

Resources of biography: Teacher identities and science teaching

LOYISO C. JITA



LOYISO JITA obtained his PhD in Curriculum, Teaching and Educational Policy at Michigan State University, USA. He is a lecturer in the Department of Curriculum Studies at the University of Pretoria where he also directs the Joint Centre for Science, Mathematics and Technology Education research centre at the university. His research interests are in the areas of science education, policy analysis, and educational leadership studies. He is currently working on several projects on school reform and classroom change in science and mathematics education.

Abstract

Changing classroom practices of teachers will continue to elude even the most sincere reform efforts. This is in part because the reformers have not paid sufficient attention to the personal aspects of teacher change. That is, how a teacher's sense of self has to change in order to enable the required changes in their teaching. There has been growing interest among researchers on the subjects of teachers' identities as they relate to the question of teacher change and many of these studies have contributed to our understanding of how teachers' professional identities are shaped and how teachers perceive their work and careers as school educators. Despite this substantial build-up in the literature on identities, few of these studies have explored the identities of teachers in developing countries. Furthermore even fewer studies have explored the connections between teachers' identities and their teaching practices either in developed or developing countries.

This article presents work on identities of a South African science teacher, Movement Sithole. It explores the relationship between his multiple identities and the teaching practices in his science classroom, essentially making the case that changing classroom practices result from changing teachers' identities. In the article I discuss how Sithole used his experiences of challenge and marginalisation in his own life as a springboard for constructing a counteridentity that enabled him to change his teaching practices. I conclude by developing the concept of "resources of biography," as a way of making sense of how Sithole was able to (re)interpret his otherwise adverse experiences to function as a resource for constructing his counteridentity that enabled him to teach science differently than many of his peers.

Introduction

Recently there has been increased activity in South African education around the development and implementation of a new curriculum, initially referred to as curriculum 2005 (which has now been translated into a more streamlined version called the Revised National Curriculum Statement, RNCS of 2002). Although there has been some criticism of the new curriculum and its foundational principles of outcomes-based system, many commentators agree on the fundamental shifts the new curriculum brings to the South African education system that has been characterised by

traditional approaches to teaching and learning, especially in the area of science. The new curriculum (2005) calls for different relationships between teachers and learners on the one hand, and learners and knowledge on the other hand, based on what has been commonly referred to as a 'transformational' model of learning. Although not properly defined, this transformational model of learning refers mainly to the need for classroom processes of teaching and learning to be aligned with the overall agenda of social transformation currently underway in the country.

Changing classroom practice is difficult (Cohen, 1988; Cohen & Barnes, 1993; Spillane & Zeuli, 1999). Such change requires significant volumes of teacher learning and teacher change. It demands that teachers re-examine their own relationships with their learners and the knowledge they seek to present and the context in which they seek to do this. It involves a fundamental interrogation of themselves, in relation to their students and the subject matter. Reformers in South Africa have done a lot to make teachers aware of the changes in the new curriculum through workshops designed to alter beliefs about teaching and learning. Although these efforts are commendable, they will continue to have mixed success primarily because they pay less attention to other critical factors that influence teachers in shaping their practices. In this article, I argue that the construction of a teachers' classroom practice is contingent on more than just what they know or believe about teaching and learning. It also depends on who they are and how they see themselves in relation to the learners, their colleagues and the subject matter. That is to say, it is shaped by their identities. I use the term *identity* to refer to a person's sense of self, as socially constructed within social settings (Spillane, 2000). Such an identity includes a person's knowledge and beliefs, dispositions, interests and orientation toward work (Drake, Spillane & Hufferd-Ackles, 2001) and also includes notions of how a teacher feels about him/herself professionally, emotionally and politically (Jansen, 2001). Teachers' identities therefore will be shaped within multiple contexts such as schools, classrooms, subject departments or cultures.

As part of a broader study of the construction of non-traditional forms of classroom practice in secondary school science classrooms – what I have called the transformative forms of practice – I investigated how the identities of Black science teachers influenced their construction of an alternative practice in their classrooms. This article explores how one of these teachers used the experiences of challenge and marginalisation in his own life as a springboard for constructing these transformative classroom practices for his students. I focus on how he (re)interpreted his otherwise adverse experiences to function as a resource for constructing an alternative classroom agenda for his science teaching. In the end, I use his story to develop the concept of 'resources of biography' as a way of understanding how identity enables and/or constrains the development of alternative forms of classroom practice in classrooms. That is I introduce the notion of the 'resources of biography' as the conceptual link between identity and classroom practice.

The next section outlines the theoretical framework used in the study, then the methodology, together with an overview of the teacher and his non-traditional classroom practices. Subsequently I explore the puzzle about the relationship between identity and classroom practice. That is to say, I construct an account of how it is that the teacher was able to teach science in non-traditional ways, by introducing the concept of 'resources of biography' as a possible explanatory variable for the observed practices.

Theoretical frame

Recently there has been growing interest among researchers on the subject of teachers' identities as they relate to their work in schools. An emerging consensus among these researchers is not only in the idea that "an individual's sense of self, or identity can be understood as and through stories" (Drake *et al.*, 2001) but also that life-history constitutes a useful research strategy for eliciting these stories of individual identities (Brunner, 1990; Casey, 1993; Connely & Clandinin, 1999; Drake *et al.*, 2001; McAdams, 1993). The framing of this study was influenced by this

emerging theoretical work that explores similar issues about teachers' lives in the context of their work and workplaces (Butt, *et al.*, 1992; Casey, 1993; Goodson, 1984 & 1992; 1996; Knowles, 1992; Middleton, 1989 & 1993; Nias, 1989; Osler, 1997a, 1997b; Weiler, 1988). Collectively the identity studies in education are beginning to suggest a number of dimensions of people's lives that have an impact on their classroom practices. For instance, the teachers' '**previous careers** (even as students) and life experiences' shape their view of teaching and the way they set about it (Casey, 1993; Goodson, 1984; Knowles, 1992; Middleton, 1993). Their '**life outside school**' together with their latent identities and cultures shape their practice (Goodson, 1984, 1992; Casey, 1993; Middleton, 1993; Nelson, 1992; Osler, 1997a & 1997b). The teachers' **career cycles**, irrespective of whether they are beginning teachers, veteran teachers, or even student-teachers plays a significant role in decisions to change their practice (Goodson, 1984; Huberman, 1993; Knowles, 1992; Osler, 1997a & 1997b). Casey (1993), Middleton (1993), and Weiler (1988), who studied different groups of feminist teachers, have also drawn our attention to the role of **political and epistemological frameworks** in crafting classroom practice. In addition Goodson (1996) also elaborated a view of the work of teachers as a 'political and social construction' by active social agents (p. 4-5).

Although we are now better informed about the role that life histories may play in crafting teaching practice, we still do not understand which of these dimensions operate under certain conditions and how they get translated into practice. Middleton (1989 & 1993), Bromley (1989), and Casey (1993) for instance propose the mediation role played by radical social theories in helping feminist teachers translate their own experiences of marginalisation (past or present) into meaningful and empowering practice for their students. Knowles (1992) uses Crow's (1987) concept of 'teacher role identity' to explain this connection between identity and classroom practice. Knowles's argument is that **teacher's childhood experience**, the **early teacher role models**, the **previous teaching experiences**, and other **critical incidents** in teachers' lives all come together to shape their 'image of self as a teacher', which is significant in their development of practice in the classroom. Despite the increasing number of identity studies of teachers, most of them are still largely descriptive with little theoretical framing to allow a broader test of the emerging understandings. And as Osler (1997a) observes, very little such work has been done in the low-income countries. South Africa is no exception to this trend. Although fewer studies have, to date, explored the question of teacher identities and the ways in which these impact on their work, the area is developing fairly rapidly as evidenced by the recent steady stream of studies in this vein from South African researchers (e.g. Macleod, 1995; Walker, 1996, Jansen, 2001; Matheson and Harley, 2001). The present study is located within these efforts to understand the identities of teachers who are engaged in one form of non-traditional practice (what I have called a transformative practice) and the impact of the identities on their classroom practices. This differs from the other studies cited here by their focus on the relationship between the core classroom processes (of teaching and learning) and the teachers' identities. Located within the context of a low-income country, South Africa, the study explores how **changing practices** result from **changing identities** – an important issue that confronts many teachers in South Africa and other countries globally.

Methodology

The study reported here involved one of three high school science teachers who were nominated (by other colleagues and by themselves) as involved in what I had characterised as "non-traditional" teaching approaches in my recruitment form. The purpose was to understand the identities of a group of Black science teachers who teach differently – against the grain as it were (Cochran-Smith, 1991; Simon, 1992). I was interested in how these teachers define and construct meaning in their lives (Denzin, 1989a,b; Bogdan & Biklen, 1992); how they make sense of their personal and work experiences (Bruner, 1990; van Maanen, 1990; Denzin, 1989a); and ultimately how they construct their identities in ways which help them to justify and explain the development of

alternative constructions of classroom experience for themselves and their learners (Bullough *et al.*, 1991; Bromley, 1989).

In my methodology I used the life history accounts of the teachers to understand the dynamics of (re)constructing new identities that serve as resources in the construction of non-traditional classroom practices.

I further employed the basic principles of a case study approach, which many scholars claim is well suited to in-depth analysis of complex issues (Stake, 1995; Weiland, 1995; Shulman, 1987). Furthermore, the case study approach was appropriate in this instance because of the life history orientation to the study of identity and teacher change. Although limited in that it does not lend itself to generalisable findings, the case study method allows for a context-specific inquiry into teaching and teacher change. It is from such in-depth context-rich case studies that other researchers working in similar contexts can draw lessons and extend the findings (Erickson, 1986).

Data included interviews and classroom observations over a period of 18 months. The classroom observations focused on such issues as the presentation of the content, assignment of science problems and questions and assessment of students' understandings of science.

I integrated much of my data collection with analysis (Miles & Huberman, 1984). I read and re-read interview transcripts, compiled detailed notes on each lesson observed, coded them to construct life history case studies for each teacher. This article presents one such case study of Mr. Sithole and uses the case to explore the relationship between teachers' identities and their classroom practice.

First I introduce Mr. Sithole and then sample his otherwise rich life stories, before I examine his classroom practice and the role of his multiple identities in the (re)construction of his practice.

Life story of Mr. Movement Sithole¹

Movement Sithole is a Black male in his late 30s who teaches Biology at a township school in Evaton². He grew up in a rented back room that was artificially separated to form a two-roomed house in this township. The oldest of the five children (2 brothers and two sisters), he was the only one to proceed beyond the matriculation level in his family. For the Sithole family, however, the 'power of an education' was never in question. Their mother came from a family of teachers, who had achieved a great deal within the system. As argued by Mr. Sithole, the land dispossessions of the past had left Africans with "no land or cattle to raise but instead with an option of going to school" in search of a better life. Such an education was the one possession the "oppressors would never be able to take away" from him and other oppressed peoples of South Africa (Interview: February, 1997)

Getting the education, however, often proved challenging for him because of a number of factors – some political, some cultural and personal, and others structural and inherent in the education system. His educational career became a victim of the many deliberate policies to segregate schooling in South Africa, pre-1994. As a SeTswana speaker, for example, he was forced to attend a local primary school where SeSotho was the medium of instruction. He attended the school for the first four years of his schooling, putting up with the marginalisation of being a SeTswana speaker until such time that the language issue caught up with him and he had to leave the school³.

His senior primary years, at a SeTswana medium school, were much better and more productive. Sithole excelled academically and developed positive ideas on teaching and teachers at his new

¹ Names of persons and schools are all pseudonyms.

² Evaton is one of a number of townships located in the south of Johannesburg.

³ Movement's experiences of segregation in primary education are a common experience for most youngsters who grow up in the "wrong areas" (i.e. not designated for their own ethnic groups) of the township.

school. Upon completion of his senior primary schooling, he entered a mixed (language) secondary school. Although Lwazi Secondary was a school with a good reputation, Movement was not happy with his experiences there.

I proceeded to Lwazi where I did my Standard Seven and Eight (Grades Nine and Ten). So this is where now things seemed to go very slow ... Because high school level, I mean high school teaching was totally different to that of primary. Teachers were different at high school. They were totally relaxed, relaxed, not teaching with that eagerness of empowering kids with knowledge, you see; especially the Afrikaans one. And some mathematics teachers were not showing that interest of seeing us, especially those (of us) who were slow learners in mathematics, you see. So, we had a problem. I had a problem actually to cope with their teaching methodology.

In our discussion, Sithole identified several factors that contributed to his negative experiences at Lwazi Secondary. First, there were the pedagogical factors: the teachers' approach to subject matter, especially the mathematics teachers that were not empowering and their 'lack of enthusiasm' and 'lack of interest in the slow learners' (Interview: February 1997). Second were the instructional guidance/supervision issues such as absence of strong guidance and supervision from the principal, in contrast with what was given by the primary school principal.

In the end his experiences at secondary school culminated in him being deprived of the opportunity to pursue mathematics further. Before the transformation in his life as a student, who now had to convince himself that he could not do mathematics and science, he had to deal with another personal tragedy in his family. Material conditions in his family deteriorated to the point that he had to drop out of school in search of a job to help provide for his family. His job search was however fruitless and he reluctantly went back to school, four months into the school year. The odds were stacked against him, both inside and outside school. On his return to school, for Grade 11, he had to be represented by his former primary school principal, who spoke at a level that 'made sense' to his counterpart at the high school. He was admitted on condition that he would not try to get back to the 'more demanding' math/science stream at that late stage of the year. Movement remembers the day of his (re)admission as one important day in his struggle for an education:

It was 19th April and when I started to go to school for my Standard Nine (Grade 11). So I nearly did not attend school that year, but then, due to some other circumstances, and the help of other eh, eh 'timer' so they talked to the principal and then until such time he accepted me at school the next month⁴ (Interview, February 1997).

The fact that he almost lost a year of secondary education remains indelible in his memory. I was never really able to establish further why this was so, except that those experiences of rejection during the job search and the near loss of an opportunity to pursue his studies together with other experiences over that period became significant in shaping his future relations with the apartheid state and its education structures. The year 1982 was the same year in which he would later be detained, supposedly for his activities in the Congress of South African Students (COSAS)⁵.

(I remember that year) because I had a lot of problems, some of the problems like, eh, I had been arrested before in 1982 during the uprising in Evaton and I found that was totally not called for because I never done anything wrong. I was presumed to be one of the COSAS members and yet I was not. I spent some days in the prison for nothing. We were manhandled by the police. Such things you know encouraged me to actually want to be a lawyer so that I would be able to assist those people, who are mishandled by police in this country (Interview, February 1997).

⁴ "Timer" is a street colloquial term for old man.

⁵ COSAS was the most vocal and active student organisation formed in 1979 to challenge the control and manipulation of secondary schooling by the white minority government.

The aggregation of his experiences drove him toward a well-formed consciousness against the system of apartheid governance. He began to form an identity of resistance to the system, and conceptualised a role for himself in opposition to that system. The formation of an identity of resistance was more significant given that a few months earlier, circumstances within his family had driven him to look for a job (as a policeman) within the very system he was now resolved to challenge. How this identity of resistance and his vision of himself as a 'helper' of his people played out in shaping his classroom practice will be discussed in the next section of this article.

Sithole worked hard at high school and passed with a matriculation exemption. However, because of his financial circumstances, he was not able to register at university and instead took the cheaper route into teaching. The system again failed Sithole in that he was not able to pursue his first or second choice of attending a university because of the economic situation of his parents. In fact, he had to scramble even to pay a R100 registration fee at the college of education:⁶

Ja. She (Mrs. Sithole) was a domestic worker and she was working in the shop, cleaning and so on. So and she had a relationship with the person who sent her there. Who was a relative to those people and told them that I don't have enough money to register, at least R100. So that family of my mother's friend, you know, okay, talked to that businessman of my problem so that I should be able to register. So they offered to help her. So I got to register for the course and it was late as well (laugh). So I arrived late, at least a week later after registration (Interview, February 1997).

One of the remarkable things about Sithole is his ability to derive humour out of his otherwise hellish experiences of struggle for an education. Although the seriousness of the experiences was not lost, he often laughed when he told the story of how he nearly missed out on an opportunity to become a teacher because he was too poor to come up with the required R100.

Armed with a R100 bill, he was able to enter college and begin his journey into the profession with the very modest goals of helping others 'achieve their goals' and 'sharing (my) knowledge, especially in the subject in which (I) had much interest (biology)' (Interview, February 1997). He was determined to share and use his experiences to provide better chances and opportunities for others in school. All the challenges in his life seem to have contributed to his conviction to 'change things.'

Having examined Sithole's life story, I now wish to explore his classroom practice.

Three major themes of Sithole's classroom practice

In summary, Sithole's case tells a story of how his practice is a constant struggle to steer his pedagogy away from a singular emphasis on 'covering the material' to a much broader practice that includes three major themes of **accountability to the system**, the **subject matter** and **accountability to the students**.

Covering the material or what I have come to call 'accountability to the system,' refers to the amount of examinable material a teacher is able to cover during his/her lessons, in order to 'prepare' the students for the end-of-year matriculation examination. At another level, the 'accountability to the system' refers to the number of students, in his/her previous classes, who have made it through the matriculation examination. That is, the percentage pass-rate a teacher has achieved previously with his/her grade twelve science classes.

Teaching for 'conceptual understanding' or what I have come to call the 'accountability to the subject/discipline' refers to the kind of teaching that pays attention to the science concepts students learn in the science classroom, the meanings they give to these concepts, how these

⁶ Education at the college of education, as opposed to university, was free and paid for by the state in return for service to the state upon completion. Students, however, had to raise a registration fee before admission.

meanings are constructed and articulated, application of the concepts to personal life, and how the teacher assesses the students' understanding of the concepts. It also highlights the repertoire of instructional approaches and design of learning contexts that a teacher uses to facilitate such conceptual understandings of science.

Teaching **all** students or what I have come to call the 'accountability to the learner' refers to a teacher's efforts to teach in ways that support the inclusion of **all** the learners in the classroom. These concerns included, in the case of Sithole's practice, such issues as how to use the students' own experiences to enhance their understanding of scientific concepts and when to let them use SeSotho, or another one of the eleven national languages to participate in the classroom discourse although such a language might not be the official language of instruction. The equity concerns also included concerns about when it was appropriate to selectively focus attention on girls in the science classroom.

The shift from an overemphasis of 'content coverage' to a situation where covering the content becomes the **basis for** and actually **enables** the achievement of conceptual understanding by **all** learners, is what highlights the practice of Mr. Sithole as non-traditional.

Describing transformation in Mr. Sithole's practice

At the time of our first meeting for this study, he was in his tenth year of teaching. For a while since his initial difficulties with meeting the requirements of 'covering the material,' Mr. Sithole had been trying to craft what he called a more 'relevant' pedagogy for his science students. When asked to describe his classroom practices, he uses terms like the following:

... independence, less dependent on the teacher, different teaching styles, breaking the monotony of the teacher in the classroom, group learning, giving chances to all students, preparing for the world, preparing for success, using (student's) personal experiences, using different words to show understanding and allow for different languages in class.

Although many of these are just abstract terms, when viewed through the lenses of voice, inclusion, conceptual understanding, collaborative learning, orchestration of discourse, and application of science concepts to authentic situations, that are often privileged by the current discourses on science education reform, Sithole's descriptions then begin to acquire more significance. His language does not, however, conjure up images of a revolution, but a revolution may just be the appropriate metaphor for his practice of science teaching at his school in Evaton.

His practice had indeed shifted from his earlier concerns with just 'covering the material,' to include concerns with accountability to the system, the subject matter/discipline and accountability to the students. How these shifts of emphasis from the one goal to the other played out in an actual classroom set-up is illustrated by the following example of Mr. Sithole's lessons on the 'Nervous System and Physiological Co-ordination.'

Classroom context and lessons

The focus is on Sithole's biology classroom, which is a medium-sized school laboratory, with seating arranged in three rows of tables and chairs. In the first row (nearest to the door) are seated seven boys and six girls, and fourteen girls are scattered around the seats in the middle row, while five more girls and seven boys occupy the third and last row of the classroom organisation (nearest to the teacher's/researcher's table). This is his Grade 12 biology class. The day's lesson, a continuation of a section on **the Nervous System and Physiological Co-ordination** was the second in a series of about three or four lessons⁷. It is a section of the Human Physiology theme in the prescribed biology matriculation syllabus. According to the syllabus, aspects of Human Physiology are first introduced in the Grade 10 syllabus, but then 'forgotten', only to be resurrected in Grade 12. This lack of continuity and proper sequencing in the curriculum is one of the conceptual

blocks identified by Sithole as contributing to his students' struggle to understand the notion of a 'system' and how it explains the co-ordination of bodily functions. Sithole was critical of the South African biology curriculum in this regard:

... For example, certain topics, they are not relevant, you see, to the pupils teaching wise, you know, especially in biology, like you see sometimes your Standard 10 (Grade 12) there is no direct link with that of Standard 9 (Grade 11). There is a gap. For example, in Standard 9 they are dealing with the animal kingdom for instance, in Standard Eight they are dealing with tissues and cells and the digestive system, you see that and also population dynamics, you see that. Standard Eight now and at Standard 10 level they are doing almost the continuation of Standard 8, in other words the child rests in Standard 9 with a new system altogether, you see that. There could be a link from Standard 8 up to Standard 10 or rather from Standard 9 to 10 should be one system and then Standard 6 and 7 and 8 should be one system continuation and at Standard 9 another system. *Ja*, which is going to be related.

Sithole's critique of the biology curriculum is framed by his three goals for science teaching. First, he worries about including **all** his students in the lessons. He discusses this concern in terms of the lack of relevance of subject matter to his students. Second, he identifies gaps in the organisation and structuring of the curriculum, in which related concepts and subject matter are discussed in two separate grades, one, two or three years apart. As with many of the reformers who advocate conceptual understanding in science teaching, Sithole proposes an organisational structure that would link concepts within and among grade levels. He proposes the use of phase organisers, for example using the concept of an ecosystem, to link subject matter presently found in Grades 8, 9 and 10 – which would be a junior secondary system. Subject matter for Grades 11 and 12 would also be linked in a similar way according to his proposal.

Sithole teaches biology twice a day to the same group of students. He runs an hour-long early morning class before school starts in order to 'cover the material' and then sees the same group of students during the regularly scheduled biology lesson at various times during the school day.

For the lesson of the day, he was planning to focus on some of the functional aspects of the nervous system. Coming to class a few minutes early, he began to draw three structures on the chalkboard: the Structure of a Multipolar Neuron; the Scheme of a Synapse; and A Schematic plan of an impulse across a Synapse.

As the students came into the laboratory, Mr. Sithole asked them to settle down and draw the structures in their books.

- T: O.K. Now we are going to discuss the movement of the nerve impulse.
T: (To the researcher) I want them to understand the transmission of impulses, before we discuss the structure of the spinal chord further.
T: First, draw the structures (that are on the board) in your notebook (Fieldnotes, August 1998).

There was a loud buzz of activity for about 15-20 minutes as the students began to draw and talk in their small groups. Although most of the students have a textbook they share with at least one other person in the classroom, Mr. Sithole preferred them to get into the 'habit' of drawing the structures in their own notebooks so that they could 'own them and get practice' (Interview, August 1998). If part of being a scientist involves the ability to represent observations or ideas in words, models, pictures, charts, and other forms of communication often used within the scientific

⁷ Mr. Sithole had planned three lessons for this unit, but based on his assessment of the students' understanding of the concepts and themes, he decided to add another lesson that would tie the unit together for the students.

community of scholars, then Mr. Sithole was not taking this for granted. He allocated time and space for his students to master these skills of participation within the scientific discourse community.

The student discussions in some of the groups involved comparisons of the representations of the structural features and debates about which representations were more or less accurate. In one of these groups, closest to where I was sitting, five or six students became involved in an argument about the representation of the **Synapse**. Their discussion was about the direction of the arrows that represented the (direction of) impulse. The arrows in the teacher's diagram all pointed in one direction – from the dendrite of neighbouring nerve cells into the cell body of the 'receiving' nerve cell. One learner who was drawing from a textbook structure, however, drew some arrows showing impulses moving out of the cell body into an axon. When the other students saw his drawing an argument ensued. The argument was about the fact that the latter student was showing an inconsistent direction of movement of the impulse. The exchange continued for a few minutes about why one representation was 'wrong' and the others 'correct.' The students were deadlocked on what the 'correct' way of representing the direction of impulse was.

To resolve the dilemma, they decided to examine a number of drawings from different textbooks. Two more textbooks were brought in (from the teacher's table) for comparison. One of the two new textbooks (brought in from the teacher's table) had a drawing of a synapse that was consistent with what the student in question had drawn, namely that two textbooks now had one pattern of drawings and one other textbook plus the teacher's drawing on the board had another pattern – making it two against two. A resolution could not, therefore, simply appeal to the politically expedient solution of paying attention to the view of the majority, as there was no clear majority in this case, as I sensed they were inclined to do when they brought in the other two textbooks. After a series of second and third rounds of close examination of all the drawings (in the textbooks and on the chalkboard), they arrived at an insightful and interesting resolution of the debate.

Their resolution was that there was nothing wrong with all the drawings – because the arrows were 'not all on the same nerve cell'. As one of the students put it (in his explanation of this insight to the others), the synapse was 'like a traffic circle where you come in and circulate and then can go out in any direction'. That is, nerve impulses come into the cell body from different directions, and leave through any axon to the effector organ or muscle.

For some experienced teachers, this incident may appear unexceptionable and in fact appeared so to this researcher at the time of the observation. It was not until I saw several of Mr. Sithole's lessons and engaged him in a discussion of what his vision of a desirable classroom practice was, that it acquired more significance. Several things are worth noting about the students' discussion:

First, this had occurred before the class started any discussion on the functioning of a synapse, the transfer of impulses or the structure of nerve cells for that matter. Students seemed to make important **connections** of the key ideas with aspects of work, is normally covered in Grades 9 and 10, concerning mammalian and human tissues. I was not able to establish whether the subject matter connections the students were making in this particular case originated with their prior learning of the concepts from the earlier grades, or whether it was a result of their preparatory reading for the day's lesson, which Mr. Sithole made a point of assigning at the end of each day.

Second, the discourse was spontaneous within the group and not directed by the teacher. What had begun as a small discussion on representations and drawings developed into a rich source of engagement in the subject matter of science. It became a source of collaborative construction of meaning by the learners.

Third, the discussion among the students took place in SeSotho (one of the eleven official languages of South Africa, not a medium of instruction at this level). Lastly, the students relied on their own resourcefulness to resolve the debate. Neither the teacher nor his chalkboard drawing

was authoritative enough on this issue. Even the one textbook that one student was drawing from was not enough to establish the 'facts' in this case. Several sources were needed and used. More importantly, however, is how the texts were used to construct new meanings on the transfer of impulse. The texts demanded interpretation and appropriation of the students' real world experiences. A metaphor that resonated with students' experiences was brought to bear on the discussion. Their metaphor of a traffic circle, however porous, enhanced their understanding of the concept of a synapse (as a functional unit of the nervous system). This is one instance where the notion of scientific authority was put on the table for scrutiny. Neither the teacher nor the textbooks by themselves were vested with this kind of authority. Students were constructing meaning out of what had appeared to be a meaningless sketch of a synapse by one of their colleagues. Such an incident as observed in this classroom fills the (policy-practice) gaps in most of the science reformers' ideas about changing the way science is presented to students in schools. The questioning and appropriation of scientific authority in this classroom, although uncommon in many science classrooms, has been highlighted as an important reform objective and documented as an important theme for change in science learning and instruction (Jansen, 1990).

'That to me is what teaching and learning is about!' (Interview, August 1998) was Sithole's excited response when I drew his attention to the group discussion. Pressed to explain what he meant, he suggested to me that the segment I had observed provided a representation of the three aspects of his non-traditional classroom practice, namely creating a safe and nurturing environment for collaborative learning ('group learning'); a habit of 'independent' exploration and "less reliance on the teacher", and making the subject matter accessible to the students by 'bringing in their experiences into the classroom'.

Sithole's classroom practice was, however, not a straightforward implementation of the three goals he had enunciated in this conversation and others. It was much more complicated and murkier than suggested by this summary. At other times, for instance, his classroom appeared no different from the many that have been studied and characterised as traditional except that his showed evidence of a constant struggle to improve his practice away from the dominant features of traditional practice. Even when his lessons appeared traditional, he always seemed to be at pains to nurture an environment of collaborative learning. He required students to caucus their responses with their group members first before sharing with others in the class. Furthermore he subjected students' responses to a public process of verification, asking them whether they agreed or not, and why. He was also enthusiastic about making connections between several concepts and themes studied earlier by his students. These latter aspects of his practice acquire even more significance in the context of the overall culture and practice of science teaching and learning in South Africa, which tends to discourage innovation and learner-centredness in the classrooms at the senior grade levels (Walker, 1996; Mehl, 1990). However, contextualising them further within his own identity and vision for a new society provides an added dimension to their significance and their potential for being transformative.

Despite his vision of a new and transformed society that he brought from the days of apartheid, nothing in Mr. Sithole's treatment of the subject matter in the classroom was overtly political and about transforming the society outside the classroom. Yet in many ways, his teaching of biology was just about that. He was challenging a status quo that provided too much structure for learning and too few opportunities for independent exploration and collaborative construction of meaning by the learners. A very quiet and soft-spoken person, Mr. Sithole is not one who would go out publicly and declare war on traditional practices to teaching despite his expressed dissatisfaction with them. His was a low-key effort at reconceptualising science teaching in his classroom. In the next section I seek to locate his practices within the context of who he is and what seemed to drive his biology teaching.

Making sense of the changes in Sithole's classroom practice

One way of reading this case study is as a story of one teacher's ability to balance his contradictory goals for science teaching with the conflicting social and professional expectations of being a teacher in South Africa. While on the one hand Mr. Sithole was struggling to reconcile his three goals for teaching science – 'accountability to the system, to the discipline, and to the learners' – he was also engaged in a process of justifying the kind of practice that was emerging out of this struggle to reconcile the goals. The resulting practice went much against the images created by the dominant discourses on how to teach science in South Africa. For example, while the dominant discourse of 'authoritarian surveillance' (Walker, 1996) created an expectation for his classroom approach to have a distinct emphasis on hierarchical relationships, his emphasis on democratic relationships and participation arising from his goals for science teaching went against the grain in the profession. How is it that Mr. Sithole was able to balance these contradictions and maintain a practice that went against the grain? What kind of resources did he draw upon to sustain a transformative vision and practice? How is it that he was able to underplay the dominant conceptions of science teaching within the context of his own life and work?

The answer to these questions is not a simple one. It requires us to look closely at the events in his life experiences and the meanings they had for him in relation to his goals for teaching science. His life experiences provided various themes (or resources) by which he defined his identity. In other words for Sithole to break free of the stranglehold of the dominant discourses that promote modal practices, he needed to see himself in a different light, not bound by these discourses; namely he needed a powerful new identity to substitute the imposed identities that support modal practices. This new identity of a transformative practitioner is a personal construction by Sithole from all his experiences as a Black student, science teacher, parent, community leader, and cultural being in South Africa. In this next section, I explore how some features of Mr. Sithole's life history have given him the tools for constructing the kind of classroom practice I have described in the previous section.

I put forward the case that his life experiences have given him what I have termed the 'resources (of biography)' which he uses as a lens to view, explain and construct what he does in his classroom. The meanings he gave to these experiences allowed Sithole to construct an identity as a transformative practitioner. In my analysis of his experiences and how they all shaped his stance on classroom practice, four particular resources or forms of defining himself (identities) stood out as having specific influence on the kind of teaching he was constructing, namely his cultural identity, identity of resistance, the professional identity, and the identity as a learner.

Cultural identity

Mr. Sithole is an African who has lived in the townships of South Africa all his life. Despite the oppression and poverty so characteristic of these township communities, many of the social networks and values are still as intact as they were before apartheid took over on a grand scale. The social values, networks and ways of doing things by communities are often referred to as culture. Aspects of this culture such as the notion that he brought up in our conversations, that 'it takes a whole village to care for and educate a child' provided the intangible tools on which Mr. Sithole draws to construct a transformative identity. The proverb essentially neutralises the idea of the 'other' in teaching and learning situations. The 'other' becomes your own, and teaching becomes a personal and cultural involvement. This ethic of caring for and helping the 'other' is so obvious in Sithole's vision for equity in science teaching. It is not clear to me that he bases his pedagogy of inclusion on the tenets of some reform literature as much as it arises from his cultural responsibility and care for **all** children in the 'village.' When I asked him, for instance, about how he makes decisions about who should talk in class, he explained it in terms of his desire to get everyone included, especially those who were not inclined to participate in the public settings of the classroom:

... sometimes those who have their hands up, you know, most of them are ones who continue to answer questions. [they] Don't give the other kids a chance. Well, the other ones, even though they are not raising their hands they may know the answers – you find that their hands are not actually up but its a little bit up, you see. They want to answer, but they seem to be shy, I should think so. So I give them a chance to participate (by calling on them).

Equity for him is about giving **all** children a chance. This is not unlike his own situation, when as a prospective education student an old 'timer' from his church gave him a chance by offering to pay his registration fees. In fulfilling a cultural responsibility towards a village child, the 'timer' opened up a chapter on equity for Sithole – a chapter which was later to (re)surface as a problem in the construction of his biology lessons. As an African, Sithole could appeal to his cultural responsibilities as a father, as elder brother, as teacher and adult member of society to care for and educate **all** children under his care.

This cultural/ethnic identity form, however, does not only provide for positive features alone, but contains contradictory aspects of culture, which were equally available to Mr. Sithole. For example, although Sithole had over the years abandoned the use of 'the stick,' he was not opposed to its use in principle – on cultural grounds ('spare the rod and spoil the child'). This expectation for him to act tough and yet be caring and democratic (or inclusive) in teaching science to his students is one of the dilemmas created by the appeal to this cultural identity form. It is obvious that Mr. Sithole chose the features of his culture that resonated with his teaching goals. How such choices within choices are made, which help us achieve particular goals at a given time, remains a question on which further research is needed.

Identity of resistance

From the time when Sithole was wrongfully arrested as a student, he has never looked back in terms of his development of an identity of resistance. Failing in his first choice to become a lawyer so that he would be 'able to assist those people (that he had witnessed) manhandled by the police' (Interview, February 1997), he set out to become a teacher with a difference. Armed with a vision of a transformed society and a strong sense of activism, he set out to challenge the status quo in teaching. He described his vision and goal as follows:

Actually there were many things that were happening in teaching that I disliked most. Especially now at Black schools. You see now. I thought that if I would be a teacher I would be able to change such scenes, especially the one of being under-resourced and then most of the teachers being unable to share their knowledge and the lack of interest in their teaching seems so and the actually the environment of our schools is bad ...

Two primary concerns spring from this statement by Sithole. First, he worries about the neglect and under-resourcing of Black schools generally. Second, he worries about the lack of support for teachers and the consequent low morale among them. These are two issues that drive his activism in and outside the classroom. As a Black teacher, he feels a particular responsibility to the students in his classroom (all of whom are Black) and is not sympathetic to those teachers who give up on the kids because the system is not supportive. His approach as a regional leader of the largest teachers' union in the country is to 'serve the kids' (Interview, February, 1997) while fighting the 'system' for better conditions of service. For him, working for change inside the classroom was intricately bound with working for change at another broader structural level of society. This included working with others to improve the conditions and resourcing of schools, and access to preschool education and other social welfare and sporting services to (deprived) children.

It is this ethic of activism that sustains Mr. Sithole in his pursuit of classroom practices that go against the grain. As a high profile leader of a teacher's union that has been in the forefront of

campaigning for educational transformation in the country, it is possible that Mr. Sithole sees himself as a trailblazer – a guinea pig in the experiments for social and educational transformation. Since he had not seen the new reform curriculum proposed to transform education in South Africa, he is nobody's experiment but his own.

So I have not seen the system (new curriculum) actually. What type of system is going to be implemented? I never got a chance to be, a chance to participate in this new curriculum process. Either, if I had a chance I would say either its positive or negative, I don't know ... Teachers' organisations are not involved in that. *Ja*, it's only the bureaucrats at the office who are trying to sort of make a curriculum.

Although the language and intentions of the new revised national curriculum would resonate well and support the transformations in Sithole's classroom, the processes of developing and implementing the new curriculum have been so controversial and contested that much of its appeal is lost to those teachers, like Sithole, who needs it the most.

Coming out of a strong tradition of workers' leadership and political activism which emphasises democratic principles of consultation, participation, democratic decision-making, it is no surprise to see Sithole play the science education game by those sets of rules. He presents students' responses to wider processes of discourse by asking others to comment on the response:

... to see whether those students agree with her before I can give my own resolution to the class. *Ja*, to see whether they understand the lesson the same way the other student who answered the question ... Sometimes I usually ask the pupils to answer the same question, if somebody is asking a question, I redirect the question to them.

The democratic approach to the science discourse enables him to pursue his goals of encouraging participation in the lessons. But, beyond that it opens up a window to the different forms of understanding by the students. The notion of a 'resolution,' although derived from the political processes of reaching a consensus on an issue, has important relevance to science education. It suggests an approach to science as a social construction, presenting scientific knowledge as generated through processes of public discourse and agreement or conventions. Discourse and social construction of science knowledge are two of the key features of the new reforms in science education locally and internationally.

Professional counter-identity

The professional culture of teaching in South Africa is based on a premise distorted by the various discourses of apartheid. For example the 'teacher qualification discourse' (Walker, 1996) tends to undermine the sense of competence of many older teachers who are defined as 'un(der)qualified.' For the younger teachers who graduate from colleges of education with an inadequate preparation in subject matter⁸, building confidence to present the subject in ways that encourage students to question and participate more can be very challenging. Furthermore, the discourse of 'authoritarian surveillance' (Walker, 1996) limits the ability of teachers to make professional decisions about what is appropriate to teach, when and how. The syllabus prescriptions are often over-determined, and all that teachers have to do is to go through the textbook page by page. Such professional expectations create and sustain a weakened sense of subject matter identity among many of the Black teachers in South Africa.

⁸ Entry requirements at Colleges of Education required less than what universities expected of prospective teachers. The result was that most Black teachers from colleges of education have less confidence and mastery of the subject matter. At the college, the curriculum took them no further than what they already knew from their Grade 12, since particular emphasis was placed on ability to teach the subject [more or less what Shulman (1987) calls the pedagogical content knowledge, PCK].

In a professional culture that seems to discourage innovation, to be different requires a very strong sense of self in relation to one's work. Upon graduation from college, Sithole set out on a path to be just that kind of a teacher who would be 'different.' He was determined to achieve better than many other teachers around him:

I thought I would teach much better than the other teachers do. For example, either I try to improve myself to make children to understand the subject that I was teaching. *Ja*. Especially science-wise. *Ja*. I try to have resources for science ... a better teacher is a person who is always prepared in the subject and always trying to share his knowledge and also to help the pupils understand the subject by implementing various methodologies to alleviate such problems of the pupils as they might have. By planning, I should think, planning, study further to improve your qualifications so that you must be having much knowledge and be able to share knowledge with the pupils, you see and have some knowledge that deals with the underachievers for some pupils have the interest but being unable to cope with such subject but you must have some other way round to encourage them so that they must be able to have interest in the subject and also to improve themselves. ... so must try to involve every pupil and to treat them equally.

In this segment Sithole identifies four aspects of practice that needed his attention in order to construct a strong sense of professional identity. First, issues of equity in dealing with all his learners, paying attention to participation and relevance of subject matter to their lives. Second, excellence in presenting and responding to subject matter issues and students' questions and concerns. This involved developing a strong pedagogical content knowledge (Shulman, 1987) in science. Third, issues of promoting deeper understanding of the subject matter and paying attention to all students' ideas in the classroom, especially those less inclined to be involved in class activities. Lastly, issues of organisation and management of the learning environment, with emphasis on proper planning and ability to improvise in terms of finding resources for science teaching. His experiences at the college of education and the in-service courses he attended in his first year of teaching had not prepared him adequately to assume such a strong sense of identity. He, therefore, had to rely on his resources (of biography) to build up the competence and confidence in the areas he identified as needing attention. Learning became a vehicle through which he developed this strong sense of subject matter identity.

Identity as a learner

Although Sithole's first years in the profession were 'horrible,' in that he was 'thrown in the fire' (Interview, February 1997) of unruly students who were caught up in the middle of an intense political struggle against the system of apartheid education, he was not swayed from his early ambition to be different. He spent his first two years (re)learning how to be a teacher under these conditions: how to deal with 'discipline problems,' how to prepare lessons that would capture the attention of students who did not see a future within the apartheid education system, and more importantly how to create avenues for the expression of his vision for a better society, better schools and better teachers. As a start, he enlisted with a non-governmental organisation that was offering Saturday classes to matriculation students in the area. This Saturday school project brought his life full circle, as he was paying back his dues in a program similar to the one he had attended as a student several years earlier. The significance of this Saturday program, however, lies in its effort to spread collaborative learning ('group learning') strategies to teachers in black schools. Sithole became a beneficiary of their staff development programs on collaborative learning methods. What began as an extra hour's activity actually contributed a great deal in shaping his classroom practices in non-traditional ways. He elaborated on the developments in his learning to be a 'better teacher' as follows:

Yes, I should think there has been a change because I am able to handle the senior classes, even lower classes, in the same manner. I am able to bring some new methodology in class. Motivate pupils. Make some resources available, either the charts available or the pupils should bring some specimen to class so that to involve them in the learning situation. They should see biology is a living subject and they should be able to do some of the aspects alone, like those projects and in a sense I'm growing with the subject ...

Sithole sees himself growing with the subject, from his ability to teach both senior and lower classes equally effectively. He places emphasis on the growth of his pedagogical content knowledge and his ability to work with and from the student's own life experiences. A pedagogical practice that sought to deal with connections between important themes in biology, that relied on non-traditional instructional approaches – allowing students to work in groups and contribute their own ideas to the subject struck me as something I had witnessed in Sithole's classroom at one point or the other during my visits. That was how he had characterised his changing classroom practice.

Conclusion: Exploring the 'resources of biography'

In the context of the recent initiatives by reformers and policymakers in South Africa and other countries, to encourage changes in teachers' classroom practices, this inquiry into the complexities of doing this is warranted. To understand the challenges and opportunities for reconstructing practice, one has to pay attention to some of the themes raised by the case of Mr. Sithole. Sithole's case complicates the challenge of reform. It brings to the fore the interconnectedness between who a teacher is and how he/she constructs and gives meaning to his/her work experiences, namely the links between identity and classroom practices. Briefly restated, the major argument arising from the Sithole case is that changing practice requires a significant shift or change in the teacher' identity. This (re)construction of an identity (of a transformative teacher) begins from and uses as tools his/her previous and current identity forms. It is indeed a reconstruction. The notion of 'resources of biography' therefore captures the fact that the new identity is indeed a selective and conscious reconfiguration from lived experiences (or biography).

To change the classroom practices of most teachers in South Africa will require a great deal of resources – both material and social resources. In addition to the material and other social resources that need to be mobilised for such classroom change, Sithole's case also draws attention to a crucial, but often neglected, dimension of change – the **personal dimension**. To change their classroom practices, teachers in South Africa and elsewhere will be challenged to (first) reconsider and change who they are as individuals (identities) within existing frameworks of educational practice. While teachers' personal histories present a set of experiences that may function as obstacles to reform, they however, remain available as potential resources for transformation as well. Sithole's case has allowed us to view this category of intangible resources on which very little research has been done to date – what I have termed the 'resources of biography' or identity. These resources include such things as one's **experiences of marginalisation, experiences of growing up or living in a particular culture** and the **experiences of participating in certain kinds of social or political activities**. How such resources of biography are used to explain and legitimate classroom practice by the teacher is the major theme of the Sithole's story and the other science teachers I studied in this research project. What makes it difficult to conceptualise and study the role of these resources of biography as opposed to the other resources (material, human and social) is the fact that they are intangible and often inaccessible until teachers begin to consciously reflect on them. They remain only as potential resources until interpreted and used as such by the individual teacher. As Dewey (1938) asserted about the power of an (educative) experience, it is a potential that leads to further meaningful experiencing. Such further experiencing, however, can only result from a conscious reflection upon the prior experience. Indeed, experience without a

framework for its interpretation is useless, as is a framework without experience (Bromley, 1989).

In discussing Sithole's story, I have highlighted not only how his personal history provided the themes (resources) for reflection on his life and pedagogy as a teacher, but also how he used these various themes (or resources) of his life to construct a counter-identity to the *status quo* in his profession. It is not only the presence or absence of such resources in a person's life story that enables him/her to construct a potentially transformative classroom practice but how he engaged in a complex process of (re) interpretation of these experiences of marginalisation to author counter-identities that sustain him and his practices. In other words, personal experiences become a resource (of biography) through reflection, reinterpretation and deployment in the craft of a counter-identity of transformation. Through this complex process of reflection and (re)interpretation of his experiences, Sithole was able to create direct links between his identity forms and science teaching and learning in his classroom.

A key point from the foregoing discussion is that, it is not only the experiences of marginalisation, or of growing in a specific culture or of engaging in certain kinds of social, political, religious and professional activities that provide a person with the resources for crafting a transformative practice, but a conscious reflection on and willingness to learn from these experiences that makes them available as resources (of biography) for crafting such a practice.

In the final analysis, to fashion a strong identity as a transformative science teacher under the conditions of teaching in the townships is a complex task that requires a strong will, a consistent vision of change, and plenty of resources – cultural, professional and educational – and **biographic** together with the mindset to engage in some form of action for change.

References

- Bogdan R & Biklen S 1992. *Qualitative research for education: An introduction to theory and methods*. Boston: Allyn and Bacon, Inc.
- Bromley H 1989. Identity politics and critical pedagogy. *Educational Theory*, **39**(3), 207-223.
- Bruner J 1990. *Acts of meaning*. London: Harvard University Press.
- Bullough RV Jr., Knowles JG & Crow NA 1991. *Emerging as a teacher*. London: Routledge.
- Butt R, Raymond D, McCue G & Tamagishi L 1992. Collaborative autobiography and the teacher's voice. In Ivor F Goodson (ed.), *Studying teachers' lives*. New York, Columbia University, Teachers College Press.
- Casey K 1993. *I answer with my life: Life histories of women teachers working for social change*. New York: Routledge.
- Cochran-Smith M 1991. Learning to teach against the grain. *Harvard Educational Review*, **61**(3), 279-310.
- Cohen DK 1988. *Teaching Practice. (Issue Paper 88-3)*. East Lansing: Michigan State University, National Center for Research on Teacher Education.
- Cohen DK & Barnes CA 1993. Pedagogy and policy (pp. 207-223). In David K. Cohen, Milbrey W. McLaughlin, & Joan E. Talbert (eds), *Teaching for understanding: Challenges for policy and practice*. San Francisco: Jossey-Bass.
- Connely, FM & Clandinin, DJ 1999. *Shaping a professional identity: Stories of educational practice*. New York: Teachers College Press.
- Creswell JW 1998. *Qualitative inquiry and research design: Choosing among five traditions*. London: Sage.
- Denzin NK 1989a. *Interpretive biography*. Newbury Park, CA: Sage.
- Denzin NK 1989b. *Interpretive interactionism*. Newbury Park, CA: Sage.
- Department of Education (DoE) 1997a. *Annual Report, 1996*. Pretoria: DoE.
- Department of Education (DoE) 1996. *Annual report: June 1994-December 1995*. Pretoria: DoE.
- Dewey J 1938. *Experience and education*. New York: Macmillan Publishing Co.
- Drake C, Spillane JP & Hufferd-Ackles K 2001. Storied identities: Teacher learning and subject-matter context. *Journal of Curriculum Studies*, **33**, 1-224.
- Erickson F 1986. Qualitative methods in research on teaching. In M.C. Wittrock (ed.), *Handbook of research on teaching*. New York: Macmillan.
- Goodson IF 1984. The use of life histories in the study of teaching. In M Hammersley (ed.), *The ethnography of schooling*. North Humberside: Studies in Education Limited, Nafferton Books.

- Goodson IF 1992. Studying teachers' lives: problems and possibilities. In IF Goodson (ed.), *Studying teachers' lives*, (pp. 234-249). New York: Teachers College Press.
- Goodson IF 1996. The life and work of teachers. *Southern African Review of Education: A Journal of Comparative Education and History of Education*, **2**, 2-17.
- hooks, bell 1989. *Talking back: Thinking feminist, thinking Black*. Boston: South End press.
- Huberman M 1993. *The lives of teachers*. (Translated by Jonathan Neufeld). NY: Teachers College Press.
- Jansen JD 2001. Image-ning teachers: Policy images and teacher identity in South African classrooms. *South African Journal of Education*, **21**(4), 242-246.
- Knowles JG 1992. Models for understanding pre-service and beginning teachers' biographies: illustrations from case studies. In IF Goodson (ed.), *Studying teachers' lives*. New York: Teachers College Press.
- Macleod C 1995. Transforming pedagogy in South Africa: the insertion of the teacher as subject. *Perspectives in Education*, **16**(1), 63-82.
- McAdams DP 1993. *The story we live by: Personal myths and the making of the self*. New York: Morrow.
- Mehl MC 1990. Science education in South Africa: Future directions from present realities. In M Nkomo, (ed.), *Pedagogy of domination: Toward a democratic education in South Africa*. Trenton, NJ: Africa Worlds Press.
- Middleton S 1993. *Educating feminists: Life histories and pedagogy*. New York: Teachers College Press.
- Middleton S 1989. Educating feminists: A life-history study. In S Acker, *Teachers, gender and career*. London: Falmer Press.
- Miles M & Huberman M 1984. *Qualitative data analysis: A source book of new methods*. Beverly Hills, CA: Sage.
- Nias J 1989. *Primary teachers talking: A study of teaching as work*. London: Routledge.
- Osler A 1997a. Teachers' biographies and educational development: A Kenyan case study. *International Journal of Educational Development*, **17**(4), 361-371.
- Osler A 1997b. *The education and careers of black teachers: Changing identities, changing lives*. Buckingham: Open University Press.
- Simon RI 1992. *Teaching against the grain: Texts for a pedagogy of possibility*. New York: Bergin and Garvey.
- Shulman LS 1987. Knowledge and teaching: Foundations of a new reform. *Harvard Educational Review*, **57**(1), 1-22.
- Spillane JP 2000. Constructing ambitious pedagogy in the fifth-grade: The mathematics and literacy divide. *Elementary School Journal*, **100**(4), 307-330.
- Spillane JP & Zeuli JS 1999. Reform and teaching: Exploring patterns of practice in the context of National and State mathematics reforms. *Educational Evaluation and Policy Analysis*, **21**(1), 1-27.
- Stake RE 1995. *The art of case study research*. Thousand Oaks, CA: Sage Publications.
- Van Maanen M 1990. *Researching lived experience: Human science for an action sensitive pedagogy*. New York, New York: SUNY press.
- Walker M 1996. *Images of professional development*. Pretoria: Human Sciences Research Council, HSRC.
- Weiland S 1995. Life history and academic work: The career of Professor G. In R Josselson & A Lieblin (eds), *Interpreting experience* (Vol.3), 59-99. Newsbury Park, CA: Sage press.
- Weiler K 1988. *Women teaching for change: Gender, class and power*. Massachusetts: Bergin and Garvey Publishers, Inc