen! How many?
123.	L	Ngamashumi amahlanu awananto	Fifty
124.	Veliswa	Bezingamashumi amahlanu awananto. Sawahlula-hlula aba ngamaqela ka-zintlanu. Aba mangaphi ke ngoku amaqela ka-zintlanu?	They were fifty. We divided them into groups of five. How many groups of five were they?
125.	L	Lishumi.	Ten
126.	Veliswa	Zaba zingaphi? Thetha wonk' umntu eve.	How many were they? Speak so that everybody can hear.
127.	LL	Lishumi.	Ten
128.	Veliswa	Heke. Kwenye i-group elandelayo. [An older child comes into the class and speaks with her.] Mamela. Mamela ke. Apha kuni? Apha kuni? Thetha, Linki, bezingaphi zonke?	Very well. Next group. [An older child comes into the class and speaks with her.] Listen. Listen. From you? From you? Speak Linki, how many were they?
129.	L	Bezingamashumi amahlanu awananto	Fifty with nothing.
130.	Veliswa	Bezingamashumi amahlanu?	Five tens
131.	L	Anesihlanu!	With five!
132.	Veliswa	Anesihlanu! Kutshiwo ke, ithi i-group yakho bezingamashumi mahlanu anesihlanu; Nohlula zangamaqela. Thetha yonk' into! Nanga amaqela ka-zintlanu. Zibalele amaqela; Kwaphuma amaqela amangaphi?	With five! Your group says they were fifty-five. You divided into groups. Say it all! Here are the groups of five. Count for yourself. How many groups did you get?
133.	LL	Alishumi elinanye	Eleven

134.	Veliswa	Kwaphuma alishumi elinanye, ne? Niyangxola apha nina. Lthi loo nto abaya bathe izinto zabo, ii-cube zabo bezingamashumi amahlanu. [Veliswa writes the answer '=50' on the board.] Bezingamashumi amahlanu ne? Bayohlula bangamaqela ka-zintlanu, kwaphuma amaqela amangaphi ke? [She writes '5X' on the board]	You got eleven, isn't it? You are making noise here. This means those said their things, their cubes were fifty. [Veliswa writes the answer '=50' on the board.] Fifty right? They divided it into five and got how many groups? [She writes '5X' on the board]
135.	L	Alishumi	Ten!
136.	Veliswa with LL	Alishumi	Ten
137.	Veliswa	[She fills in '10' so that the sum is complete: '5X10=50'.] Nantsiya! Ithi loo nto xa uzintlanu umphinda-phinde kalishumi, zenza zingaphi? Ngamashumi amahlanu awananto.	[She fills in '10' so that the sum is complete: '5X10=50'.] There it is! It means when you multiply five by ten what is the answer? Fifty with nothing.
138.	L	Ngamashumi mahlanu awananto.	Fifty with nothing. Let us all say it. [She points to the sum with her ruler. The learners join in.] five multiplied by ten is equal to fifty.
139.	Veliswa with LL	Masitsho sonke [She points to the sum with her ruler. The learners join in.] Uzintlanu umphinda-phinde ngolishumi zenza amashumi amahlanu. Bona aba, nitheni nina? [She points to one of the groups at the back.] Nithe zingaphi ii-cube zenu? Yek' ubhala wena.	You here what have you done? [She points to one of the groups at the back.] How many cubes did you say you had? Stop writing.

(Veliswa, VRL2, tt.108-139)

Vignette:

The vignette below is part of a revision lesson based on the children's responses to a question in the ANA exemplar. I have reformatted it from my field notes and present it as vignette 11.1.

Vignette 11.1: Veliswa's calculation method used to answer the 'peg question' in the ANA exemplar

(Veliswa, FN, pp.10-11; reformatted for ease of reading)

The children in Veliswa's class have written the ANA exemplar in preparation for the ANA. The first question in the exemplar proved to be challenging for the children. Veliswa decided to go over this question with the children.

Question 1 in the isiXhosa paper had a picture of 35 clothes pegs scattered on the page (the number of pegs in the English paper is 44). The children have to answer a number of questions based on the picture. I refer to question 'e' that requires the children to determine the difference between their estimate and the actual number of pegs.

1. Jonga umfanekiso ongezantsi.



a. Thakolola izingaphi izinto ezimfanekiselweni _____

b. Zibale _____

c. Yenza amaqela amano no ngalo mifanekiso _____

d. Phawula ngo X isiqingatha senzi izinto ezimfanekiselweni _____

e. Uthini umahluko phakathi kwenani elithakolalweyo nalona nani lithakolalayo? _____

f. Zingaphi izinto okufuneka ndizibambe okanye ndizithathe ukwenza nani elithakolalweyo lilngani nonani lithakolalayo? _____

1. Look at the picture below.



a. Estimate how many objects there are in the picture.

b. Count the given objects.

c. Group these objects in fours.

d. Mark one half of the page with an 'X'.

e. What is the **difference** between the estimated number and the actual number of objects?

f. How many objects must I add or subtract to make the estimated number equal to the actual number?

(SA. DBE, 2012b)

(SA.DBE, 2012c)

Veliswa asks the children who had estimated to tell the class what their estimate was. A girl responds '45'.

Veliswa writes '45' on the board.

She then asks the children how many pegs are actually in the picture.

A boy writes '35' on the board.

She asks the children for the difference between '35 and 45'. No-one puts up their hand.

She waits and repeats the question a couple of times and a child writes '10' on the board.

The teacher asks another question but the children don't seem to know what she wants. A girl eventually volunteers and speaks to the teacher in isiXhosa [I don't follow the conversation]. The teacher calls her up to write on the board.

She writes:

$$35+2+2+2+2+2$$

The teacher clearly wants something else as she tells the girl to sit down. No-one seems to know what to do. The teacher writes the standard vertical algorithm on the board.

T	U
4	5
-	3
	5

She asks the children repeatedly what is '5-5'. They keep saying '10'.

She draws '5 tallies' on the board and crosses them out. ~~|||||~~

She writes '0' under the units.

Together with the children they work out '4-3' and the teacher writes a '1' under the tens column.

The answer is '10'. She asks the children what the answer is and they say 'amashumi' ('ten') in unison.

APPENDIX 12

Nokhaya

Classroom Observation, Video 3, 22 August 2012

In this transcript of Nokhaya's lesson on clock time, I have put the terms 'after' and 'before' into single inverted comments when they appear in a turn which has a fair amount of text, so that it makes sense. I have not done this when it is the only word spoken in a turn e.g. when the children repeat 'after' a few times.

1.	Nokhaya	[The teacher has a kitchen clock in her hand. She instructs the children] Ndifuna sime sonke sijonge ngapha. [The teacher points to the back of the class and the children turn around so that they are facing the back of the class] Uyi-wotshi ke njengokuba ujonge apho edongeni. Uyintoni?	[The teacher has a kitchen clock in her hand. She instructs the children] I want us all to stand and face this way. [The teacher points to the back of the class and the children turn around so that they are facing the back of the class] You are a clock as you stand facing the wall. What are you?
2.	LL	Uyi-wotshi.	You are a clock.
3.	Nokhaya	[Repeating after the children] Uyi-wotshi. I-wotshi ino 'emva': Kuthiwe imizuzu 'emva', imizuzu 'phambi'. Ndifuna ke ngesandla sakho undibonise xa ndisthi 'emva' ses'ph'isandla? Ses' ph' isandla? Sisandla sasekhohlo. 'Emva' [A child moves his right arm out. Stops and turns around to see the teacher. Some other children also turn around] Yithi 'emva' [Stretches her left hand out towards the door. Some children look around and stretch their left arm out toward the door waving her arm up and down] Sasekhohlo, 'emva'.	[Repeating after the children] You are a clock. A clock has an 'after'. It is said: minutes 'after', minutes 'before'. I want you to show me with your hands when I say 'after' which is the hand? Which is the hand? It is the left hand. 'After' [A child moves his right arm out. Stops and turns around to see the teacher. Some other children also turn around] Say 'after' [Stretches her left hand out towards the door. Some children look around and stretch their left arm out toward the door waving her arm up and down] Left hand, 'after'.
4.	LL	[Most of the children now have their left arms up waving them as the teacher is doing] 'Emva' [A few children are waving their right arm. They have the wrong arm up]	[Most of the children now have their left arms up waving them as the teacher is doing] 'After' [A few children are waving their right arm. They have the wrong arm up]
5.	Nokhaya	Emva	After
6.	LL	Emva	After

7.	Nokhaya	Emva	After
8.	LL	Emva [There are some children waving the wrong arm].	After [There are some children waving the wrong arm].
9.	Nokhaya	Xa sisithi 'phambi' sisebenzisa isandla sasekunene; masisisebenzise: 'phambi' [Teacher puts out her right arm now and starts waving it up and down. The children follow suit] 'phambi'	When we say 'before' we use the right hand; let us use it, before [Teacher puts out her right arm now and starts waving it up and down. The children follow suit] 'before'
10.	LL	Phambi [All the children are waving their right arm in the direction of the window].	Before [All the children are waving their right arm in the direction of the window].
11.	Nokhaya	Heh?	Huh?
12.	LL	Phambi	Before
13.	Nokhaya	Heh?	Huh?
14.	LL	Phambi	Before
15.	Nokhaya	Heh?	Huh?
16.	LL	Phambi	Before
17.	Nokhaya	Heh?	Huh?
18.	LL	Phambi	Before
19.	Nokhaya	Esasekhohlo? [The teacher switches arms.]	Left hand? [The teacher switches arms.]
20.	LL	Emva [The children stitch arms.]	After [The children stitch arms.]
21.	Nokhaya	Heh?	Huh?
22.	LL	Emva	After
23.	Nokhaya	Heh?	Huh?
24.	LL	Emva	After
25.	Nokhaya	Heh?	Huh?
26.	LL	Emva	After
27.	Nokhaya	Esasekunene?	Right hand?
28.	LL	[The teacher and children switch arms] Phambi	[The teacher and children switch arms] Before
29.	Nokhaya	Heh?	Huh?
30.	LL	Phambi	Before
31.	Nokhaya	Heh?	Huh?
32.	LL	Phambi	Before
33.	Nokhaya	Jongani phambili [The children turn around and face the front of the classroom].	Face the front [The children turn around and face the front of the classroom].
34.	Nokhaya	[The teacher holds the wall-clock up] Nantsi le wotshi. Ime njengani nale wotshi. Ithi le wotshi 'emva' [The teacher moves her hand down the right side of the clock-face, as you look at it]. Ithini?	[The teacher holds the wall-clock up] Here is this clock. It is positioned the same way as you are standing. This clock says 'after' [The teacher moves her hand down the right side of the clock-face, as you look at it]. What does it say?

35.	LL	Emva [Some the children spontaneously put their arms up]	After [Some the children spontaneously put their arms up]
36.	Nokhaya	Ithini?	What does it say?
37.	LL	Emva	After
38.	Nokhaya	[The teacher moves her hand up the left side, as you look at it, of the wall-clock] Ithi kweli cala 'phambi', 'phambi', 'phambi' [repeating for the children]	[The teacher moves her hand up the left side, as you look at it, of the wall-clock] This side it says 'before'; 'before'; 'before' [repeating for the children]
39.	LL	Phambi [The children change arms]	Before [The children change arms]
40.	Nokhaya	Phambi	Before
41.	LL	Phambi	Before
42.	Nokhaya	Ndiyakhomba ke ngoku... Uz' undixelele ukuba njengokuba ndikhomba nje uqaphele ntoni. Ndithi 'emva' [The teacher moves her hand down the right side, as you look at it, of the clock] Uyabona? Ndithi emva. Undibonile? Ndiz' othi 'phambi', 'phambi' [The teacher moves her hand up the left side, as you look at it, of the clock]. Uqaphele ntoni? Ndithi 'emva' [Moving her hand down the right side, as you look at it, of the clock]. Nibonile neh?	I am pointing now... You must tell me what you are observing as I point. I say 'after' [The teacher moves her hand down the right side, as you look at it, of the clock] Do you see? I say 'after'. Have you seen me? I'm going to say 'before', 'before' [The teacher moves her hand up the left side, as you look at it, of the clock]. What have you noticed? I say 'after' [Moving her hand down the right side, as you look at it, of the clock]. You have seen, hey?
43.	LL	Yes Miss.	Yes Miss!
44.	Nokhaya	Ndithi 'emva' ndiz' othi ke ngoku 'phambi'. Uqaphele ntoni? Heh? Ubonile? Isandla sam ndiyasehlisa xa ndisithi 'emva' [Moving her hand down the right side, as you look at it, of the clock]. Ubonile neh? Ndiz' othi 'phambi' [Moving her hand up the left side, as you look at it, of the clock] ndisithini?	I say 'after' and then I am now going to say 'before'. What have you noticed? Huh? Have you observed? I move my hand down when I say 'after' [Moving her hand down the right side, as you look at it, of the clock], have you noticed? Huh? I am going to say 'before' [Moving her hand up the left side, as you look at it, of the clock], and what will I do (with my hand)?
45.	L	Usinyuse.	Move it up.
46.	Nokhaya	Inoba kutheni ndisenza loo nto?	Why do I do that?
47.	L	Uya phambili.	You are moving forward.
48.	Nokhaya	Heh?	Huh?
49.	L	Uya phambili.	You are moving forward.

50.	Nokhaya	Inoba kutheni ndisenza loo nto? Ndinyuka ngapha, heh? Ngapha ndehlise isandla, ndathi 'emva' [Moving her hand down on the right side, as you look at it, of the clock]. Ndathi 'emva'. Undibonile? Ngapha ndasonyusa [moving her hand up the left side, as you look at it, of the clock], inoba kutheni? Heh? Inoba kuthen? Heh?	Why am I doing that? I move my hand up this side, huh? On this side I moved my hand down and said 'after'. [Moving her hand down on the right side, as you look at it, of the clock]. I said 'after'. Have you observed? On this side [moving her hand up the left side, as you look at it, of the clock], I moved it (my hand) up. Why? Huh? Why? Huh?
51.	L	Uya phambili, usiba luyehla.	You are moving forward. The clock-hand is moving downwards.
52.	L	Ndiyalazi ixesha.	I know the time.
53.	Nokhaya	[To the first child] Heh? Kha uphinde uthethe le nto ubuyithetha!	[To the first child] Huh? Repeat what you just said!
54.	L	Olu siba luyehla.	The clock-hand is moving down.
55.	Nokhaya	Kweli cala lingapha usiba luyathini? [Moving her hand up the left side, as you look at it, of the clock]	On this side, the clock-hand is doing what? [Moving her hand up the left side, as you look at it, of the clock]
56.	L	Luyenyuka.	It is moving up.
57.	Nokhaya	Very good! Luyenyuka. [Moving her hand up the left side, as you look at it, of the clock] Luyenyuka. Yiyo le nto isandla ndisenyusa. Ndisithi luyathini? Luyenyuka.	Very good! It is moving up. [Moving her hand up the left side, as you look at it, of the clock] It's moving up. That is why I move my hand up. It is doing what? It is moving up.
58.	LL	Luyenyuka.	It is moving up.
59.	Nokhaya	Kweli cala lingapha luyehla [moving her hand down the right side, as you look at it, of the clock]. Luyathini?	On this side it is moving down [moving her hand down the right side, as you look at it, of the clock]. It is doing what?
60.	LL	Luyehla.	It is moving down.
61.	Nokhaya	Kweli cala lingapha luyenyuka. [Moving her hand down the right side, as you look at it, of the clock] Kweli cal lingapha luyathini?	On this side it is moving up. [Moving her hand down the right side, as you look at it, of the clock] On this side it is doing what?
62.	LL	Luyehla.	It is moving down.
63.	Nokhaya	Yiyo le nto ndithe 'emva' [moving her hand down the right side, as you look at it, of the clock]. Ndathi ngapha 'phambi' [moving her hand up the left side, as you look at it, of the clock] Ndenyuka. Ndifuna ke ngoku undixelele ixesha. [Waves her left arm out in the direction	That is why I said 'after' and moved it down [moving her hand down the right side, as you look at it, of the clock]. I then said 'before' and moved it up this side [moving her hand up the left side, as you look at it, of the clock] It is moving up. I now want you to tell me the time. [Waves her left

		of the door i.e. the right side of the clock as you look at it] Ukhumbule ukuba bendithe kweli cala ngubani? [Moving the minute-hand to her left].	arm out in the direction of the door i.e. the right side of the clock as you look at it]. You must remember that I said. On this side is what? [Moving the minute-hand to her left].
64.	LL	Emva [A few children wave their right arm in the direction of the door]	After [A few children wave their right arm in the direction of the door]
65.	Nokhaya	Kweli cala ngubani? Moving the minute-hand to her right].	On this side is what? Moving the minute-hand to her right].
66.	LL	Emva [A few children wave their right arm in the direction of the door]	After [A few children wave their right arm in the direction of the door]
67.	Nokhaya	Ngubani?	What is it?
68.	LL	Emva [A few children wave their right arm in the direction of the door].	After [A few children wave their right arm in the direction of the door].
69.	Nokhaya	[Waving her right arm, now the left side of the clock as one faces it, to the windows] Ngubani?	[Waving her right arm, now the left side of the clock as one faces it, to the windows] What is it?
70.	LL	Phambi [A few children wave their left arm in the direction of the window]	Before [A few children wave their left arm in the direction of the window]
71.	Nokhaya	Ngubani?	What?
72.	LL	Phambi [A few children wave their left arm in the direction of the window]	Before [A few children wave their left arm in the direction of the window]
73.	Nokhaya	[The teacher moves the hands of the clock to set the time. She sets it to 07h15 and holds it up for the children to see] Ngubani xesha? Ukhumbule ke xa uzaw' ndixelela eli xesha.	[The teacher moves the hands of the clock to set the time. She sets it to 07h15 and holds it up for the children to see] What is the time? Remember what I've told you. What is the time?
74.	L	Ngumkhono emva kwentsimbi yesixhenxe.	It is a quarter past seven.
75.	Nokhaya	Ewe! Ngubani ixesha ke?	Yes! What is the time?
76.	LL	Ngumkhono emva kwentsimbi yesixhenxe.	It is a quarter past seven.
77.	Nokhaya	Ngumkhono emva kwentsimbi yesixhenxe. Ngumkhono emva kwentsimbi yesixhenxe. Xa singafuni ukuthi ngumkhono emva kwentsimbi yesixhenxe, siza kuthi ngubani ixesha?	It is a quarter past seven. It is a quarter past seven. If we do not want to say it is a quarter past seven, what are we going to say the time is?
78.	L	Quarter past seven.	Quarter past seven.
79.	Nokhaya	Ewe. Xa singafuni ukutsho siza kuthi ngubani?	Yes. When we don't want to say that, what are we going to say it is?
80.	L	Quarter past	Quarter past

81.	Nokhaya	Saw'thi ngubani? Phakamis' isandla. Saw' thi ngubani xa singafuni ukutsho?	What'll we say it is? Raise your hand. What'll we say it is when we don't want to say that?
82.	L	Quarter past	Quarter past
83.	Nokhaya	Heh?	Huh?
84.	L	Quarter past seven	Quarter past seven
85.	Nokhaya	Besesitshilo kaloku. Xa singafuni ukutsho saw' thini? Xa singafuniyo ukutsho sakuthi ... yimizuzu [She moves her finger from the '12' to the '3'].	Huh? We've said that already. When we do not want to say that what'll we say? When we do not want to, we'll say it is ... minutes [She moves her finger from the '12' to the '3'].
86.	LL	Phambi	Before
87.	Nokhaya	Heh?	Huh?
88.	LL	Yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	It is fifteen minutes after the hour of seven.
89.	Nokhaya	Kwakhona!	Again!
90.	LL	Yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	It is fifteen minutes after the hour of seven.
91.	Nokhaya	Kwakhona!	Again!
92.	LL	Yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	It is fifteen minutes after the hour of seven.
93.	Nokhaya	Uyazi njani ukuba ilishumi elinesihlanu laa mizuzu? Le mizuzu uyazi njani ukuba ilishumi elinesihlanu [pointing her finger to that side of the clock]?	How do you know that this is fifteen minutes? How do you know that this is fifteen minutes [pointing her finger to that side of the clock]?
94.	L	Ubala ngezihlanu	You count in fives.
95.	Nokhaya	Ubale ngantoni?	You counted in what?
96.	LL	Ngezihlanu	In fives
97.	Nokhaya	Ubale ngantoni?	You counted in what?
98.	LL	Ngezihlanu	In fives
99.	Nokhaya	Masizibale ke ezi zihlanu. [She moves her hand over the 15-minute-past-7 space on the clock-face].	Let us count these fives. [She moves her hand over the 15-minute-past-7 space on the clock-face].
100.	LL	Ntlanu, shumi, lishumi elinesihlanu.	Five, ten, fifteen.
101.	Nokhaya	Imizuzu mingaphi ke?	How many minutes?
102.	LL	Lishumi elinesihlanu emva kwentsimbi yesixhenxe.	Fifteen minutes after the hour of seven.
103.	Nokhaya	Kwakhona!	Again!
104.	LL	Lishumi elinesihlanu emva kwentsimbi yesixhenxe.	Fifteen minutes after the hour of seven.
105.	Nokhaya	Sithe kuqala 'ngumkhono emva kwentsimbi yesixhenxe', ngoku sithi 'yimizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe'. Uyayibona' ba	We first said it is a quarter past seven, we are now saying it is fifteen minutes after seven. Do you see that there are many ways of saying this? Not so?

		zininzi iindlela zokuyibiza, andithi?	
106.	LL	Yes Miss	Yes Miss!
107.	Nokhaya	Ndifun' ba ngoku umnt' azo kundibhalela apha ebhodini. Yimizuzu ilishumi elinesihlanu emva kwentsimbi yesixhenxe. Ubhale ngokwenani. Imizuzu elishumi elinesihlanu emva kwentsimbi yesixhenxe.	I now want someone to write this on the board for me. It is fifteen minutes after the hour of seven. Write it as a number. Fifteen minutes after the hour of seven.
108.	L	[A child writes 07.15 on the board].	[A child writes 07.15 on the board].
109.	Nokhaya	Unyanisile?	Is that true?
110.	LL	Yes Miss [They clap].	Yes Miss [They clap].
111.	Nokhaya	[The teacher sets the time to 08h35] Nguban' ixesha ngoku? [Holds the clock for the children to see. The child who wrote the answer on the board raises her hand]. Andizukukubuza, andikubuzi ... ndifuna abantu bade bayibone bonke, bade baphakamise. Ngubani ngoku ixesha? [One child puts up her hand] Hee! Libonwa nguNtantiso yedw'eli xesha! Ngubani ngoku ixesha?	[The teacher sets the time to 08h35] What is the time now? [Holds the clock for the children to see. The child who wrote the answer on the board raises her hand]. I am not going to ask you. I am not asking you, I am not asking ... I want everybody to see, so that they can raise their hands. What is the time now? [One child puts up her hand] Hey! It is only Ntantiso who can see this time! What is the time now?
112.	L	[A child doesn't wait to be asked, he just volunteers an answer] Twenty five past seven.	[A child doesn't wait to be asked, he just volunteers an answer] Twenty five past seven.
113.	Nokhaya	Ewe, kodwa uyayikhumsha. Unyanisile. Ngu-twenty five past seven. Kodwa uyayikhumsha. Ndifuna uyithethe ngesiXhosa. Ndifuna uyithethe ngesiXhosa. Hayi! Yho! Futhi asingo twenty five past seven lo. Asiyiyo I twenty five past seven. Yiyo?	Yes, but you are speaking in English. You are saying the truth. It is twenty past seven, but you are speaking in English. I want you to say it in isiXhosa. I want you to say it in isiXhosa. Oh! No! This is not even twenty five past seven. This is not twenty past seven. Is it?
114.	LL	No Miss.	No Miss.
115.	Nokhaya	Ndifuna umntu oza kuyithetha ngesiXhosa, anagyikhumshi. Ngubani ixesha, bhuti? Ewe? [Asking a child to respond].	I want someone who'll say it in IsiXhosa and not in English. What is the time, boy? Yes? [Asking a child to respond].
116.	L	Ngamashumi amabini awananto phambi kwentsimbi ...	Two tens with nothing before the hour of...
117.	Nokhaya	Amashumi mabini awananto? Ngubani? Besithe ngantoni kanene apha?	Two tens with nothing? What is it? What are we counting in, here?

118.	LL	Ngezihlanu	In fives
119.	Nokhaya	Ngoku, abantu abakwazi ukubala ngezihlanu? Ngubani ixesha?	Now, do people not know how to count in fives? What is the time?
120.	L	Imizuzu ingamashumi mathathu anesihlanu phambi kwentsimbi yesibhozo.	It is thirty five minutes before the hour of eight
121.	Nokhaya	Okay. 'Phambi'? Sithi 'phambi' xa sisithi ngamashumi mathathu anesihlanu? Uba sithe kaloku imizuzu ngamashumi mathathu anesihlanu, ithi loo nto sehlile ngapha [She moves her finger around the clock face from the '12' to the '7'] Xa sisihla besithe ngubani?	Okay. 'Before'? Do we say 'before' when we say thirty five minutes? If we say thirty five minutes, it means we have moved down on this side [She moves her finger around the clock face from the '12' to the '7'] When we move down what did we say it is?
122.	LL	Emva	After
123.	Nokhaya	'Emva'. Besithe kaloku xa sisihla ngu 'emva' ngapha. [She moves her finger around the clock face from the '12' to the '7'] Ngoku ukuba uthi 'imizuzu ingamashumi amathathu anesihlanu' uhlile. Siza kuthini ke ngoku? Siza kuthi 'emva' okanye sithi 'phambi'?	'After'. We said when we move down it is 'after'. [She moves her finger around the clock face from the '12' to the '7'] Now, if you say 'thirty five minutes' you have moved down. What are we going to say now? Are we going to say 'after' or say 'before'?
124.	LL	Emva	After
125.	Nokhaya	Sithi ngubani ke ngoku apha? Ubusithi ngubani ke ngoku? [She refers to the child who gave incorrect answer] Zilungise ke ngoku.	We say what is it, now? What were you saying it is now? [She refers to the child who gave incorrect answer] Correct yourself now.
126.	L	Imizuzu ngamashumi amathathu anesihlanu emva kwentsimbi yesibhozo.	Thirty five minutes after the hour of eight.
127.	Nokhaya	Heh? Ewe? Ngubani?	Huh? Yes? What is it?
128.	LL	Yimizuzu mithathu anesibhozo...	It is three minutes and eight
129.	Nokhaya	Heh? Yimi...? Heh?	Huh? It is...? Huh?
130.	LL	Yimizuzu mithathu...	It is three minutes...
131.	Nokhaya	Mithathu? Okanye ngamashumi...? Uthini kanye?	Three? Or Tens...? What are really saying?
132.	LL	Imizuzu ingamashumi mathathu anesihlanu emva kwentsimbi yesibhozo.	Thirty five minutes after the hour of eight.
133.	Nokhaya	Heh?	Huh?
134.	LL	Imizuzu ingamashumi mathathu anesihlanu emva kwentsimbi yesibhozo.	Thirty five minutes after the hour of eight.

135.	Nokhaya	Kha ulibhale apha elo xesha. Kha ulibhale eli xesha. Uthi yimizuzu engamashumi mathathu anesihlanu emva kwentsimbi yesibhozo. Kha undibhalele elo xesha pha ebhodini. Ngubani umntu oza kubhala? Bhala ke. [Child writes on the board]. Yha! Ngubani?	Just write this time here. Just write the time. Say thirty five minutes after the hour of eight. Just write that time for me here on the board. Who is going to write? Write, then. [Child writes on the board] Yha! What is it?
136.	L	Ngamashumi mathathu anesihlanu	Thirty five
137.	Nokhaya	Imizuzu?	The minutes?
138.	LL	Imizuzu engamashumi mathathu anesihlanu emva kwentsimbi yesibhozo	Thirty five minutes after the hour of eight.
139.	Nokhaya	Okanye, singathi ngubani ixesha ngoku? Singathi ngubani xa singafuni ukulibiza ngolwa hlobo? Saw' thi ngubani ixesha? Mamela ke, xa singafuni ukulibiza ngolwaa hlobo singathi siqale ngapha ngoku. Ngu 'phambi', mos, kweli cala, andithi?	Alternatively, what can we tell what the time is now? How can we tell the time if we do not want to tell it this way? What'll we say is the time? Listen then, if we do not want to tell the time this way we can start this side now, this side is 'before', mos, not so?
140.	LL	Yes Ma'am.	Yes Ma'am.
141.	Nokhaya	Siqale ngapha. [She moves her hand up the left side, as you look at it, of the clock]. Masikhe siqale, sizofuman 'uk'ba mingaphi na laa mizuzu phambi kwentsimbi yethoba. Uyayibona? Masikhe sikhangele. Bala.	We start this side [She moves her hand up the left side, as you look at it, of the clock]. Let us start, so that we can find out how many minutes it is before the hour of nine. Do you see? Let us find out. Count.
142.	LL	[Said in isiXhosa] 5; 10; 15; 20; 25 [As the children count, the teacher is moving her hand down the left side of the clock, as you look at it, pointing to the '11', '10', '9', '8', '7']	5; 10; 15; 20; 25 [As the children count, the teacher is moving her hand down the left side of the clock, as you look at it, pointing to the '11', '10', '9', '8', '7']
143.	Nokhaya	So? Imizuzu mingaphi?	So? How many minutes?
144.	LL	Twenty five	Twenty five
145.	Nokhaya	Phambi? Yithethe yonke kaloku.	Before? Say it all.
146.	LL	Imizuzu iyi-25 phambi kwentsimbi yesibhozo [Just before the children say 'yesibhozo' eight, the teacher points to the '9' on the clock].	25 minutes before the hour of eight [Just before the children say 'eight', the teacher points to the '9' on the clock].
147.	Nokhaya	Heh? [Still pointing to the '9']	Huh? [Still pointing to the '9']
148.	LL	Yesithoba	Of nine
149.	Nokhaya	Heh?	Huh?

150.	LL	Imizuzu ingamashumi mabini anesihlanu phambi kwentsimbi yesithoba.	Twenty five minutes before the hour of nine.
151.	Nokhaya	Heh?	Huh?
152.	LL	Imizuzu ingamashumi mabini anesihlanu phambi kwentsimbi yesithoba.	Twenty five minutes before the hour of nine.
153.	Nokhaya	Uyimamele ke ngoku ukuba sikweli cala? Sibala kweli cala, sithi imizuzu 'phambi'. Imizuzu ingamashumi mabini anesihlanu 'phambi' kwentsimbi yesithoba, ngoba sikweli cala. Kodwa ngelaa, ngokuya besisiza nayo ngaph' ya sithe imizuzu mingaphi?	Have you listened now as we are on this side? Counting on this side, saying minutes 'before'. Twenty five minutes 'before' the hour of nine because we are on this side. But when we were coming with it to this side we said how many minutes?
154.	LL	[Teacher joining in] Imizuzu ingamashumi mathathu 'emva' kwentsimbi yesibhozo.	[Teacher joining in] Thirty five minutes 'after' the hour of eight.
155.	Nokhaya	Kodwa ngoku, ngoba siya kwintsimbi yethoba sithi imizuzu mingaphi?	But now, because we are moving to the hour of we say how many minutes?
156.	LL	[Teacher joining in] Imizuzu ingamashumi mabini anesihlanu phambi kwentsimbi yesithoba.	[Teacher joining in] Twenty five minutes <i>before</i> the hour of nine.
157.	Nokhaya	Sithi...	We say...
158.	LL	[Teacher joining in] Imizuzu ingamashumi mabini anesihlanu phambi kwentsimbi yesithoba.	[Teacher joining in] Twenty five minutes before the hour of nine.
159.	Nokhaya	Sithi...	We say...
160.	LL	[Teacher joining in] Imizuzu ingamashumi mabini anesihlanu phambi kwentsimbi yesithoba.	[Teacher joining in] Twenty five minutes before the hour of nine.
161.	Nokhaya	Uyivile ke ngoku le nto?	Have you understood this now?
162.	LL	Yes Miss.	Yes Miss!
163.	Nokhaya	Uza kundixelela le na ke ngoku [The teacher sets the time to 08h55] Ngubani ixesha? Ngubani?	You are going to tell me this one now [The teacher sets the time to 08h55] What is the time? What is it?
164.	L	Imizuzu mihlanu phambi kwentsimbi yesithoba.	Five minutes before the hour of nine.
165.	Nokhaya	Yha! Unyanisile. Ngubani ngoku?	Yeah! It is true. What is it?
166.	LL	Imizuzu mihlanu phambi kwentsimbi yesithoba.	Five minutes before the hour of nine.

167.	Nokhaya	[Repeating what the children have said] Imizuzu mihlanu phambi kwentsimbi yesithoba. Ndifuna umntu ozondibekela ixesha. Eli xesha libe yimizuzu engamashumi amabini emva kwentsimbi yokuqala. Ibe yimizuzu engamashumi amabini emva kwentsimbi yokuqala. Ndifuna umntu ozondibekela. [To a child] Yiza... imizuzu engamashumi amabini ... Uza ndibekela apho ewotshini awananto emva kwentsimbi yokuqala, imizuzu engamashumi amabini emva kwentsimbi yokuqala. Bala izihlanu zakho apha. Babonise ke [The child sets the time and holds the clock up for the class to see]. Ngubani ixesha?	[Repeating what the children have said] Five minutes before the hour of nine. I want someone who will set the time for me. The time must be twenty minutes after the hour of one, twenty minutes after the hour of one. I want someone to set this time for me. [To a child] Come here... twenty minutes after the hour of one... You are going to set this time on the clock twenty minutes with nothing, after the hour of one, twenty minutes after the hour of one. Count your fives here. Show them your answer [The child sets the time and holds the clock up for the class to see] What is the time?
168.	LL	Yimizuzu engamashumi amabini awananto emva kwentsimbi yokuqala.	Twenty minutes with nothing after the hour of one.
169.	Nokhaya	Kwakhona!	Again!
170.	LL	Yimizuzu engamashumi amabini awananto emva kwentsimbi yokuqala.	Twenty minutes with nothing after the hour of one.
171.	Nokhaya	Ngubani ozondibhalela eli xesha? [A child volunteers] Kudala ebhala lo, ndifun' omny' umntu [Another child comes up to the board]. Amashumi amabini awananto emva kwentsimbi yokuqala.	Who is going to write this time for me? [A child volunteers] This one has been writing for quite a while now, I want someone else. [Another child comes up to the board] Twenty minutes with nothing after the hour of one.
172.	L	[The child writes 01:20 on the board. She stands away and the class claps]	[The child writes 01:20 on the board. She stands away and the class claps]
173.	Nokhaya	Ndifuna umntu oza kundibekela ixesha libe yimizuzu emihlanu emva kwentsimbi yesibini, imizuzu emihlanu emva kwentsimbi yesibini ... imizuzu emihlanu emva kwentsimbi yesibini. Nabanye abantu mabaphakamis' isandla. Nali... nants' iwotshi. Uzondibekela imizuzu ibe mihlanu emva kwentsimbi yesibini. [A child volunteers]	I want someone who will set the time to five minutes after the hour of two, five minutes after the hour of two... five minutes after the hour of two. Other people must also raise their hands. Here it is... here is the clock. Come and set the time to five minutes after the hour of two. [A child volunteers] Come. Show, show, boy. Show to all of them. What is it?

174.	L	Khawuze. Bonisa, bonisa bhuti. Babonise bonke. Ngubani? [He sets the clock to five minutes past two and holds up the clock to show the class. They clap].	[He sets the clock to five minutes past two and holds up the clock to show the class. They clap].
175.	LL	Yimizuzu emihlanu emva kwentsimbi yesibini	Five minutes after the hour of two
176.	Nokhaya	Kwakhona.	Again.
177.	LL	Yimizuzu emihlanu emva kwentsimbi yesibini.	It is five minutes after the hour of two.
178.	Nokhaya	Ngubani umntu ongandibhalela elo xesha pha ebhodini? [A few children put their hands up but one walks to the board to write]. Hayi ubusowubhalile kaloku wena.	Who can write this time on the board for me? [A few children put their hands up but one walks to the board to write] No, you have already written.
179.	L	Andikabhali mna Miss.	I have not yet written Miss.
180.	Nokhaya	Khang' abhale?	Did she not write?
181.	LL	[Some say] Ebebhalile. [Others say] Khang' abhale.	[Some say] She has written. [Others say] She did not write.
182.	Nokhaya	Alright, bhala ke. [The child writes: 02:5]. Li right? Ubhale kakuhle?	Write, then. [The child writes: 02:5] Is it right? Did she write well?
183.	LL	No	No
184.	Nokhaya	Yintoni le kufuneka eyilungisile? Kholeka, kha uyibhale. [A child inserts '0' before the '5' in the previous child's work]. Nalo ke. [The children follow the teacher and clap their hands]	What needs to be rectified here? Kholeka, write it. [A child inserts '0' before the '5' in the previous child's work] There it is. [The children follow the teacher and clap their hands]
185.	Nokhaya	Ndifuna umntu ozondibekela intsimbi yeshumi elinambini entloko, intsimbi yeshumi elinambini entloko. Yima. Ndizazibizela. Phakamis' isandla. Bayephi oobhuti? Kutheni ningaphakamisi nje?	I want someone to set the time to twelve o'clock, twelve o'clock. Wait I am going to call on someone myself. Just raise your hand. Where are the boys? Why are you not raising your hands?
187.	L	Nank' uMgongxo Miss.	Here is Mgongxo Miss.
188.	Nokhaya	Khange wenze?	Did you not get a chance?
189.	L	Khange Miss.	No Miss
190.	Nokhaya	O! Uphakamise mva, khange ndikubone.	Oh! You raised your hand last, I didn't see you.
191.	L	Hayi, ndiphakamise kuqala, Miss. [She sets the clock to 12 o'clock].	No, I was the first one to raise a hand, Miss [She sets the clock to 12 o'clock].
192.	Nokhaya	Babonise [The teacher holds the clock up] Li right?	Show them [The teacher holds the clock up] Is it correct?

193.	LL	Yes Miss [They clap] Yintsimbi yeshumi elinambini entloko.	Yes Miss [They clap] It is twelve o'clock.
194.	Nokhaya	Heh? Heh?	Huh? Huh?
195.	LL	Yintsimbi yeshumi elinambini entloko.	It is twelve o'clock.
196.	Nokhaya	Ngubani ongakhe andibhalele elo xesha apho ebhodini? Ndlela, suk' ebhodini.	Who can write this time on the board for me? [To a child] Come! Ndlela, move away from the board.
197.	L	[The nominated child writes '12:00' on the board and the others clap their hands]	[The nominated child writes '12:00' on the board and the others clap their hands].
198.	Nokhaya	Ndifuna ngoku umntu oza' ndenzela icala emva kwentsimbi yethoba, icala emza kwentsimbi yethoba. [The teacher points to a child. She fiddles for a while] Kha' wubabonise. Unyanisile?	I want someone who will set half past nine, half past nine. [The teacher points to a child. She fiddles for a while] Show them. Is she correct?
199.	LL	No Miss!	No Miss!
200.	Nokhaya	Icala emva kwentsimbi yethoba. [The same child fiddles once more]. Usayenza, khanimeni. Makhe simlinde. Babonise. Unyanisile?	Half past nine. [The same child fiddles once more]. Wait, let's wait for her. Show them. Is she correct?
201.	LL	Yes Miss	Yes Miss
202.	Nokhaya	Heh?	Huh?
203.	LL	Yes Miss	Yes Miss
204.	Nokhaya	Ngubani eli xesha?	What time is this?
205.	LL	Licala emva kwentsimbi yethoba.	Half past nine.
206.	Nokhaya	Heh?	Huh?
207.	LL	Licala emva kwentsimbi yethoba.	Half past nine.
208.	Nokhaya	Khanindibhalele ke eli xesha pha ebhodini. Ngubani oza' yo' bhala?	Write this time on the board for me. Who will go and write?
209.	L	Ndim!	It's me!
210.	Nokhaya	Kudal' ubhala wena. Masiphe abanye ithuba.	You have been writing quite a lot. Let's give others a chance.
211.	L	Khange ndibhale mna Miss.	I didn't get a chance to write Miss.
212.	NoLkhaya	Khang' abhale? Okay.	She didn't write anything? Okay.
213.	LL	[Child given the chance and write '09.30' on the board. They clap their hands].	[Child given the chance and write '09.30' on the board. They clap their hands].
214.	Nokhaya	Xa singafuni ukuthi licala emva kwentsimbi yethoba, singathini? Singathi ngubani ixesha?	If we do not want to say half past 9, what would we say the time is? What would we say?
215.	L	[Responds in English] Half past nine	[Responds in English] Half past nine

216.	Nokhaya	Sukukhumsha. NgesiXhosa sa' w' thi ngubani ixesha xa singafuni ukuthi licala emva kwentsimbi yesithoba.	Don't speak in English. In IsiXhosa, how shall we tell the time if we do not want to say half past nine?
217.	L	Imizuzu engamashumi amathathu awananto emva kwentsimbi yesithoba.	Thirty minutes with nothing after the hour of nine.
218.	Nokhaya	Good! Sa' w' thini?	What shall we say?
219.	LL	[Clapping their hands] yimizuzu engamashumi amathathu awananto emva kwentsimbi yesithoba.	[Clapping their hands] Thirty minutes with nothing after the hour of nine.
220.	Nokhaya	Kwakhona!	Again!
221.	LL	Imizuzu engamashumi amathathu awananto emva kwentsimbi yesithoba.	Thirty minutes with nothing after the hour of nine.
222.	Nokhaya	Ndithe kuwe ke yeyona nto ilula le yokubala imizuzu. Bal' imizuzu qho kubuzw' ixesha. Bal' imizuzu. Uyayazi mos ukuba xa ukweli cala lingapha ngu 'emva'; kweli cala ngu 'phambi'. Qho kubuzw' ixesha bal' imizuzu. Ibalwa ngantoni kanene imizuzu?	I have said to you that the easiest thing to do is to count the minutes. Count the minutes each time you are asked to tell the time. Count the minutes. You know that when you are on this side it is "after"; this side is "before". Count the minutes each time you tell the time. How are the minutes counted by the way?
223.	LL	Ngezihlanu.	In fives
224.	Nokhaya	Qho, bal' imizuzu. Okay. Ndibekele ngoku ixesha ibe yintsimbi yeshumi entloko. [Now a number of children run up to the teacher] Yima! Ndiza zonyulela. [A child is chosen to set the time].	Count the minutes all the time. Okay. Now set the time to ten o'clock. [Now a number of children run up to the teacher] Wait! I'll nominate [A child is chosen to set the time].
225.	L	[The child sets the time and shows the teacher]	[The child sets the time and shows the teacher]
226.	Nokhaya	Bonisa abanye. Ngubani ixesha?	Show the others. What time is it?
227.	LL	[The children clap] Yintsimbi yeshumi entloko.	[The children clap] It is ten o'clock.
228.	Nokhaya	Heh?	Huh?
229.	LL	Yintsimbi yeshumi entloko.	It is ten o'clock.
230.	Nokhaya	O! Ndenzele ngoku ixesha ibe ngumkhono phambi kwentsimbi yesixhenxe, umkhono phambi kwentsimbi yesixhenxe, umkhono phambi kwentsimbi yesixhenxe. Mgongco. [She points to Mgongco to set the time]. Umkhono phambi kwentsimbi yesixhenxe.	Oh! Now set the time to quarter to seven, a quarter to seven, quarter to 7. Mgongco. [She points to Mgongco to set the time]. A quarter to seven.

231.	L	[The child sets the time and shows the teacher].	[The child sets the time and shows the teacher].
232.	Nokhaya	Bonis' iklassi ke.! Unyanisile?	Show the class. Is he correct?
233.	LL	No Miss [Mgongco resets the clock]	No Miss [Mgongco resets the time]
234.	Nokhaya	Unyanisile?	Is he correct?
235.	LL	Yes Miss	Yes Miss
236.	Nokhaya	Nguban' ixesha?	What time is it?
237.	LL	Ngumkhono phambi kwentsimbi yesixhenxe.	It is quarter to seven.
238.	Nokhaya	Ngubani?	What?
239.	LL	Ngumkhono phambi kwentsimbi yesixhenxe.	It is quarter to seven.
240.	Nokhaya	Xa singafuni ukuthi ngumkhono phambi kwentsimbi yesixhenxe, sithi ngubani ixesha? S' ow' thi ngubani?	If we do not want to say quarter to seven, how shall we tell the time? How shall we say it?
241.	L	Yimizuzu elishumi elinesihlanu phambi kwentsimbi yesixhenxe.	It is fifteen minutes to seven
242.	Nokhaya	Heh?	Huh?
243.	LL	[Some children say] yimizuzu elishumi elinesihlanu phambi kwentsimbi yesibhozo. [Other children say] phambi kwentsimbi yesithoba.	[Some children say] fifteen minutes to eight. [Other children say] fifteen minutes to nine.
244.	Nokhaya	Heh?	Huh?
245.	L	Yesithoba	Nine
246.	Nokhaya	Heh?	Huh?
247.	LL	Yesibhozo	Eight
248.	Nokhaya	[The teacher takes the clock from the boy] Ewe, phambi kwentsimbi yesibhozo. Ngubani ixesha?	[The teacher takes the clock from the boy] Yes, before the hour of eight. What is the time?
249.	LL	Yimizuzu elishumi elinesihlanu phambi kwentsimbi yesibhozo.	Fifteen minutes to the hour of eight.
250.	Nokhaya	Kwakhona!	Again!
251.	LL	Yimizuzu elishumi elinesihlanu phambi kwentsimbi yesibhozo.	Fifteen minutes to the hour of eight.
252.	Nokhaya	Okanye?	Or?
253.	LL	Ngumkhono phambi yesibhozo.	A quarter to eight.
254.	Nokhaya	Heh?	Huh?
255.	LL	Ngumkhono phambi yesibhozo.	A quarter to eight.
256.	Nokhaya	Ewe, ngumkhono phambi kwentsimbi yesibhozo. Kodwa, mna bendithe makube ngubani ixesha? Mna bendithe mandinikwe ixesha libe ngumkhono phambi kwentsimbi yesixhenxe, andithi na?	Yes, it is quarter to eight. But, which time did I request? I requested to have the time set to quarter to 7, not so?

257.	LL	Yes.	Yes
258.	Nokhaya	Ndisafuna umntu ozandibekela ixesha kube ngumkhono phambi kwentsimbi yesixhenxe [One child takes quite a while to adjust the clock-face] ... phambi kwentsimbi yesixhenxe. Nguban' ixesha?	I still want somebody to set the time to quarter to seven [One child takes quite a while to adjust the clock-face] ... to seven. What time is it?
259.	LL	Ngumkhono phambi kwentsimbi yesixhenxe. Ngumkhono phambi kwentsimbi yesixhenxe.	Quarter to seven. Quarter to seven
260.	Nokhaya	Yesixhenxe?	To seven?
261.	LL	Yesibhozo	Eight
262.	Nokhaya	Heh?	Huh?
263.	LL	Yesibhozo	To eight
264.	Nokhaya	Ngubani ixesha?	What is the time?
265.	LL	Ngumkhono phambi kwentsimbi yesibhozo.	Quarter to eight.
266.	Nokhaya	Unyanisile ke?	Is she correct?
267.	LL	No Miss.	No Miss.
268.	Nokhaya	Mna bendithe mayibe ngubani?	What did I say it should be?
269.	LL	Ngumkhono phambi kwentsimbi yesixhenxe.	Quarter to seven.
270.	Nokhaya	Yena wenze bani?	Which time did she set?
271.	LL	Ngumkhono phambi kwentsimbi yesibhozo.	Quarter to eight.
272.	Nokhaya	Ngubani umntu oza kumlungisa? [A child volunteers] Babonise. Ngubani ngoku ixesha?	Who is going to correct her? [A child volunteers] Show them. What is the time now?
273.	LL	Ngumkhono phambi kwentsimbi yesixhenxe.	It is quarter to seven.
274.	Nokhaya	Yha! Nantsi ke mna into ebendiyifuna. Bendifuna u'ba umntu andenzele umkhono phambi kwentsimbi yesixhenxe. Ithi loo nto nanku umntu oye waba right. Yena uwuqondile umcimbi. Hambani no' hlala phantsi. Banik' iincwadi zabo zokubhala; nizozibhalela nani amaxesha (...) Hlal' endaweni yakho. Iphi incwadi yakho [to a child]? Iphi incwadi yakho? Iphi incwadi yakho? Yha! Yenza ezi sum ke ngoku.	Yes! This is what I wanted. I wanted someone to set the time to quarter to seven. It is clear that this is the person who has done this correctly. He understands this. Go and sit down. Give them their workbooks. You will now write the time (...) Sit at your place. Where is your book [to a child]? Where is your book? Where is your book? Ja! Do these sums now. Has everybody got it?
275.	LL	Yes Miss. No Miss.	Yes Miss. No Miss.
276.	Nokhaya	Yekabani le ncwadi? Ulijonge ke ixesha lakho. Ubhale ngolwa hlobo besibhale ngalo. Mamela ke, esa sithuba siphaya sincinci,	Whose book is this? Look at the time. Write as we have been writing. Listen, the writing space is not enough for you to write

awuzo' kwazi ukubhala ngamazwi. Bhala ngamanani encwadini kuthwa bhala ngamazwi, kodwa ke bhala ngamanani. [Nokhaya moves around to different children marking their work and speaking to them].	your answer in words so write in numbers. The instruction in the book is that you must write your answer in words, but you must write it in numbers. [Nokhaya moves around to different children marking their work and speaking to them].
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