

Beginning Teachers' Professional Identity Formation in Early Science Mathematics and Technology Teaching: What Develops?

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Abstract

This article is about professional teacher identity (PTI) formation of two foundation phase (pre-primary and primary level) teachers in their first year of teaching early science mathematics and technology (SMT) in two different schools. The study used a qualitative research approach involving phenomenology and case study method to illuminate factors that influence beginning teachers' professional identity formation. Data was generated from different sources for the purpose of triangulation, which included visual and written narratives, observations and interviews. The article concludes by noting the complexity of the 'makings' of teachers, and how identity formation is connected to individual life histories, the quality of initial teacher education, school context as well as national context. These factors emerge as strong determinants of the kind of professional teacher identities, which the two novice teachers develop in their first year of SMT teaching, and the kind of teachers they aspire to become.

Introduction

This article is based on personal histories, professional educational studies, teachers' workplace, interviews and classroom observations of two female South African foundation phase (pre-primary and primary grade levels) teachers' identity formation in their first year of teaching early science, mathematics and technology (SMT).

Beginning to teach is a particular and complex stage of professional teacher identity (PTI) development (Avalos, 2011; Cherubini, 2009; Hobson, Ashby, Malderez & Tomlinson, 2009). The high levels of attrition surrounding beginning teachers worldwide, have been well documented (Avalos, 2011; Cherian & Daniel, 2008). While existing literature suggests that teacher effectiveness improves sharply after the first few years of entering the profession, research shows that many beginning teachers abandon the profession prior to attaining this level of expertise in any appreciable way (Fantilli & Mc Dougall, 2009). In light of the wealth of evidence that links high performing students to capable and well prepared teachers, the preparation and retention of quality teachers in the system has become a matter of education reform policy worldwide (OECD, 2005).

One way to address the challenge of teacher quality is through the development of positive professional teacher identity (Day & Gu, 2010); and it is a process that

starts during professional studies and is continued during the lifetime of the teacher as a practitioner (Osgood, 2006). For Samuel (2008), a positive PTI is one in which the teacher is viewed as ‘an agent of change’ willing and able to accommodate and respond to curriculum reform.

Background

In South Africa there is a paucity of discourse and research into Early Childhood Phase (ECP: 3-5 years) and Foundation-Phase (FP: 5-9 years) teacher education. The poor historical status of this sector of the education system, particularly in respect of the comparatively few African candidates, who opt for a teaching career in early childhood education and foundation phase has been of national concern (Council on Higher Education (CHE, 2010; DoE, 2007). Additionally, the growing body of literature surrounding the benefits to children of early exposure to science, mathematics and technology (Eshach & Fried, 2005; Gillard, 2008; Ginsburg & Golbeck, 2004; Saracho & Spodek, 2009) is void of the South African context. Science, mathematics and technology in early years remain a neglected area of study.

Since 1994, curriculum reform in the new South Africa, has had far reaching implications for early childhood phase and foundation phase teacher education. The National Education Department in the quest to improve the quality and status of ECP & FP teachers introduced a four year Bachelor of Education (ECE & FP) degree programme full time, to be offered only by universities. The main educational focus at pre-primary and primary education is the acquisition of basic educational skills, knowledge and values as prerequisites for further education and training. The FP curriculum emphasises problem-solving skills and competencies grounded in inquiry based education (DoE, 2003). Eight learning areas namely, language, mathematics, science, technology, life orientation, economic and management, sciences and arts and culture make up the FP curriculum, and they are grouped into three learning programmes of literacy, numeracy and life skills. According to the Council on Higher Education (2010) the aims of the B.Ed FP teacher education qualification, are to integrate academic components of the programme, notably, the three learning programmes with work-based (school) learning; to develop student teachers as reflective practitioners and to enhance professional competence through inquiry and reflection. The teacher education programme to which the two beginning teachers were exposed prepared them as ECP and FP teachers specialising in early SMT content, pedagogy and pedagogical content knowledge. The learning area of mathematics forms the core of the numeracy programme, while science and technology learning areas are integrated into all three learning programmes (DoE, 2003).

In recent years, various studies (Bosman, 2006; Botha, Maree & de Witt, 2005; Van Heerden, 2005) have shown that South Africa’s foundation phase teachers remain uncertain as to how to implement inquiry-based teaching using an integrated SMT curriculum. Part of the problem is that the national curriculum lacks adequate specification

of the content knowledge to be taught in the learning areas (Hoadley et al., 2010) and so there has been uncertainty about how much science and technology should be included at foundation phase. Because of this lack of clarity FP teachers have begun to question the place of science and technology in foundation phase level curriculum. Without this belief in the inclusion of science and technology, Akerson, Buzzelli, and Eastwood (2010) and Furtak (2005) contend, that such teachers tend to avoid or neglect teaching those two subjects in the curriculum. For this reason, this study focused on how first year beginning teachers sustain (retain), their initial teacher identity in the context of teaching early SMT, and the factors that influence the process.

Context

With the implementation of the new reform-based ECE & FP education curriculum in South Africa, many FP teachers are having to adapt to a range of teaching strategies and roles different from traditional ones (DoE, 2007). The identity formation of beginning ECP and FP teachers, who themselves as student teachers, enter institutions of higher learning with limited academic credentials, and confidence in SMT, (DoE, 2005) is yet to attract researchers' interest. The question that is asked, is whether the initial teacher education programme is adequately preparing FP teachers to fulfill their new professional roles.

The kind of teacher envisaged by the institution's Education Faculty, in which the two teachers successfully completed their 4 year B.Ed programme is described as 'reform-minded teacher'. According to the philosophy, which underpins that institution's foundation phase teacher education programme, a reform-minded teacher is expected to become the nucleus of reform and transformation in implementing South Africa's new national curriculum in any given work place. Our research interest was with exploring how these two first year 'reform-minded' FP teachers sustain (retain) their initial teacher identity or develop new professional identity in the context of teaching SMT in their different schools. In this study, sustainability is about the relative stability (retention) or otherwise of the beginning teacher's initial professional identity development (as a result of the initial teacher education programme) in the work place.

Objective of the Study

The objective of the study was to investigate how two beginning teachers in their first year of teaching SMT in the early years, form their professional teacher identity in different school settings, and the internal and external factors that influence the process.

The study addressed the following research questions: what internal and external factors if any, contribute to professional teacher identity (PTI) formation in the context of teaching SMT in the early years? How do these factors affect their PTI formation in SMT teaching and in different school contexts?

Theoretical Approach and Central Concepts

Professional Teacher Identity: Assumptions Made

Identity is a complex construct, yet extremely important if we wish to understand the practice of teaching as a profession. Teacher education is essentially about developing professional teacher identity. However, even when pre-service teachers have been exposed to the same programme, there still remains in a large measure of variability what individuals have, and do; and not only in just how they teach, but also how they view themselves as teachers in teaching a given subject (Flores & Day, 2006). For this reason, PTI is seen as a complex and on-going process and has emerged especially in teacher education as a subfield of identity theory (Beijaard, Meijer & Verloop, 2004). Identity has thus far been defined in as many ways as there are researchers and practitioners in the field (Gee, 2001). A sampling of these definitions offers us an insight into the different ways the construct is understood and used. However, as Luehmann (2007) has stated they do share some common features as follows :

- *Identity is socially constituted, i.e.* based on the socialization or interactions with others.
- *Identity is constantly being formed and reformed*, though the change process for one's core identities is long term and labour intensive.
- *Identity is considered by most to be multifarious, i.e.* consisting of a number of interrelated ways one is recognized as a certain kind of person.
- *Identity is constituted in interpretations and narrations of experiences.*

Suffice it to say that our view of identity stems broadly from a socio-cultural perspective in which a person's identity is shaped through interactive everyday activities, and is constituted and mediated in interpretations and narrations of lived experiences. For this study, we assumed that the two teachers have an initially formed teacher identity as 'reform-minded' FP teachers (consistent with the philosophy of their teacher education programme) when they successfully completed the programme, and that this identity is either sustained (i.e. relatively stable) modified or changed (relatively unstable) during their first year of teaching as a result of personal and contextual factors including the work environment.

The process of becoming a reform-minded teacher is of necessity complex and takes a long time to accomplish (Day, 2008). Because of that, beginning teachers may or may not necessarily define themselves as professionals who can automatically implement reform. For this study, we therefore defined professional teacher identity in early SMT teaching as an amalgam of 'technical' knowledge (SMT content knowledge, pedagogical knowledge and pedagogical content knowledge); beliefs and understanding about the nature of early SMT, and how they (early SMT) should be taught and learned by children; knowledge of the FP curriculum goals and how all of these categories of knowledge and

beliefs, mediate practice in a given learning environment. The notion of amalgam implies that each of those knowledge categories can stand on their own or in unison to constitute professional teacher identity.

Beginning Teachers

Although most beginning teachers are idealistic and positive about their entry into the profession, they enter the new teaching situation with a sense of 'self' and the variety of roles they feel that they have to play as teachers. This sense of 'self' as teacher has largely been shaped by previous and current history (Cieslik, 2006; Day, Kington, Stobart & Sammons, 2006). Despite the initial enthusiasm, many researchers (Flores & Day, 2006; Keys, 2007; Whitelaw, 2007) have emphasized the reality shock new teachers experience as they first take on their roles as school teachers. How such conflicting emotions and teaching dilemmas are often resolved entails as Maclure (1993, p.313) indicated a 'continuing site of struggle' within the school community of practice, notably the teacher's workplace (Jurasaitė-Harison & Rex, 2010; Reynolds, 1996; Whitelaw, 2007). The upshot is that teacher identity formation is not only influenced by personal and professional issues but also by social response.

The Study's Conceptual Framework

The study used a learning identity framework to collect and analyse data. The framework was premised on the assumption that professional identity formation and the process of learning are closely linked (Billett & Somerville, 2004; Cieslik, 2006), as they are both influenced by factors internal and external to the individual (Egan, 2004; Smith, 2007). Within the study's identity framework, the external factors which the literature suggests are likely to influence teacher identity formation, include the national curriculum, national educational reform publications, public expectations, and school culture (Jansen, 2003; Jita & Vandeyar, 2006; Onwu & Mogari, 2004). The other factors internal to the novice teacher as suggested, include knowledge of curriculum goals and their classroom interpretation, pre-teaching identity, educational background, and beliefs and values of what it means to be a foundation phase SMT teacher (Day, Kington, Stobart & Sammons, 2006). These internal and external factors as summarised in Table 1 below, were used for instrument development and the identification of emergent themes in the data analysis.

Table 1. Identified factors affecting PTI formation

External Factors	Internal Factors
Initial teacher education programme	SMT Curriculum knowledge-its goals and interpretation in practice
National SMT Curriculum – implementation guideline documents	Understanding of the nature of early SMT and how children learn
School Context, its culture, and ethos within community of practice	Self-beliefs and values about being a ‘reform-minded’ SMT teacher
Nature of institutional school support	Personal history relating to SMT education

The Methodology

The study used a qualitative research approach involving phenomenology and the case study method (Casey, 2007; Cohen, Manion & Morrison, 2000) within an interpretive paradigm to investigate the lived school experiences of the two teachers for over a period of 10 months. Data was generated from a combination of sources for triangulation. These sources ranged from teacher visual narratives (in the form of photo collages assembled to express visual aspects of the teacher’s practice in SMT teaching) and written narratives, open-ended and semi-structured interviews, to specific classroom observations. The two teachers’ teaching portfolios, and reflective journals were also used as data source. Inductive analysis strategies were used to interpret the wealth of data generated from the teachers’ descriptions and ‘meaning’, and to reduce the data to central emerging themes as reported here.

Main Findings

In line with the research methodology, the teachers’ voices are in quotes and in italics as taken verbatim from the protocols. The main findings are presented in brief constructed narratives according to the following main influences, which impact on the two teachers’ professional identity formation. These include: (i) personal history in SMT; (ii) initial teacher education; (iii) school context experience; (iv) SMT curriculum implementation; (v) SMT teaching; (vi) institutional support; (vii) classroom practice.

Acronyms used for data sources in the text: Narrative reflection 1 (NR1); Narrative reflection 2 (NR2); Interview 1 (In1); Interview 2 (In2); Observational reflection (OR).

The two teachers are identified by pseudonyms and treated as separate cases.

I The Case of Nontombi

Nontombi taught a grade one class of 42 learners in their local mother tongue, Tswana. Most children came from single parent households in an area of high unemployment. Parental support and involvement in school was low. Learner absenteeism was rife. The school physical environment, although poorly resourced, was welcoming and safe.

Personal history in SMT: Nontombi entered university with negative attitude, limited knowledge and uninformed beliefs about science, mathematics and technology (SMT), which had been shaped by her school experiences. She *“did science and maths in matric, (Grade 12) but no exposure to technology. I did not enjoy the subjects mathematics and science at school”* (In1).

Teacher education programme: Nontombi's initial dislike and negative perception of mathematics and science gradually changed during her university studies. She attributed this gradual transformation to her university education experiences. She described the process as one whose *“emotions (when she first appeared before her class) went initially from feeling like I was thrown into the deep end ... and that I had to sink or swim..... toward feeling (later in the year) more confident and positive...”* (In1). *“University learning helps you know that you can be confident to innovate in your teaching style ... and to apply new ways of teaching and adapt your techniques to grow as a teacher”* (NR1).

Her university education is instrumental in helping her to construct her PTI. She explained: *“in my first year at university I used to think that science is about test tubes and white overalls but science is all around us. Technology is the same. I did not know anything about technology before I came to university.”*

“it (university teacher education) changed the way I used to think about maths, science and technology ... During my years at university I realised that maths can be made interesting and can be learnt and taught in a different way” (In1). *“I learned that science can be approached in different ways ... the teacher can use lots of different environments as areas for discovery and for exploring and investigating and thinking in scientific terms- technology is the same —”* (In1). *“Science at foundation phase level is about investigating and that is our primary focus in this phase”* (NR1).

Pre-service teacher education seemed to have laid a good foundation and positively influenced the way she now taught: *“The resources we used at University and the knowledge we acquired there form a reference point to remind one of strategies to use when teaching for example using what was learned as a basis for more reflective teaching such as knowing the learner's zone of proximal development and moving him or her from the known to the unknown”* (NR1). The narrative reflects the application of a constructivist theory (Vygotsky) of learning to her teaching.

School Experience as a First Year SMT Teacher

School context: In this her first year of teaching Nontombi felt that the transition from being a university student teacher to one of managing her own classroom was one of initial shock: “*My emotions went from feeling like I was thrown into the deep end ... towards feeling that as a new teacher I needed to work hard to make schooling a meaningful experience for each learner*” (In1).

The situation at school was however difficult, because of the poor conditions of the school’s physical facilities. “*Learners are from a poor socio-economic background. They sometimes miss a few days of school. This (absenteeism) affects their progress. So the learner ends up not knowing the subject. That is a huge problem for us*” (In2). The children’s education was frequently interrupted by pupil absenteeism.

Feelings of anxiety emerged in Nontombi’s account of her initial experiences. We observed that the situation initially made her to feel unprepared to handle the role required of a teacher, but later she responded to the challenge and adjusted accordingly. She introduced creative activities to interest and actively engage the children. The comments which follow reflect her teaching philosophy and relationship with her pupils. “*As my learners got to acquire new knowledge I felt better about what I was doing and more confident...everyday is important in a child’s learning, time should be fully utilised and children should learn something new at school every day*” (In2).

Curriculum interpretation and implementation: Nontombi like her other counterpart had the freedom to interpret and implement the curriculum in line with her own teaching philosophy. When she first started, she found the new curriculum difficult to interpret according to the recommended protocols in the ‘Foundations for Learning’ document. She felt that the document was particularly unhelpful. “*We have been using The Foundations for Learning Campaign files as directed by the DoE (Dept. Of Education) and these I found very confusing*” (NR1) because “*The curriculum changes every year. This is disconcerting. You find something that works and the next year you are made to readjust because of something else*” (In2). Nontombi’s criticism of the changes reflected in a way a loss of a sense of herself as a SMT teacher. She did not seem to be on top of things, because the frequent changes and the little attention given to science and technology in the school time table gave rise to new teaching dilemmas and the destabilization of otherwise comfort zone requiring some mental adjustments, a far cry from what she was used to. The reluctance to entertain the curriculum changes could also reflect the amount of effort needed to justify herself as a SMT teacher.

Teaching SMT: Mathematics was regarded as the foundational subject at the school and had a prominent place in the curriculum. “*Maths is a priority subject here*” (In1). “*I think my children love mathematics because they see I love it*” (In1). She is positive about teaching mathematics to her children. But while mathematics or numeracy was regarded

as the main focus of teaching in her school, the school curriculum made no adequate provision for science and technology teaching. For her, this was unacceptable: *"Learners should know science and I wish I could do more. The factors that caused me not to teach science and technology are lack of time and I haven't had the opportunity. We [other staff members] plan the FP subjects together and science is not a priority subject because it does not count for marks"* (In1) *"...so there is very little time allocated to teach science"* (NR2). The dilemma she faced was that science and technology at that level were somewhat neglected, especially technology, because they *"don't count for marks"* (i.e. not tested).

Nontombi's uneasiness about the school's position on science & technology teaching had its positive side. It led to her growth as a resourceful teacher. She demonstrated initiative and resourcefulness by planning integrated S & T lessons around real life situations, an approach that is consistent with the intentions of the foundation phase curriculum. *"Science and technology are now taught integrated with life skills and language"* (In2). In our observations (NR1) however, there was no evidence that technology was consistently and systematically integrated into her lessons. Technology was essentially silent.

Nontombi simply did not find the integration of mathematics, science and technology into the three programmes easy at all. With mathematics it was a little more straightforward she explained: *"You can do maths on its own...but to integrate science and technology into other subjects... this is difficult"* (In2). Her commitment to becoming an effective reform driven SMT teacher was shaken when she learnt that the curriculum was about to be revised: *"I heard that science and technology are being removed from the curriculum and I am against this removal. The subjects are essential for the development of the child"; "...The curriculum changes every year. There is a lack of consistency"* (In2). The change if it occurs is likely to result in new situations, and perhaps destabilisation of personally embedded views requiring new interpretations and adjustments that could impact on her PTI development.

Institutional support: Professional identity implies both person and the work environment. Nontombi's 'painful beginnings' involving initially conflicting perspectives and emotions of what to teach and how to teach her young learners, were largely alleviated by the support she received from her senior colleagues at school. As a new teacher in unfamiliar territory *"I experienced a lot of support from my fellow teachers and my seniors"* (OR). The supportive atmosphere at school helped to cushion her worries, and led to feelings of self-worth. The existing school culture contributed to positive experiences in her understanding of her professional identity as a SMT teacher. As we later observed, over the months, she increasingly became more comfortable and forthcoming in discussing her teaching ideas and views with her more experienced colleagues in their team work. She explained that *"through my enthusiasm I am able to do things.... and have grown in the past few months from being a 100% theoretical teacher to being*

one with some experience; I have seen how what I have learnt can be implemented in the classroom” (In2). Her senior colleagues agreed with those sentiments.

Classroom practice: Nontombi adapted the curriculum in a way that suited her own beliefs about the nature of mathematics and science (technology not as prominently) and how they should be taught at that level. She positioned herself alongside the children in her class in such a way as to see herself as co-discoverer, in which she and the children together explored concepts through guided discovery (as we observed). As a result of her improved knowledge of her children she adjusted her teaching to reflect the children’s developmental level: *“I adjusted my teaching approach to the practical situation at school. I still have the same attitude and beliefs about the subjects (SMT). But I have learnt specific information about the school, who my learners are and how to teach them”*

“Continuous interactions between the learners and myself in the teaching and learning situation and their reactions and mine to the daily happenings in the class help me reflect and fine-tune how I teach for lesson improvement” (OR). For example, *“With each planned mathematics lesson, using a weekly planner I write how each aspect of a given concept is going to be dealt with and then I play it out in my head. At the time of execution I observe how the learners react ...and this reaction sometimes indicates to me what I should do in a different way and how differently”* (NR1). Her positive belief about reflective feedback in her teaching constitutes part of her identity: *“I am positive about my teaching. I feel that I am making a difference”* (In1) and *“I believe that my identity is strong enough for me to be successful and to become an even better teacher. I want more knowledge; I have a passion for children and I want to be there for them”* (In2).

For Nontombi, teaching goes far beyond mere instruction but also to include the socialization and wellbeing of her children. She overcame an initial period of uncertainty but her belief and commitment to making a difference in the lives of her learners coupled with the support of her colleagues were positive mediating influences that grew and sustained her identity formation.

II The Case of Anne-Marie

Anne-Marie taught a reception year (Grade R) class of 33 children in English. The children came from different countries, with diverse cultural and language backgrounds. The school was well resourced and provided a safe learning environment.

Personal history in MST: At school, Anne-Marie had limited exposure to mathematics and science but none in technology. Her experience of school mathematics and science was not particularly memorable so she ended up *“not liking...maths at school, because the teacher could not make it attractive for me. I found mathematics and science boring”* (In1). This early experience did not necessarily impact negatively in shaping her pre-teacher identity because she always believed that to become a successful teacher is a process of lifelong learning: *“of on-going experiencesbut with different responses to various*

learning situations" (In1).

Teacher education programme: Anne-Marie's earlier perception of mathematics and science gradually changed during her university studies, when she "... *realised that mathematics and science can be interesting*" (In1). However during her teaching practice she "*unfortunately...learnt very little about science and technology from my (her) mentor teachers at school*" (NR1). Nevertheless, the theoretical and practical knowledge acquired during her university training programme was of great help in her first year of teaching: "*I learned so much during my four years at university*" (OR) "*...the knowledge acquired during my studies provides me with the background knowledge for my lessons*" (In1). In the course of planning her lessons she did at some point wonder "*if all the theory we learnt at university will work in practice*" (In1). Surprisingly she was happy to admit that "*Theory provided a necessary foundation for me in what lies ahead as a teacher*" (In2). "*I tried new things with my children to see what can work, and what will not, but also to see where I can adjust my activities*" (OR). Her background knowledge made her want to innovate. Her pre-service education seemed to have had a positive influence on the way she approached her teaching and the willingness to try things out as an innovative teacher. It was also instrumental in helping her to develop and shape her professional identity as ECE & FP teacher of SMT.

School Experience as a First Year SMT ECE Teacher

School context: Becoming a professional teacher in her first teaching position was for Anne-Marie one that elicited as she put it "*creative energy and enthusiasm. I was excited to teach*" (In1). For her it meant following a developmental path with a number of challenges. Transiting from being a student teacher to the reality of a classroom was a rude shock for Anne-Marie since "*you only realise what happens in a classroom when you stand all alone on your own*" (In2). The situation at school was difficult at first because of lack of institutional support: "*...the principal opposed everything I proposed*" and "*...this had a devastating effect on me*", "*... one can only stand up for oneself up to a point, especially if she was the principal as well*" (In2). Soon afterwards the principal left the school and the situation changed. "*I was lucky enough not to have a whole year of that situation*". With the principal's departure: "*... I have much more freedom and can set up the classroom the way I want to*" (In2). Anne-Marie's initial desire to develop a new professional identity as a "*creative teacher*" was from the onset a struggle within the context of her practice. This was essentially because of the mismatch between her beliefs reflected in the way she wanted to teach the new curriculum, and the principal's perspectives of what was expected of a beginning novice teacher. There was a conflict. For Anne-Marie, her role as a beginning early years teacher was all about who she wanted to become as a ECE & FP SMT teacher. It went beyond an answer to the question of 'Who am I now after my teacher education and training?' Towards the end of her first year of

teaching she still felt that *“everyday brings a new challenge that I can learn from”* (NR2). Professional identity development for her was something dynamic, an ongoing process of personal development alongside issues of her work environment.

Curriculum interpretation and implementation: Because of the *‘freedom’* she felt following the principal’s departure, Anne-Marie created the intellectual and social space she needed to implement the curriculum in line with her teaching philosophy. She went about *“thinking of creative activities in which to get the children actively engaged and interested”* (OR). During an informal visit to her ECE class she was observed to present an Art lesson in which SMT ideas were creatively integrated into the lesson. Each child designed and engraved his or her own geometric shape on a Styrofoam tile, and produced at least four different images using the concept of symmetry. Her teaching approach favoured integration of early SMT concepts into the three learning programmes.

Teaching SMT: Anne-Marie regarded the integration of early SMT into her programme as important focal points in her teaching: *“... mathematics is the foundation subject for us”* But *“I integrate and apply mathematics, science and technology concepts in my structured lessons”* (In1). To illustrate, she narrated that *“a parent brought a box full of silk worms”* to her class: *“I let the children design and build a house for the worms as part of an investigation. I started the project with a story about Sally Silkworm who lost her house in a fire. Learners were then divided into groups and they could choose materials with which to build the house”* (NR2). She planned an integrated SMT lesson around a real-life problem (*‘the loss of habitat’*) in which the children had to design an appropriate habitat for the displaced silkworms. She and the children also *“had to identify the right leaves (mulberry) to feed the worms”* (In2). She *“... started a small garden”* and *“a wormery”* in which the children brought *“potato peels and other materials for the worm garden”* (NR2). For her, the transition from *“theory”* to doing practical activities with her children was as a result of giving practical expression to her teaching philosophy. *“I have a nature corner in my classroom where beans sprout and silkworms spin cocoons and shapes. We have birds, fish and a vegetable garden.. the children explore”* (NR2). During one of our informal visits the children happily described how they and their teachers organized the planting of the vegetables in the garden. Her teaching philosophy encouraged children’s experiential learning through guided discovery, as an aspect of the cognitive dimension of her PTI formation.

Institutional support: Anne-Marie found in-house support for her ideas and worked closely with other teachers who held similar views about SMT teaching at pre-primary level. She described the collegiality that existed among them. She and her *“... colleagues plan and work together... One of my colleagues is an experienced teacher and she supports me very well”* (In2) ... *“I have support for my ideas on teaching at pre-primary school level because my colleagues feel exactly the same about how to teach children at*

that age" (In1). Her developing professional identity as a pre-primary school teacher who wants to become a successful ECE SMT teacher was further reinforced by the support she received from her peers in her workplace.

Classroom practice: Anne-Marie adapted her classroom teaching in a way that suited what she believed was important to her as a ECP SMT teacher and to her pupils too. "*I try to make the MST subjects interesting so that my children will realise the subjects are worthwhile and important*" (In1). She averred that "... *one should have a passion for teaching*" (In1) and "*I have a passion for children*" (In2), "... *my identity as a teacher is strong enough for me to be successful and to become a better teacher*" (In2). She valued and enjoyed her current teaching experience because she saw her children from different countries happy to learn together, insisting that "*Classroom experience means more than theory*" (OR) and "*I would not change my work or my school for anything. Many children in my class come from all over Africa and others even from abroad ...which makes my work interesting and enjoyable*" (NR1). Her workplace experience had reinforced her pre-identity 'image' of a reform-minded teacher, and she honestly believed that she is "*a good teacher because my children are happy, I am happy, and we enjoy learning together*" (OR).

Like Nontombi, caring for her children, was a crucial feature in understanding her role as a ECP SMT teacher. She used 'hands-on' experiences and out-of-classroom activities to engage her young children in fun lessons: "*Not only did I enjoy the lesson.... my children enjoyed the lesson....The children enjoy science because they think it is magic and they are fascinated and they think and wonder about what they experience. When we went to the Willem Prinsloo Museum they observed candle making, which is a scientific process and they learnt something more!*" (NR2). For her, the personal touch was important.

Anne-Marie's positive experiences with her children and colleagues gave her a broad understanding and appreciation of what her professional role as a SMT teacher at ECP & FP ought to be and how it should be sustained. In her case, the more central an identity is, the less easy it is to change or lose that identity.

Summary

In summary, both teachers entered the university with limited academic credentials, interests and confidence in SMT. Although placed in vastly different school contexts the two case teachers found the transition from student teacher to beginning teacher to be mostly an unstable period of coping and survival. When teaching dilemmas or conflicting emotions occurred, adjustments were necessarily made, but usually in ways that suited their own beliefs, knowledge and understanding about the nature of early mathematics and science (technology not as prominently) and how they should be taught to children at that FP level. Their limited school SMT background did not appear to have had any negative impact on their future performance as foundation phase SMT teachers. Instead their

‘technical knowledge’ about SMT teaching and learning as a result of university teacher training, represented an important component of their PTI. Overall, the similarity in the identity profile of the two FP SMT teachers was characterised by a cognitive dimension of SMT knowledge for teaching children in the early years, reflective practice and resourcefulness. These findings do imply that the quality of the initial teacher professional development programme is thus crucial for the kind of PTI initially formed and whether it is sustained or changed in any given school setting or workplace. Hence the results of the study have relevance for the importance of quality assurance of teacher education and training programmes. Additionally, in-school support and self-belief were particularly important for positive PTI development.

Conclusion

In conclusion, the study has highlighted the complexity of professional identity formation and sustainability, which the two foundation phase teachers develop in their first year of SMT teaching and how this is connected to their personal and professional histories, the quality of teacher education and training, alongside issues of school context as well as national context. These key factors emerge as strong determinants of the kinds and the relative stability of professional identities which the two teachers developed in their first year of teaching, and thus the kind of teachers they hope to become. The construction of personal narratives in the identity formation of South African early years SMT teachers, has contributed to literature in the field. The findings are consistent first, with what extant literature has to say about the development of teacher identity (Søreide, 2005; Watson, 2006), and secondly the conceptual framework used provides a useful tool for further engaging in a detailed knowledge and understanding of the complexity of the ‘makings’ of teachers and how this is connected to the quality of initial teacher education, school context and national context. Also the findings provide some insight into the crucial role of how teachers’ beliefs can influence their practice both positively and negatively. Significant in the study is the recognition of teachers’ workplace, the school culture specifically and how it impacts on professional identity formation.

Finally, the methodology and results of the study have certain implications for future research. The internal and external factors used for the learning identity framework provide a useful tool that can be used to inform and design larger quantitative studies especially of instrument development for PTI profiling and comparisons. The schools in which the beginning teachers found themselves indicated that schools did not always welcome novice teachers as part of the school community of practice. More research is needed on how schools could give beginning teachers more support and be more receptive to the new ideas they may bring to classroom. Specifically, more evidence-based studies are needed in teacher education research on what counts as ‘professional’ in professional teacher identity development or formation. The study fits in well with the current national need in South Africa and elsewhere to improve teacher education at pre-

primary and primary level education.

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