

## **CHAPTER FOUR**

### **REPORTING THE RESULTS OF SIX CASES: THE NARRATIVE PORTRAITS OF BEGINNING TEACHERS' PROFESSIONAL TEACHER IDENTITY FORMATION IN EARLY MATHEMATICS, SCIENCE AND TECHNOLOGY**

‘... people construct narratives and narratives construct people, and our identities emerge through these processes’ – Watson (2006).

#### **4.1 INTRODUCTION**

In Chapter Four the results of the study are presented. The data was analysed against the background of the main research question of how first-year ECP and FP teachers form and sustain or change their professional teacher identity in the teaching of mathematics, science and technology (MST) in the early years. Subsidiary questions of what internal and external factors, if any, influenced their professional identity were addressed. The question of how the identified factors, if any, affected their professional identity formation in different school settings, therefore guided the presentation of the results. The results are presented in six cases describing each individual beginning teacher’s professional identity in the context of teaching MST in different school contexts.

#### **4.2 NARRATIVE DESCRIPTIONS: SIX BEGINNING TEACHERS' PROFESSIONAL IDENTITY PORTRAITS**

In this section the narrative descriptions of the six cases are presented. These narrative descriptions and the photo collages describe representative selected practices and experiences of the case teachers’ realities in their different school settings. The voice of each beginning teacher helps to explain the specific lived experiences in MST teaching, extracted from ‘statements and quotes’ (Creswell, 2007:227). The abbreviations used with the quotes identify the data collection methods as follows: Narrative reflection one (NR1); Narrative reflection two (NR2); Interview one (In1); Interview two (In2); Observational reflection (OR).

The results of the identity portrait of each case are further summarised in Table 4.1 according to three selected identity categories namely; (i) prior experiences in MST; (ii) initial teacher education programme; (iii) school experience as a first-year MST teacher.

#### 4.2.1 THE CASE OF BEA

Bea taught a Grade 1 class of 42 learners in their local mother tongue, Tswana. Most children came from single parent households where parental support and involvement were low. There was high unemployment and the school implemented a feeding scheme. Learner absenteeism was rife. Although the school was situated in a high-poverty area, the school environment was very neat, organised and safe.

**Personal history in MST:** Bea entered university with negative attitudes, limited knowledge and uninformed beliefs about MST that had been shaped by previous experiences. She said that she ‘did science and maths in matric, I did not enjoy the subjects at school’ (In1).

**Teacher education programme and MST education:** Bea described her process of becoming a FP MST teacher as that of a person whose ‘*emotions went from feeling like I was thrown into the deep end ... and that I had to sink or swim*’ toward ‘*feeling more confident*’ (In1) and positive. She attributed this transformation to her university education experiences, explaining that ‘*University learning helps you know that you can be confident to innovate your teaching style*’ and to ‘*apply new ways of teaching*’ and you then ‘*adapt your techniques to grow as a teacher*’ (NR1).

According to her, her teacher education programme and internship were important positive learning experiences that were instrumental in helping her to develop her professional teacher identity in the teaching of MST, as she ‘*changed the way I [she] 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). Bea did her first internship period in a Grade 2 class at an English primary school (diverse multi-cultural context) and her second internship period at an English early childhood setting (diverse multi-cultural context). During this period she could apply her theoretical knowledge of MST in practice.

Her thinking about the nature of science and technology also changed from when she commenced her studies to her present situation '*At university I learnt that science can be approached in different ways ... teacher can use lots of different environments as areas for discovery and for exploring and investigating and thinking in scientific terms – the teacher has to allow children to think and allow time to discover and explore*' (In1). She explained that '*I used to think that science is about test tubes and such, but science is all around us, technology is the same*' (In1). She wanted her learners to discover things on their own because '*science at foundation phase level is about investigating and that is our primary focus in this phase*' (NR1).

Furthermore she explained that she used the content and pedagogical knowledge, skills and resources she had acquired during her teacher education programme as a '*form of referral to remind you of strategies to use when teaching a certain aspect – using what was learnt as a basis for more reflective teaching*' (NR1). She specifically applied elements of the constructivist theory (Vygotsky) that she had encountered during her studies, '*using what was learnt as a basis for observation such as knowing the learner's "zone of proximal development" and moving him/her from "the known to the unknown"*' (NR1).

Becoming a professional FP MST teacher was for Bea a process of interaction between personal perceptions and specific aspects of one's professional training in a particular context. That implied a process of growth stimulated by learning from classroom experiences and also engaging in dialogue with her colleagues in her peer support group at school. As would be noted later there were also issues of disagreement (see Teaching MST) among colleagues that led to growth and resourcefulness.

**School context:** During her first year of teaching Bea felt that moving from being a university student teacher to the reality of her own classroom was a shock because '*My emotions went from feeling like I was thrown into the deep end ... towards working hard to make schooling a meaningful experience for each learner*' (In1).

She taught in a school that challenged her adaptive and decision-making capabilities due to the existing realities of the learning environment. The school situation was

characterised by the poverty she observed and children's learning difficulties, which were further exacerbated by a high rate of absenteeism. All of those factors and conditions posed veritable obstacles to effective teaching and learning. '*Learners are from a poor socio-economic background. They sometimes miss a few days of school. This influences their progress. So the learner ends up not knowing the subject. That is a huge problem for us'* (In2).

**Curriculum interpretation and implementation:** Bea initially found the curriculum difficult to follow, especially with regard to the recommended protocols and procedures specified in the Foundations for Learning document. She found the documents unhelpful: '*We have been using The Foundations for Learning Campaign files as directed by the DoE and this 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). Bea's resistance to the change reflected a loss of a sense of herself as a teacher, because curriculum change required new approaches and attitudes. The reluctance to use the documents or to entertain the curriculum changes might also reflect the effort that she needed to make to adjust to a new direction contrary to what she had been exposed to at the university. It required an effort to justify herself as a teacher.

**Teaching MST:** Mathematics was regarded as the foundational subject at the school and it had a prominent place in the curriculum. '*Maths is a priority subject*' (In1) and '*Maths is important every day*' (In2). She was positive about teaching mathematics to her children and enjoyed their reaction: '*I think my children love mathematics because they see I love it*' (In1).

While mathematical knowledge and skills were regarded as the main focus of teaching in the primary school, the school curriculum did not make provision for the teaching of science and technology. There was some disenchantment in the way science was taught or not taught in the school. She insisted that '*Learners should know science and I wish I could do more. Maybe I should plan better to include science on Fridays*' (In2). Bea's situation was clearly expressed when she said: '*We [other staff members] plan the subjects together and science is not a priority subject because it does not count for marks*' (In1) '*...so there is very little time to teach*

science ... However, we could plan a science project like a discovery table' (NR2) she posited.

She identified factors that inhibited her from fulfilling her role as an MST teacher. '*The factors that caused me not to teach science and technology are because of lack of time*' (In2) and '*Very little science and technology, if any, is taught in the foundation phase at the school. I don't see science and technology*' (In1).

This hidden uneasiness about the school's (and colleagues') position on science and technology teaching led to growth as a teacher. She revealed her creative ability by adapting the curriculum to integrate science and technology with other lessons, consistent with the intentions of the FP curriculum. She explained that '*Science and technology are taught integrated with life skills and language*' (In2). When the teachers' strike interrupted her science lessons over an extended period of time, she felt frustrated because '*Our science observations (about plant growth) had to be postponed and there was very little time left in the end to make a really good observation and measurement of the processes*' (OR). She also wanted to start a science corner and '*to include science into my teaching, maybe a discovery table*' (NR1). However, she did not find the integration of science and technology into the programme easy. With mathematics it was a little more straightforward: '*You do the maths, and have to integrate the science through other subjects ... this is difficult*' (In2). What motivated Bea was clearly a love for MST. She appeared to lose a sense of herself as an MST teacher when she learnt that the curriculum was about to change: '*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*', and '*The curriculum changes every year. There is a lack of consistency*' (In2). Curriculum change was likely to affect her professional teacher identity formation, because curriculum change was likely to result in new stories and new situations to live by; new interpretations and re-interpretations of experiences. Thus, teacher identity formation is invariably an ongoing process of construction and reconstruction of identity.

**Institutional support:** Since professional identity implies both person and context, Bea's dilemmas and emotional conflicts were alleviated by the support she received

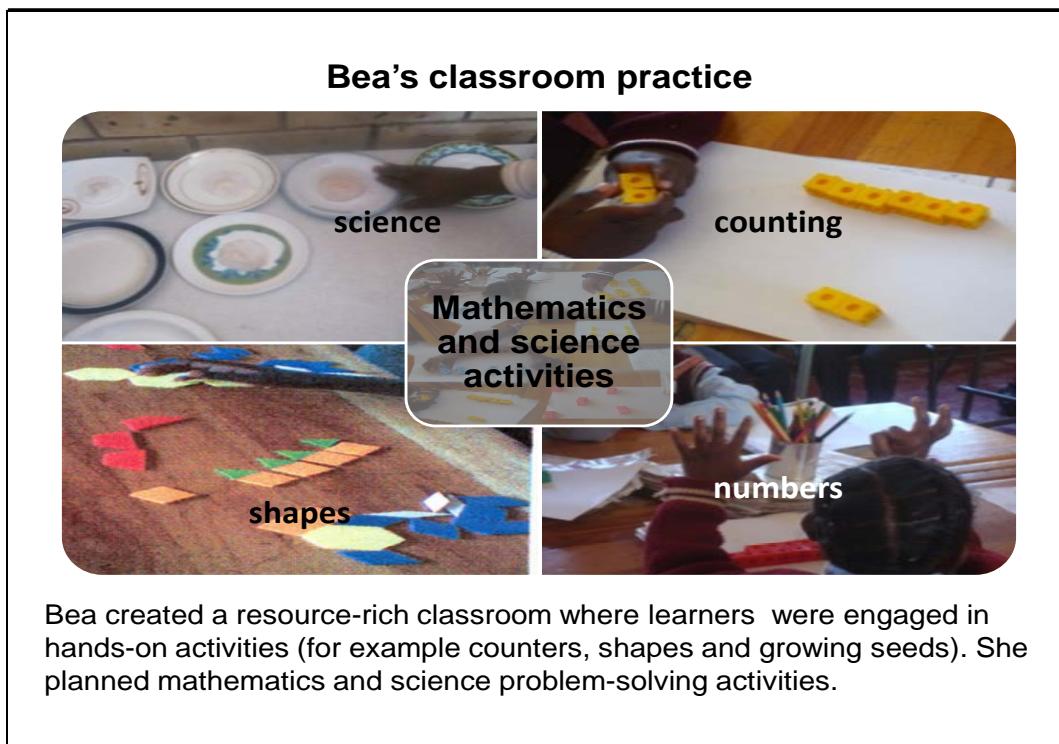
from her colleagues at school. She approached them for help and she received the assistance she sought: '*I experienced a lot of support from my fellow teachers and my senior*' (OR). Institutional support from her peers created positive emotions and feelings of self-worth and self-confidence, to the extent that she was able to win the confidence of her colleagues, because, as she put it '*I convinced the team through my enthusiasm and they know I am able to do things because they ask me for my ideas and input*' (NR1). She felt that she had '*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).

**Classroom practice:** She adapted the curriculum in a way that suited her own beliefs about the nature of mathematics (science and technology not as prominently) and how it should be taught at that level. She positioned herself alongside the children in her class in a somewhat symmetrical relationship as co-inquirer in which all the children explored concepts through guided discovery. Pondering on her classroom practice she stated that the '*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 a better lesson the next time around*' (OR).

Although she had to change and adjust her pedagogy to the reality of her classroom, her positive beliefs about her teaching ability consistent with the inquiry-based approach strengthened. She said '*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). She adapted to the poverty and absenteeism of the children in her classroom by: '*I adjusted my teaching approach to the practical situation at school. I still have the same attitude and beliefs about the subjects. But I have learnt specific information about the school, who my learners are and how to teach them*' (In2).

She regarded herself as a 'hands-on' teacher who tried to use creative means (as part of her identity formation) to teach her children: '*I believe children need to manipulate resources in order to learn better ... I always use counters so that the*

*child can move smoothly from the concrete to the abstract* (In1) and she created ‘an atmosphere of discovery and one that fosters learning...’ (NR2). For example, ‘*With each planned lesson, using a weekly planner, I write how each aspect of say 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).



**Figure 4.1: Bea's classroom practice (observation and photo collages)**

For Bea the process of becoming an FP teacher started when she entered the teacher education programme. Her MST professional teacher identity formation was an ongoing process of interaction between her personal perceptions and the professional training she received. She overcame an initial period of uncertainty during which the reality of her demanding teaching situation required dedication to her task as teacher. Her desire to teach and to make a difference in the lives of children, combined with encouragement and support from her principal and colleagues, were aspects that enabled her to sustain and grow her professional teacher identity in the teaching of MST.

#### 4.2.2 THE CASE OF RIANA

Riana's first year teaching experience was in a Grade 2 Afrikaans class with 25 children at a primary school situated in the east of Pretoria. Although most learners came from middle-to high-income homes, there was a support group that assisted the increasing number of learners that needed food and clothing. This school endeavoured to employ educators that make a difference and Riana was employed in a permanent post.

**Personal history in MST:** Riana had '*science and maths in matric, but did not like it...*' (In1) and consequently did not feel positive or confident about teaching mathematics and science. Riana elaborates that '*I used to be negative about science, because I did not understand it and did not like it*' (In1). Riana admitted that she had no knowledge of technology when she entered her teacher education programme, as she had '*no technology.*' (In1) exposure at high school level and therefore '*technology ... was an ... unknown learning area*' (NR1).

**Teacher education programme and MST education:** Riana entered her teacher education programme with negative feelings about mathematics and science and limited knowledge about technology. There were indications that at the beginning of her first year of teaching her feelings had changed as she explained '*My training at university helped me to recognise that MST are important*' (In2) and she also at that point felt that '*science is part of our lives*' (NR1). Riana explained that her experiences as student teacher at university prepared her for her task as a teacher and formed a '*good foundation*', and she had '*learnt [the] most in maths, ... and ... technology, but not much in science*' and that she had '*the latest information and I have something to contribute*' (In1). For Riana, her professional teacher identity had been formed through the interaction between her own background and the influence of her university training as her '*thinking skills and other skills were developed. This was meaningful*' (In2) and therefore '*My training taught me to think independently*' (In2).

Although her teacher education programme and internship provided important information, she felt that she was not yet adequately prepared to teach technology,

because '*At first when I thought of teaching a technology lesson during my teaching practice, I felt insecure as this was an unknown learning area to me*' (NR1).

Riana did her first internship period in a Grade 1 class at an Afrikaans primary school and her second internship period in a Grade R classroom at an inner-city English primary school (diverse multi-cultural context). In spite of her initial insecurity about technology, she had had positive teaching experiences in technology and science involving the children and her mentor teacher. She explained that '*During practice teaching my teacher was open to discussion on teaching technology and we gave a combined technology lesson that worked*' (In1) and '*I teach science based on the interest that children show*' (In1); '*They [learners] were building volcanoes in the sandpit*' (NR1); '*They asked about volcanoes, so I did a science lesson on volcanoes. The reaction was exciting*' (In1).

**School context:** After a positive teaching experience during the internship period, working with the established teachers and groups within the school was an enormous shock to Riana. '*Now that I have my own classroom it is difficult to teach the way I want to, because I have to fit in with what the other teachers do. During the first meeting I was told that what one does, everybody does. This makes teaching very difficult*' (In1).

Riana had developed specific beliefs, feelings and opinions about MST teaching during her teacher education programme and she felt that teaching MST was important. Instead of just following suit and doing what the other teachers did, she had her '*own ideas and think for myself*' (In2). When she entered the new school context she realised that her beliefs, feelings and thinking about MST were different from those of the teachers at the school. She stressed that she felt '*frustrated because in the primary school I cannot teach the way I would like to. I cannot teach like this for a whole year*' (In1).

Riana was also under pressure from parents as they were '*very involved in their children's progress and this creates pressure*' and the parents '*compare books [from the different Grade 2 classes] and complain if the books are not the same*'. In spite of this difficulty she found innovative ways to maintain her beliefs about MST teaching '*if*

*I do something original, I do it on a loose sheet so that the parents cannot pick it up' (In2).*

Riana's experiences during her first year of teaching put pressure on her teacher identity. She realised that she had to survive and consequently conformed to the politics and culture of the school, saying that '*I did things their way to know I was safe, and not to have pressure from the parents'* (In2).

Riana had undergone an array of emotional experiences as a beginning teacher, and the story of her professional experiences raised interesting questions about the emotional dimension of teachers' work. These emotional experiences resulted in an identity conflict and as first-year beginning teacher she became uncertain about her knowledge and ability. She said: '*I feel that I don't have all the knowledge, and I am inclined to rather do what the others do in case I don't have the right idea'* (In2). Riana's feeling of insecurity continued throughout the first year. She was severely restricted and frustrated by the teachers' inflexible ways but she tried to maintain her positive attitude and beliefs about teaching. She felt that her learning curve had been restricted by the school situation but she maintained that the '*university gave me skills that assist me to cope'* (In2).

After an initial period of negativity she devised solutions to reduce her frustration. The '*solution for me is that I must convince the team through my enthusiasm; it all depends on my enthusiasm'* (NR1). She planned alternatives to teach her way and therefore '*I am going to negotiate, which will be difficult but worthwhile; let's see what happens'* (In1). She also tried to plan new approaches with the support of the other like-minded young teacher, but she knew that it '*depends on the time we have and how flexible I'm allowed to be within my prescribed work schedule'* (NR1). To a certain extent she felt that she had made progress. '*Now, after almost a year, they are more inclined to listen to my ideas than at the beginning. They think I am more realistic now, after a year'* (In2).

In spite of her initial feelings of frustration and disappointment about asserting herself as a professional teacher, Riana tried to maintain her positive attitude towards the school, her colleagues and MST teaching. She devised an approach to try and solve

the difficult context in which she found herself while maintaining her professional teacher identity. She recognised her first year of teaching as a year of learning new skills and indicated that '*I have learnt to work with other people. I have sharpened up my negotiating and social skills because I have learnt to work with others. I have also learnt how to manage time effectively*' (In2).

**Curriculum interpretation and implementation:** Compounding Riana's challenges were the cumbersome curriculum demands: '*The curriculum requirements and goals set to achieve by the end of the term create pressure*' (In2). Moreover, the challenge of navigating and gaining familiarity with the curriculum requirements made it difficult to support the special needs of some learners in her class: '*The negative effect is that the weaker children cannot keep up and once they fall behind, they cannot catch up. Some children are disadvantaged because of the pace required*' (In2). Riana admitted, however, that '*The curriculum requirements and goals set to achieve by the end of the term create pressure*' (In2).

For her the reality of curriculum implementation comprised adapting her aspirations and convictions as a teacher with a positive teacher identity to the reality of the curriculum in that '*Technology as a learning area gets little attention in the curriculum of my school. Many teachers see technology as a waste of time*' (NR2). She also '*noticed that the school curriculum does not allow much time for science, I would like to make my own time for science. I also want to try and inspire the other teachers to do more science activities in their classes*' (NR1).

**Teaching MST:** Teaching mathematical knowledge and skills is a very important focal point of teaching in the primary school. Riana felt comfortable with the teaching insights she had received during her training: '*Much of the material we received is valuable*' (In1). She was '*positive about teaching maths*' and more important, she wanted to '*ensure that children feel positive towards maths*' because for her mathematics was '*one of the learning areas that children can feel enthusiastic about and they can do well*' (In1).

She believed that '*maths is important, but children have to be taught the concepts; they cannot learn them by themselves. The work should be enriched*' (In2). Riana

revealed the underlying strength of her teacher identity when she accepted the challenge of balancing the workbook with hands-on activities. '*In working with both, I have experienced that the hands-on activity carries much more value*' (NR1). She expressed her concern about the use of workbooks in mathematics: '*During my teaching practice I experienced that most schools have a set of workbooks which they follow when it comes to mathematics. The problem with this is that when you extend the lesson beyond the workbook, you lose time and you get stressed*' (In1).

During October of Riana's first year of teaching, she still struggled to find a compromise to the conflict between the school culture and her beliefs. She tried to construct a sense of herself in relation to the challenging teaching context in which she found herself. She maintained that: '*I also like to use counters when introducing a new number*' (NR1) because '*I like to make my numeracy lessons more hands-on, but I have time constraints*' (NR2). Riana felt that her more concrete and creative approach to teaching mathematics '*brings me into conflict with my fellow teachers, because they want to do the same as last year. They are unwilling to try new stuff*' (In2).

Throughout the observation lesson it was evident that Riana tried to implement her beliefs about MST; for example, during her reflection on the lesson she pointed out: '*I believe that children should first do maths practically. I did not use the workbook in my lesson because the children would not have understood the concept. They learn more if they write the work themselves. They enjoyed the lesson*' (In2).

As the year progressed, she found it easier to assert herself and to implement her mathematical pedagogical epistemology by utilising blocks and other physical teaching aids in group work. She contended that '*Learners understand concepts more quickly when I use three-dimensional materials. I am also more relaxed and better prepared because I have grown used to the pace of the daily programme*' (NR2).

Although she was positive about science and technology she expressed concern that very little time was available for those two subjects. She pointed out that '*unless the curriculum provides more time and attention to science and technology, these two*

*subjects will be sidelined as less important. There is no time to teach these two learning areas' (In2). For her 'technology and science are important because children learn valuable concepts and they also enjoy them' (In2).*

Additional pressure was exerted on Riana's professional teacher identity because the school curriculum did not provide for the teaching of science and technology. Therefore, implementing science and technology into Riana's Grade 2 class posed some difficulties at first, as she explained: '*I don't have time for technology lessons, but I am going to do technology during the art class*' (In1) and '*I cannot teach a science lesson only in my classroom. All the classes must do the same work. Secondly I have to teach the three learning areas that are important to the school, literacy, numeracy and life skills (movement)*' (In2).

Although it was difficult, Riana planned to teach science and technology by '*changing some of my time allocation of life skills to provide time for science and technology lessons*' (In1). Riana believed that '*if you do not make time to teach science and technology, there will never be time to teach them. You have to prioritise the teaching of science and technology*' (NR2). She found practical solutions and declared that she had '*learnt to accommodate science and technology in the last half an hour of the day*' (In2).

Riana believed that science could be taught '*through discovery and experimenting. At this level science is about everyday things*' (In2). She would have liked to teach science and technology '*based on the interest that children show*' and she would '*start with the project approach to make them used to thinking about things, and then tackle a science lesson*' (In1). One example of Riana's approach to science teaching was when she used the theme '*animals*' in a science lesson. '*We discussed the different kinds of animals and their characteristics. Then learners collected pictures of animals and sorted them into categories and as a summary of the week's work they had to draw a brain map of the different mammals*' (NR2).

**Institutional support:** Reflecting on her first year of teaching, Riana recalled feelings of exclusion by the more experienced teachers for her ideas about MST teaching. Her story provided insight into the challenges facing her as beginning teacher with

regard to how she perceived judgement from the older, more experienced teachers, who instead of respecting her knowledge as beginning teacher, regarded her as inexperienced. The group of more experienced teachers at this school provided support on condition of compliance. As a new teacher in a school with its own political culture where a '*first-year teacher is not recognised by the older teachers who feel that you have book knowledge, but you don't have teaching experience*' (In2), she felt that she had no support. '*The older teachers have their ways of teaching and if you do not fit in with them, they are negative against you*' (In1).

Riana indicated that she valued the assistance of experienced teachers when teaching specific mathematical concepts. She explained that they '*helped me when I went to them for assistance. They would advise me on how to teach a specific concept if I was uncertain*' (In2). However, she experienced this assistance as '*negative in the sense that teachers would indicate how they would do something, indicating that any other approach would not work*' (In2). The negative influence that she experienced from the older teachers was counteracted by the support of another beginning teacher who also believed in hands-on teaching methods. '*Fortunately we are two new teachers out of a group of five who teach Grade 2 and we have decided that we will push our ideas*' (In1).

Riana's professional teacher identity withstood different feelings of isolation, disagreement and discouragement at the beginning of her teaching career. She experienced a school culture that contradicted her teaching beliefs and her vision of the profession that formed the foundation of her experience as a new teacher. She commented that '*The situation at school was not what I expected. The school prescribes methods and approaches and this has a negative effect on me. During my interview the principal asked me what I could contribute to the school and I felt that I had a lot to contribute, such as my way of teaching and my insights into methodology. I was excited to teach, but the situation at school disappointed me and I thought: is this what teaching is about?*' (In2).

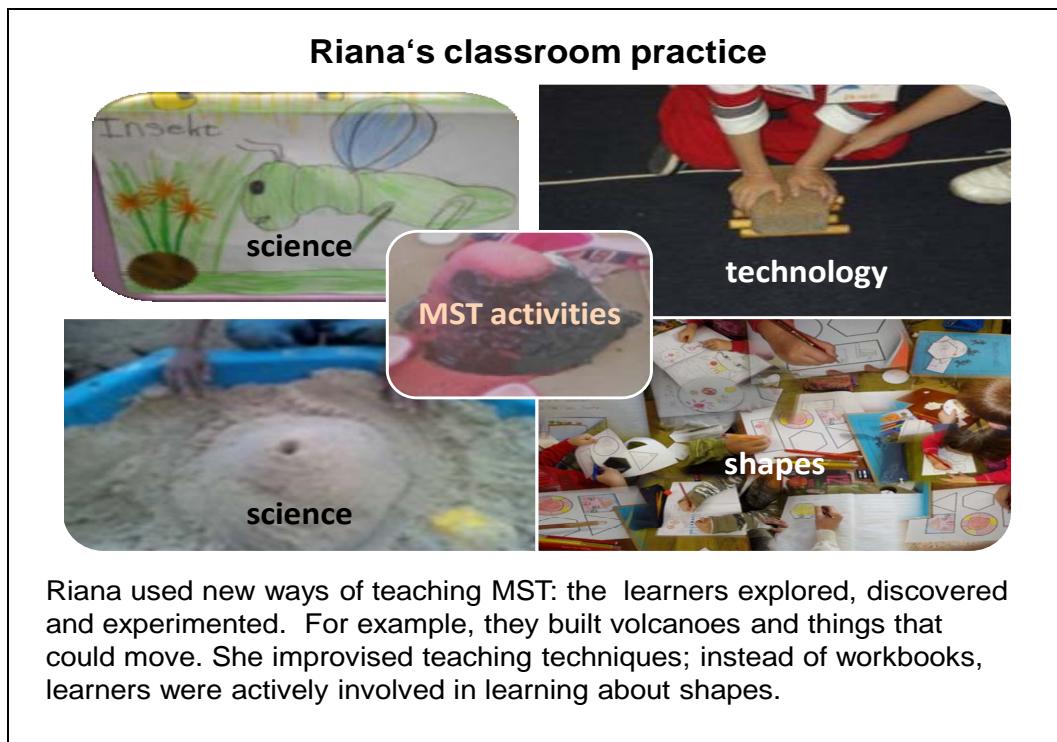
Riana's negative experiences in her first year of teaching infused many aspects of her teacher identity. She felt that '*The biggest influence on my teaching was the school situation. I think I would have had a totally different learning process if I had*

*been at a different school. I wanted to teach in a particular way, but the workbooks and the way that the teachers work together had an influence' (In2).* This had not been the teaching experience she had envisioned; it was therefore not surprising that she left this school at the end of her first year of teaching to go to another school where she might get a chance to employ her beliefs and knowledge.

**Classroom practice:** Riana felt challenged by the administrative duties that took her away from her teaching MST. '*I am out of my classroom to do other things, not teaching all the time.*' (In1). The numerous administrative tasks frustrated her because they affected the children's MST learning, and in order to cope she had to compromise with the use of 'worksheets', a pedagogical approach she did not agree with, because she believed in '*working creatively and three-dimensionally with the children before going to the abstract. Workbooks are difficult and ineffective because of the way they are constructed and used. I am not positive about workbooks because I think there are more effective ways of teaching*' (In1).

Another frustrating interruption to her classroom practice was the intrusive use of the intercom system for announcement and administrative purposes. She said: '*One of the factors that had a detrimental influence was the intercom system that interrupts my lessons and most of the time the announcement had no bearing on us. This is a major interruption and distraction for the learners*' (In2). During the observation of an activity where the children were actively involved in counting money the intercom came on seven times and interrupted Riana's teaching and the children's learning. Riana refocused the children after each interruption and completed the lesson.

When Riana entered the school as first-year beginning teacher, she was eager to make a difference and to be accepted as an equal with something to offer. She wanted to be a good MST teacher and to teach creatively. Although she was challenged by time and institutional restrictions that at times prevented her from teaching MST according to her beliefs, Riana developed a more flexible practical approach to teaching that provided time for both hands-on activities and the workbook. She was convinced that through hands-on, three-dimensional activities, the '*learners don't experience the three-dimensional work as maths and think they are playing*' (In2).



**Figure 4.2: Riana's classroom practice (observation and photo collages)**

Riana entered her teacher training programme with a background of mathematics and science, but she was not confident about teaching the subjects. After positive experiences during the teacher education programme which formed her professional teacher identity in the teaching of MST, she started her first year of teaching feeling enthusiastic about teaching the subjects at FP level. Riana's positive approach to teaching was stifled because of the conflict between the school culture and her beliefs. She found it difficult to sustain her professional teacher identity in the face of opposition to her convictions on MST teaching at that particular school. During the first year she struggled to find a compromise between the school culture and her beliefs as an MST teacher. At the end of the year she left the school to teach in an environment that would hopefully accept her ideas on MST teaching. Taking this step indicates that Riana sustained her MST professional teacher identity.

#### 4.2.3 THE CASE OF LEA

Lea's first teaching post was at a rapidly expanding Afrikaans primary school in a northern suburb of Pretoria. As one of six Grade 2 teachers, she had 36 learners in her class. Although most of the learners came from middle-class income homes, a

few children required financial support and there was a growing number of children from single-parent families.

**Personal history in MST:** Prior to entering the teacher education programme, Lea recalled her negative feelings about the rigid approach to teaching mathematics and science at school level '*I remember the structured nature of mathematics and science teaching and we did not have the opportunity to learn (creatively) what learners have now*' she '*did not have technology at school*' and she only '*did science up to grade nine level*' (In1).

**Teacher education programme and MST education:** Lea entered her teacher education studies at university with what may be described as negative feelings towards MST. '*When I started with the mathematics modules I was negative because I did not like mathematics*' (OR). '*I did not know much about MST*' (In1). However, she later acknowledges that her four years at university had broadened her outlook and changed her perceptions about MST '*the methodologies of MST have made me change my perceptions about these subjects*' (In1). She has become '*aware of many aspects and possibilities to teach mathematics*' (NR1) She has now realised that '*children like maths*' (In1) and she now feels '*differently about maths*' (OR).

Lea did her first internship in a Grade 1 class and her second internship period was completed in an English early childhood setting with a diverse multi-cultural context. Lea's experiences during her internship and the research project during her final year helped to shape her attitude towards teaching MST. She would often refer '*back to my experience during training*' (In1). Although she at first did not understand '*what it means to think mathematically, ... after completion of my internship I was thinking mathematically, scientifically and technologically*' (NR1).

Although her internship period changed her perceptions, she observed some realities about MST teaching in schools. She came to the conclusion that '*maths was only taught at two-dimensional level, especially in the primary school. I also noted that very little science and technology is taught in the primary school*' (In1). Lea completed her teacher training programme with a firm resolve to include learner-centred, creative approaches in her teaching of MST. Her approach to teaching was

confirmed during observation when the children designed milk bottles during an integrated MST lesson.

**School context:** Lea entered her first year of teaching feeling positive about teaching MST as she was appointed by the school where she had completed her internship. Although she valued her internship period at a time which she termed to be '*a make or break year*' (In2), the reality of the school culture was not in sync with her ideal vision of the profession. Very soon she was made to realise that '*A new teacher cannot think that she can come into her classroom and do what she wants; ... there are too many restrictions and rules*' (In2). Here Lea refers to the workbooks that had to be completed and that all the classes had to do the same work. She described her first year of teaching as '*not easy*' because when '*you stand in front of your own class for the first time you are uncertain*' (In2). She was torn between what she wanted to do and what she was expected to do with regard to teaching methodology. She stated that for a teacher '*being in your own classroom is vastly different. As student teacher you are unaware of what really happens at school. The pressure in your own classroom is tremendous, as other tasks intrude on your teaching and everything has to be completed*' (In1). The situation that she describes pressurised the formation of her professional teacher identity, but at the same time strengthened her resolve to carry on.

Lea found that the older teachers at school did not support her belief that science and technology are important learning areas. She realised that the '*older teachers have never done science and technology and therefore have no interest to teach the subjects*'. She was '*careful not to attract too much attention with new approaches and teaching methods. I keep a low profile not to attract attention*' (In2). She tried to keep a low profile and explained that '*I conform because I do not want conflict*' (In1).

The other teachers at the school mainly used workbooks when teaching mathematics and did not always allow learners time to do hands-on experimentation and discovery. She experienced conflict because '*Some days I do not want to use the workbook, but I must keep up with the other five teachers. Everybody does the same*' (In1), and her '*colleagues have been teaching for a long time and are not open to new ideas*' (In2). While teaching the way the other teachers do may be regarded as a

coping strategy for survival on her part, this approach pressurised her professional teacher identity as she wanted to teach differently.

Lea acknowledged that she did not have enough time to teach the way she wanted to. Time constraints were a constant challenge that permeated her professional life. She acknowledged that during '*practice teaching I could negotiate with the teacher to do something new, but there is no time at school. The workbook must be completed in a hurry, and that is all that is possible in the available time ... time is a factor that has to be kept in mind when teaching*' (In1). A further complication was the fact that '*many admin tasks make it difficult to plan my teaching day*' (NR2).

The school employed a team approach to lesson planning. During these team meetings she used the opportunity to share her pedagogical knowledge from her teacher education programme. She explained that '*I still make use of my books from university when planning my lessons. At school we do team planning, and when I do the preparation for everybody for the week, I use what I have learnt, especially the maths and science handbook that we used at university*'. However, sadly the reality was that her '*new ideas are not accepted*' (In2) and this feeling of frustration and rejection of her ideas exerted pressure on her developing teacher identity, as agent of change and transformation.

The challenges that Lea experienced at that school were compounded by the pressure from parents who wanted all the classes to do exactly the same work '*parents talk to one another and apply pressure*' (In2). She also felt that coping with the children's poor socio-economic background complicated teaching and added that '*some children are from poor socio-economic homes and do not have food. Some children come from broken homes, with resulting problems*' (In2). However, in spite of these challenges she '*had positive feedback from (some) parents who write encouraging comments in the children's books that I send home and at feedback meetings*' (In2).

Lea's story sheds light on how the school situation, institutional support or otherwise affect professional teacher identity formation for a beginner teacher. The many challenges and how they go about resolving those professional dilemmas exert

pressure on the developing professional teacher identity. For Lea, the challenges were met with a resolve to keep on planning to convince the other teachers of her viewpoint.

**Curriculum interpretation and implementation:** Lea realised that mathematics was the foundation subject in the numeracy programme. However, the challenge of navigating and gaining familiarity with the FP curriculum translated into the difficulty of teaching science and technology, as no specific time was allocated to the teaching of these two subjects. *'The tempo of learning at school is high, as are the standards. Children have to achieve specific assessment standards and milestones. This makes the teaching of science and technology very difficult'* (NR2).

South African curriculum documents recommend cross-curricular integration of learning areas. However, these suggestions were difficult to implement as *'I still try to integrate technology into art or maths in my own class. I try to do the same with science, although it is more difficult with science'* (In1).

The announcement by the department of education that *'technology is going to be removed from the curriculum from 2011'* (In2) brought the realisation that the curriculum would be much poorer for its removal and that the children would suffer: *'we are moving backwards to the old ways of teaching that are less learner-centred and children cannot learn effectively'* (In2). Lea felt apprehensive about that curriculum change, as she felt that MST concepts should be taught to prepare children for the more advanced classes. She felt that with the impending removal of technology from the curriculum and with science not receiving adequate attention, it was difficult to teach science and technology. The change affected her pedagogical beliefs that children learn through *'discovery and experimentation'* (NR1) and her epistemological beliefs: *'I feel that science and technology will die out unless I do something about it. They [children] will lose out unless I introduce them to the children'* (In1). The situation described here put pressure on Lea's professional teacher identity as she felt that she could not teach her children the way she believed she should.

**Teaching MST:** Teaching mathematical knowledge and skills is a very important focal point of teaching in the primary school. Lea felt comfortable with the teaching insights she had received during her training. She felt that '*mathematics is a foundation subject*' (In1) and it '*is the focal point, science and technology are subsidiaries*' (In2). She also believed that '*MST form the basis for learning in other learning areas*' and that '*MST provide important knowledge and skills to learners that they will be able to use for the rest of their lives*' (NR1). For Lea, planning her lessons was most important, as '*without planning and preparation, lessons tend to be reduced to talking and workbooks and the children don't benefit*'. Lea wanted the children to '*become skilled at problem-solving*' (In2). Therefore, the acquisition of inquiry skills was an important focus in her MST teaching and she planned to develop these skills by allowing the children to talk about what they had done and learnt '*I often do the reflection informally*' (In2).

Lea's attempts to teach science and technology were severely restricted by the curriculum guidelines that required the integration of science and technology into the other learning areas. '*I try to teach science and technology but this does not often happen*' (NR2) and '*There is really very limited time to teach science and technology in the foundation phase*' (NR1).

Lea's vision of teaching creatively was stultified by the rigid, prescriptive school structure that required the completion of workbooks. Consequently she could not let the children use counters and other manipulatives. She felt that her teacher identity was negatively affected by her inability to teach creatively and that she was '*stagnating as a teacher. I find that the reality in school is different*' (NR2).

During a visit to her classroom, Lea demonstrated that in spite of the various challenges she encountered, she had a well-constructed teacher identity in MST. She integrated the three MST learning areas in her teaching to accommodate science and technology. For example, she planned an integrated MST lesson around a real-life problem '*the children had to design their own milk container that did not need a fridge*' (OR). The lesson included mathematical measurement concepts – the children experimented with hands-on activities measuring different volumes (millilitres and litres). Science concepts came into play when children observed what '*happens*

*to milk when left in the sun' (OR). In technology the children had to design a milk container that would help to keep the milk fresh. During this visit it was evident that her philosophy of teaching was an integrated MST approach where problem-solving was an important component of her planning. Lea's approach to pedagogy was hands-on and interactive, as she believed that '*learners react more positively when they are actively involved in their own learning process and I plan the activities in such a way that learners can be hands-on*' (NR1). She experienced the integrated curriculum as a reality in her day-to-day practice. She observed that '*I integrate and apply MST concepts in structured lessons*' (In1).*

Lea's professional teacher identity in teaching MST seems to be based on a positive approach to learner-centred inquiry-based teaching. She believes that MST should be taught as an integrated whole, for the benefit of the children '*They enjoy active participation much more than sitting passively*' (NR1).

**Institutional support:** Lea's experience provides some insight into the challenges that beginning teachers face and the pressure exerted on their developing teacher identity if they feel they are not supported by more experienced staff members, who instead of guiding them, do not regard their ideas, content knowledge and pedagogical knowledge as valuable. Lea '*felt that I did not have support, except from the other young teacher*' (In1); furthermore, '*new ideas were not accepted*'; the '*situation at present makes me [her] feel like a failure, as if I am a bad teacher*' (In2). As a result she '*find(s) teaching difficult because it feels as if I am stagnating because I cannot think creatively. There is no time for learner-centred activities and when I suggest something my idea is turned down*' (NR2). The '*school where I am does not allow me to teach anything outside of their usual programme. My head of department is not open to new ideas*' (In2).

Furthermore she felt that the '*more experienced staff members' do not have the background in science and technology. There is also the fact that the other teachers do not want to spend time to plan the new lessons*' (In2). In the beginning Lea admitted that she found it difficult to implement her MST beliefs, new ideas and knowledge and it was difficult for her to assert herself confidently in her teaching role without the support of management and experienced teachers. The school culture

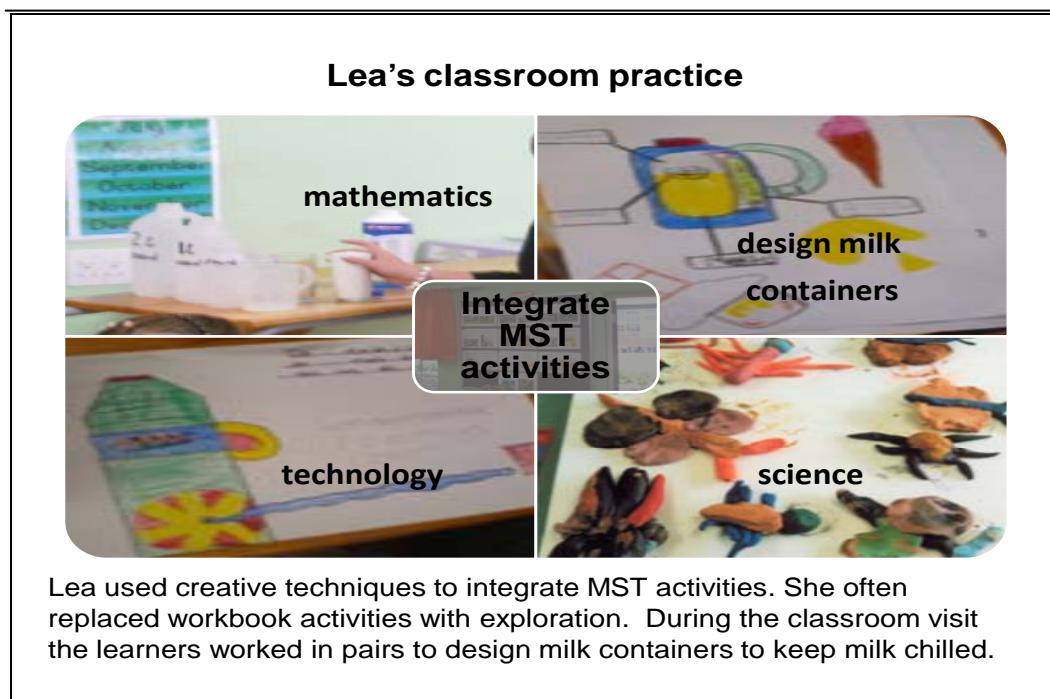
invariably affected her teacher identity formation negatively and this resulted in an identity crisis. She felt that she was compelled to adapt '*I will have to adapt to a degree to avoid conflict*' but towards the end of the year she declared that '*I shall not become like them, I shall keep on teaching the way I want to*' (In2). She announced that she did not want to '*follow the rules*' (In2) of the school culture, she wanted to prove herself and act decisively, thus asserting her identity by taking on the challenging school context and teaching MST the way she believed would benefit the children in her class. Lea fell back on the conviction that MST had to be taught and learnt according to how she had been taught at university, namely in an inquiry-based manner.

**Classroom practice:** Lea had to find a way to cope as a new teacher within a school culture that did not support her positive beliefs about MST teaching. In addition, she struggled with not having enough time to attend to and adequately prepare MST lessons using appropriate pedagogical knowledge and resources. She found that familiarising herself with the curriculum and the '*specific assessment standards and milestones was time-consuming*' (NR1). Lea further experienced conflict as her '*opinion has changed about the teaching of MST. There is not as much time as I originally thought when I was a student. I want to teach maths the right way. The old way of teaching is not learner-centred, which is bad because children cannot think for themselves. Keeping the different learning styles in mind, the workbooks are not the answer. I am behind with my workbooks because I am doing practical work*' (In1). Lea reacted emotionally as the '*situation at present makes me feel like a failure*' (In2).

Practical experience in the classroom resulted in increased insight and awareness of how children learn and what should be taught. She taught '*maths differently from the other teachers. I use counters and Unifix blocks with counting to reinforce the concepts*' (In1).

Her colleagues were '*not open to new ideas*' (NR2) and they turned down her ideas. She had to change and adjust her pedagogy to the challenges of the school context and the reality of her classroom in order to survive. Although at first she reacted emotionally to the dilemmas in which she found herself and '*feel(s) like a failure*'

(In2), she gradually strengthened her positive beliefs about her teaching ability, which is consistent with the inquiry-based and hands-on learner-centred approach. She felt that '*children do not learn better with the workbooks, they learn better if they can experiment and explore*' (In2). Consequently she planned '*for the children to experience learning material*' and to '*learn from one another. I team up a strong learner with a weaker one, and they learn from each other. I go back to my experience during training*' (In1).



**Figure 4.3:** Lea's classroom practice (observation and photo collages)

Lea entered the teacher training programme with a limited background in science and technology. In spite of this, she entered the school environment with a positive MST professional teacher identity, largely due to the influence of the teacher education programme and specifically the research project. Her professional teacher identity was immediately under pressure due to the demands of the school culture, lack of support and conflicting ideas on MST pedagogical approaches. She partly conformed to pressure and used pedagogical approaches contrary to her beliefs. In spite of this, she used innovative integrated approaches without attracting attention, thus sustaining and even strengthening her MST professional teacher identity.

#### 4.2.4 THE CASE OF GINA

Gina had a class of 22 three-year-old children in a well-resourced private early childhood school in a south-eastern suburb of Pretoria. Most children came from high to middle socio-economic income homes. The languages of instruction were Afrikaans and English. Gina had a teaching assistant who helped with cleaning and assisted with some activities. The formal programme ran from 08:30 until 12:00, when the children had lunch (the school provided the food).

**Personal history in MST:** Gina was exposed to MST knowledge at school, as she ‘*took maths, science and technology in matric*’ (In1). At school she was ‘*positive about maths and science*’ but she ‘*did not like technology*’ because ‘*we were the first OBE [outcomes-based education] learners and the learning material was very confusing*’ (In1).

**Teacher education programme and MST education:** When Gina entered her teaching education programme she was positive about mathematics and science but did not like technology; she said that ‘*it was badly taught ... I did not enjoy it at school*’ (In1). After studying technology at university, she changed her mind. She was more positive and wanted to teach the subject and she wanted children to feel positive about it. She explained that ‘*I feel that I know what technology is and that I don't want children to feel towards the subject what I felt*’ (In1).

Gina’s love for science was evident when she chose ‘*general science as a three-year elective in her teacher training programme*’ (in1). She further said that the ‘*science pedagogy we studied was not as comprehensive as the maths pedagogy, it was very basic. I had to find out later exactly how the information fitted into my teaching of the subject*’ (In1).

For Gina, becoming a professional early childhood MST teacher was a process of interaction between personal perceptions and specific aspects of her professional training. The learning process implied growth stimulated by theoretical knowledge (MST modules in the programme) and learning from classroom experiences (internship period). Her experiences during the internship programme were ‘*definitely*

*influenced by what I had learnt from the modules during my teacher training programme' (NR1).*

She confirmed that the MST knowledge she acquired during her studies provided her with a platform to expand from, but it also made her question the position and value of science and technology teaching within the FP. She found it difficult to accommodate science and technology: '*The reality about science and technology is that teaching science does not exist where I am.*' (In1) and '*teaching technology takes too much time*' (In1). Furthermore, Gina found technology '*a very difficult subject to teach when children do not have the basic skills required to carry out technology activities*' (NR2).

Although Gina had prior exposure to MST at school and in her teacher education programme, she had limited practical exposure to the teaching of science and technology during the internship. She said '*I did not experience a whole lot of science or any technology during my internship in the Grade 1 classroom*' (NR1) and she did not have enough time to teach science and technology: ' (NR1). She further felt that '*if you want to fill the gap of science and technology, you have to think differently*' (In1). Gina demonstrated her developing teacher identity in science by devising strategies such as planning activities in the vegetable garden and including insects and animals themes to her the classroom practice.

**School context:** Gina entered her own classroom with confidence, but her concept of self as a teacher was challenged when she was faced with unforeseen complexities. Gina found teaching in her own classroom difficult due to time constraints and the young age of the children in her class. She elaborated thus: '*Constraints are placed on the kind of activities I can plan because of the age of the children, the time available for work in the daily programme as well as the expectation from the principal and parents to produce a minimum number of lasting products (mostly pictures) in a week (it is expected that each child should create two products during a week)*' (NR1). As lack of time was the problem, she needed to improve her time management skills and '*adapt from the time when I was a student on practice teaching and had much time, to the present where time is of the essence*' (In1).

Her notion of self as a teacher was apparent from her ability to adapt to the situation of dealing with parents and administrative duties and her mastery of coping mechanisms. For example, she survived by planning her teaching to accommodate the different influences and challenges she encountered. She stated that she '*found doing things in class difficult at first, but (they) became easier as I taught more. Things that take time are the everyday admin tasks or consoling young children when their parents bring them to school*' (In2). She also experimented with different teaching techniques because '*master[ing] teaching techniques on my own*' helped her to '*understood them better*' (In1).

She managed her feelings of initial frustration by planning her daily programme to include what she wanted, while at the same time adhering to the requirements of the school such as the paper trail evidence for the principal and parents. Gina attributed much of her ability to adapt to '*the situation at school*' (In1) to personal experience and mastering teaching techniques.

Gina felt confident about teaching MST because she realised that she could accomplish more in her early childhood classroom than elsewhere: '*The pre-primary school situation is much less rigid than primary school ... the teacher has more freedom to attend to children who need help. Also the pre-primary class has an assistant who can help*' (In1). In this specific setting an assistant was provided, which might not always be the case in all situations.

**Curriculum interpretation and implementation:** Gina realised that she had more freedom to teach in the early childhood setting than teachers in the primary school, in spite of the expectations from the principal and parents that contradicted her pedagogical beliefs. During observation it was evident that Gina was given the opportunity to make her own decisions on content and pedagogical approaches. Gina believed that children should '*learn about maths, science and technology using physical objects, as far as possible. I incorporate the maths/science activity into an art activity*' (NR2). Training as a teacher made Gina realise '*the importance of science and technology, it should be an important part of any curriculum, instead of a part that is left behind when other things seem more important*' (NR1). Gina accordingly integrated science into her art classes and she selected learning material

that was both ‘developmentally appropriate and challenging. It is no use to only keep them where they are, but you need to push them a little further to be effective’ (In1).

**Teaching MST:** Apart from some constraints and rules at the beginning of the year, Gina enjoyed teaching in the less formal surroundings of a group of children between two and three years old. She succeeded in initiating age-appropriate activities within the time available. ‘*Developmental appropriateness should always be the first consideration*’ (NR1).

Gina’s understanding of how mathematics should be taught at their level was reflected in her conviction that ‘*Teaching maths means acquiring basic skills like number concept in a concrete manner*’ (In1), and ‘*I think it is about laying the foundations for the development of basic mathematical skills.*’ (In1). She believed that ‘*Young learners need to experience mathematics for themselves. They need to see, for example, ‘what concepts such as heavy and light mean’*’ (NR1). Mathematics should be taught informally and ‘*learning mathematical concepts and skills should be an enjoyable experience for all learners. When a child enjoys something, he or she is more likely to give participation and therefore gain something from the experience*’ (NR1). During observation it was clear that children were actively involved in experimentation through activities like gardening and observing the growth of plants and observing animals.

She believed that MST learning areas were important for the development of concept formation of the children in her class. Gina added: ‘*Mathematics, science and technology should form part of every early childhood programme. It is in the early years that children learn the foundation skills they will need and use to succeed in these subject areas later in their schooling*’ (NR2). During observation children used blocks to build constructions and used three-dimensional Unifix blocks to make patterns.

Although she found mathematics easier to teach than science and technology, she also felt ‘*comfortable in teaching science because I know what I am doing*’ (In1). She planned her lessons but was always on the lookout for opportunities to integrate relevant aspects from science and technology during her lessons. Gina felt that

*'technology should be hands-on'* (In1) and she taught *'technology through art, and [tries] to create situations where they may choose colours or what things must look like'* (In2). During observation of her integrated lesson she combined art, science and technology by letting the children create patterns and also by working in the garden. Integration of learning areas allowed her the opportunity to teach more work in the limited time at her disposal.

Gina considered the pedagogical knowledge she acquired during her university studies to be *'important for providing insight, because without it one does not understand the process of what is happening'* (In1) and *'Teaching maths is much more specific, while science and technology teaching is more general in nature'* (In1). Her teacher training background influenced her teaching approach and she stated that she *'always teach[es] MST in a concrete manner. I start three-dimensionally and then move to two-dimensional. I stick to basic stuff and keep things as simple as possible. I take a small group of three and work individually with each child'* (In2). This teaching approach was demonstrated during the observed lesson.

She planned to include MST in her daily programme, but she was also *'constantly subconsciously ... on the lookout for situations where knowledge and skills regarding these learning areas can be incorporated'* (NR2). One such situation was *'a pasting activity simply as part of an art project, but it turned out the children needed to apply mathematical skills to complete the task successfully, since the activity involved copying a pattern. Once I had realised this, I focused the children's attention on the pattern (a fence) and asked them to copy it'* (NR2) and *'the three little pigs story was the perfect opportunity to bring maths into art'* (OR). Gina's developing professional teacher identity is illustrated in her confident approach to situations in her class, as was observed during her observation lesson.

**Institutional Support:** Gina received quality support from the principal and did not lack teaching resources. She felt confident and in control of her situation as a teacher, with a strong sense of self as a teacher who could negotiate with her principal. She stated that *'the principal supported me in providing materials that I required. I would just write a note and she would order the material'* (In2).

Gina also enjoyed the benefit of having an assistant whose services were provided by the principal '*an assistant who can help.*' (In1). Her situation at school strengthened her developing professional teacher identity.

**Classroom practice:** Gina felt secure in her classroom and there was evidence of planning for intentional mathematics and science teaching in the specific integrated lessons she prepared. She explained that '*once a week I set aside the time allocated to the main activity for a maths or science activity*' (NR1); and '*every Wednesday I do either a maths or science activity. Sometimes it is a separate activity, but I try to incorporate it into an art activity*' (OR). Another example was that '*when the theme allows, I include discussions about MST in the theme discussion and language development. When I plan a theme, I try to look for ways in which these learning areas can be included*' (In2). During the observed lesson on insects she combined maths and language by telling the children about insects and classifying them according to their features.

She had become confident, flexible and adaptable in her ability as a teacher and she found '*it is easier to decide on approaches in class, because my theoretical and practical experience confirm my beliefs*' and she '*manage[s] my time better*' (In1). Her '*biggest change during the first year is that I have found more confidence in my teaching. I have also learnt to think on my feet, especially when an activity does not quite work, I then adapt*' (In1). She was able to teach with confidence because her dedication to her task and the support she received from the school management reinforced her developing teacher identity.

Gina valued and applied the knowledge she had acquired during her teacher education programme and had not changed her opinion with regard to the 'how and what' should be taught and 'why' mathematics was important. She adapted her acquired knowledge to the classroom context and '*refer to my notes and handbooks in maths when in doubt about what to do*' (In2).

She demonstrated a practical and flexible approach to teaching as observed, and said that '*I learnt through trial and error, for instance I immediately simplify material when I realise the material is too complex*' (In2). She further relied on her classroom

experience ‘science activities … have taught me – less is indeed more. The simpler the activity, the more children gain from the experience’ (NR2).

Gina constantly worked at improving her teaching skills; proof of this was found in her statement: ‘*The reflection I wrote made me think about my teaching and encouraged me to improve my teaching*’ (In2). Reflective practice had improved her teaching ability as well as her insight into her task as a teacher.

Gina was comfortable with the requirements of the school and accommodated her own beliefs within the school’s contextual framework or ethos. She was convinced of her ability as a teacher and of the quality of her contribution to the development of the children in her class; therefore it appeared as if Gina in her first year of teaching was constructing a positive and stable professional teacher identity in MST, as she explained: ‘*without a doubt, although influenced by multiple sources, my beliefs about MST correlate to the way in which I plan and teach these learning areas*’ (NR1).

Gina’s self-identity as an MST teacher was further revealed through her personal and emotional involvement with the children in her classroom. She cared about their wellbeing and development. She had this to say: ‘*children should learn mathematical concepts from a very young age. Children should be challenged to expand their knowledge and skills, but should be assisted along the way so that they experience success as they are learning. I believe that each activity should be adapted to the level of each child*’ (OR).



**Figure 4.4: Gina's classroom practice (observation and photo collages)**

With her background in mathematics, science and technology at matric level, Gina selected science as her main subject for degree purposes. She regarded the teacher education programme as important in the formation of her MST professional teacher identity. She felt, however, that she had received little practical exposure to science and technology during her fourth-year internship period. Although she experienced the same reality shock as the three FP teachers, she regained her equilibrium quickly because of her personal commitment to teaching and the support she received from colleagues at the early childhood centre. In the process of professional teacher identity formation, Gina not only sustained and strengthened her MST professional teacher identity, but she also adapted to the particular situation in which she found herself. Her first year of teaching was a year of growth and development in the practical aspects of teaching.

#### 4.2.5 CASE OF JENNA

Jenna taught a group of 20 children of four and five years old from diverse socio-economic and cultural backgrounds in a privately owned early childhood school. The owners were very involved and they had been running the school for approximately

20 years. Although there was a rich diversity of multilingual children in her class, the language of instruction was English. At the time of observation the school was without a principal, as the previous one had left.

**Background:** Jenna, who did '*mathematics at matric*' level, had a '*positive view about mathematics*' (In1). She always thought that she '*was going to be a foundation phase teacher*' and therefore she '*did not see the need to do science*' at school. She also '*did not do technology*' (In1) at school.

**Teacher education programme:** Jenna entered university with a positive attitude towards mathematics. Her liking for the subject was enhanced during her teacher education programme and the practical internship period: '*Personally, mathematics had the biggest influence and impact on me and I feel this is the learning area that I am most competent to teach*' (NR1). The programme at university '*prepared me for teaching maths. We did lots of practical exercises to illustrate mathematical theory at primary level*' (In1). Jenna felt that she did not have the same grounding in science and technology and she was still uncertain about specific aspects in those two subjects, notably '*as I do not know what the learning outcomes are and have to look them up. I do not have the same experience (of maths) with science and technology. I also did not see many lessons on science and technology during practice teaching*' (In1).

She stated that she had learnt very little about science and technology from her mentor teachers: '*science was taught in a less practical manner and hence this is the learning area I tend to neglect as I am to this day unsure of exactly what is expected and how it can be implemented effectively*' (NR1). She also recalled that '*during practice teaching teachers did not really give attention to science and technology*' (In1). Jenna was aware that her years of teacher training had influenced her teacher identity: '*I feel that the knowledge that I acquired during my years of study and my mentor lecturer are factors that shaped and assisted me in my development*' (In2).

**School context:** From the outset Jenna felt optimistic in the school where she was and this tended to strengthen her notion of becoming a successful MST teacher in FP. She said she '*can teach positively in an early childhood setting. There is enough*

*time ... in comparison with the primary school, where things are more formal and structured*’ (In1). She felt in control of her situation, knew her children well and experienced those factors as ‘*positives in my teaching situation*’ and ‘*everything is easier than when I did practice teaching*’ (In2).

Pondering her experiences as a new teacher, Jenna commented that ‘*being a first-year teacher, I do believe that every lesson is a learning opportunity*’ (OR).

Jenna expressed her positive teacher identity through her actions. ‘*You follow the examples taught at university and that is what you believe in. Then suddenly you are at a school that wants you to do otherwise and the danger is that you conform. Your mind knows that you should do what you believe. I do think that given time to adjust and find your feet, you will express your own opinion and teach the way you feel you should*’ (In2). Jenna’s remarks were due to the experience she had had in a Grade 1 FP classroom during her practice teaching. The situation in which she found herself during her first year of teaching was different, as she had support for her ideas and the freedom to apply them. During observation it was evident that she planned an interactive number concept development lesson where children had to count out and identify numbers. Although she facilitated number concept development for the second language learners, she also made provision for exploration and discovery. She used the memory of her past experiences to express her thoughts about a conforming and changing professional teacher identity in the light of a possible difficult situation in the future. In doing so, she displays insight and a sound, well-established professional teacher identity.

**Curriculum interpretation and implementation:** Jenna explained that the dilemma of teaching MST to children of four and five years old was that there was no curriculum in MST for this age group and consequently ‘*no assessment standards for children younger than grade R, but with a bit of innovation one can work out lessons that help the children to reach the grade R outcomes with ease*’ (NR1). Because there were no clear curriculum guidelines for MST except for the FP curriculum, Jenna adapted the Grade R curriculum to suit the developmental needs of her class. During observation she used number concept development principles in an activity. The children had to count out objects from one to five, draw the amount and match it

to the symbol. The children were actively involved, using manipulatives to represent the number value and helping one another in the process.

For Jenna, '*MST are all integrated and can be integrated into the other learning areas as well*' (NR1) and '*integration of learning materials in MST has become a reality for me*' (In2). During observation she displayed a science theme table where the children could explore the theme of winter. She integrated the theme by counting how many children were wearing scarves during the introduction and identifying the different kinds of warm clothing the children were wearing.

Knowing the curriculum guidelines for grade R mathematics, she '*divide[d] numeracy into the five learning outcomes and each day of the week after outside play time we do some form of fun concrete activity that aims at achieving the specific learning outcomes*' (NR2) and '*When I plan for maths I consult my outcomes and plan what they must know. I often adjust the lesson to the children's needs and achieve my outcomes along a different route*' (In2).

**Teaching MST:** As a beginning teacher, Jenna wanted to teach the children in her class MST. She wanted them to feel positive about MST; therefore for her '*the teaching of MST is important in the early years. A great deal of planning needs to go into the teaching of these three learning areas*' (In1). She used situations that arise in the classroom as '*opportunities of incidental learning on a daily basis with regards to MST*' (NR2).

Jenna felt confident about her pedagogical and mathematical knowledge; she believed that '*maths is important in the development of children's thinking processes*' (In1). She often '*integrate[s] maths with other subjects*' (In1). Jenna tried to teach lessons in all three learning areas '*to make sure the children reap the true benefits of education*' (NR1) She stated that she '*strongly feel(s) that these three learning areas need to be taught in a very concrete manner in order to make abstract thinking in the future easier for the child*' (In2). Therefore, she planned lessons in a '*fun and interactive manner, having no correct or incorrect way of doing things but rather leaving the creativity and problem-solving in the hands of the learners*' (NR1). For example, '*If we count out stuff in class, I allow the children to help. They learn the*

*basics in an informal, playful manner*’ (In1). She also acknowledged that the ‘*children made me aware of possibilities in maths*’ (In2). During observation it was evident that she used questioning techniques to prompt reactions from her second-language learners. She involved the children in questioning and answering activities that led to higher-order thinking and problem-solving.

Jenna’s identity of self as a teacher was illustrated in her explanation of herself in her teaching philosophy as a ‘*big supporter of the constructivist approach*'; she ‘*firmliy believes that learners need to be active agents in the construction of their own knowledge*’ (OR).

During classroom observation it was evident that she applied the constructivist approach in her teaching. For example, she presented an activity of number concept development where the children first used objects to count out from one to five. Then they had to arrange the groups of objects from one to five. The third step was that the children had to draw each set of numbers (symbolic representation of number) in the correct sequence. (See Jenna’s photo collage on classroom practice).

Reflecting on that activity, Jenna explained that ‘*I feel that my method of teaching is effective and that there are learners who really benefited and were given the opportunity to do a challenging yet exciting activity that tested their own limits ... the sense of accomplishment that the learners experience is indescribable*’ (OR)

Jenna remarked that ‘*science is all around us, but we take what happens around us for granted and do not open our eyes to the possibilities that present themselves. Technology is the same*’ (In2). The reality of her teaching situation in the school was that ‘*science and technology were neglected*’, and that it was ‘*difficult to teach science and technology because I do not have enough pedagogical knowledge; I am uncertain of how to teach science and technology*’ (In1).

Jenna came to the conclusion that in the teaching of MST she had to ‘*accommodate all different levels of learners, which is challenging*’ and ‘*one needs to think on one’s feet, and be two steps ahead of the learners. It is essential that one has a backup plan to fall back on*’ (OR). She had also ‘*learnt that there are daily situations where one can promote MST. Learners enjoy MST and have a thirst for knowledge, children*

*just needs to be stimulated by the teacher' (NR2).* It was evident through the activities observed that Jenna's mathematics professional teacher identity was well established and sustained and that she could teach mathematics with confidence.

**Institutional Support:** At the beginning of the year, Jenna voiced her frustration as '*The owner of the school will not provide resources and I do not have the means to buy them, so at the moment they are unobtainable*' (In1). Then, later in the year, the situation at the school changed when she '*was made responsible for finances and we [all the teachers] collected funds for MST apparatus. The parents contribute an amount every term and we allocate funds where needed*' (In2).

Institutional support by the other teachers and her feeling of accomplishment observed during her lesson strengthened Jenna's view of herself as a teacher. The reaction of the children to her pedagogical approaches she employed, gave her the confidence to teach and develop a feeling of self-worth: '*I feel that my method of teaching is effective*' (OR). Jenna valued the institutional support: '*The most important aspect at school was the support I received from the teachers during lesson planning and that helped me a lot*' (In2). She found colleagues, and fellow graduates of her teacher education programme to be a great source of informal support. She acknowledged that '*my principal supports me and listens to what I have to say*' (In1); '*my principal is positive and provides assistance and positive input*', (In1) and '*The principal provides me with ideas for lessons and has an open door policy, I am able to ask for advice if I feel I need it*' (OR).

The school context and institutional support that Jenna experienced in that early childhood setting promoted a feeling of security and emotional closeness that seemed to strengthen her professional teacher identity and beliefs about teaching. Being able to teach in a school culture that promoted collaborative and effective support during the first year of teaching helped Jenna to cope and to feel positive and confident about her teaching.

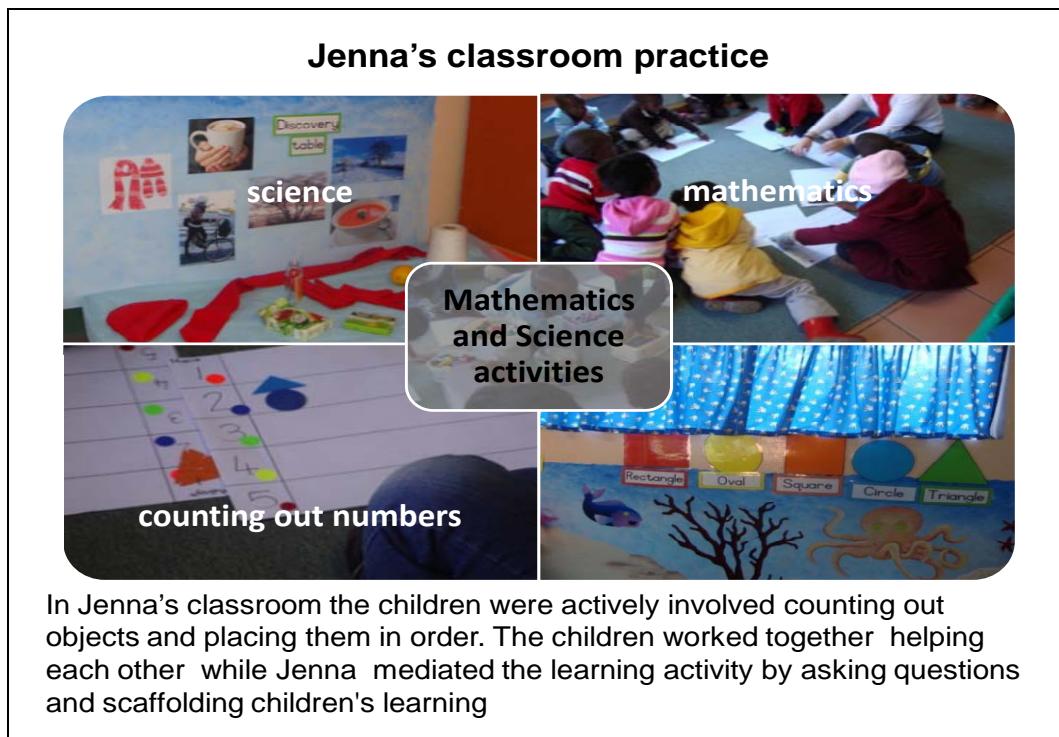
**Classroom practice:** Jenna valued the teacher education programme that informed her perceptions and beliefs about teaching in the FP. She felt that a teacher should be innovative and creative. '*I believe that learners need to be taught through*

*discovery and scaffolding and not by rote learning' (OR). 'Because I do not like technology I would rather spend the time I have on teaching what I am passionate about, which is maths' (In1).* She favoured 'child-initiated teaching where the teacher acts as facilitator' and she believed '*in applying Vygotsky's scaffolding and the zone of proximal development*' (In2). Jenna's developing MST professional teacher identity is clearly illustrated in her comments and her actions as observed. She applied Vygotsky's notion of scaffolding children's learning and asking challenging questions during the observed lesson.

Her comments on her classroom practice and the different responses of her learners brought her to the conclusion that children are unique and individual and that different learning and teaching approaches should be investigated and applied. She therefore '*plan(s) multi-level lessons and can adjust to the situation that develops*' (In2). She also realised that 'learners who cannot work independently and do not benefit from peer teaching need intervention; '*she always 'asked questions' and encouraged 'learners to become critical thinkers'* (OR).

During observation the children reacted in ways that allowed Jenna to open new areas or activities and she was constantly on the lookout for these opportunities '*I have children in front of me that learn in different ways and have multiple intelligences that have to be developed*' (In2).

Jenna regarded her first year of teaching as an important period of growth for shaping her beliefs and knowledge about MST. She realised that as a beginning teacher she was involved in a learning process, which she described as follows: '*I feel that I have grown as a teacher and that I am in my own class and in control of what happens. Although it is a great responsibility I feel comfortable because I have more experience and I can do a more integrated programme with the children*' (In2). She consequently felt that '*experiences during this year have made me positive about my teaching*' (In2).



**Figure 4.5: Jenna's classroom practice (observation and photo collages)**

Reflecting on her growth from student teacher to beginning teacher, it was clear that she developed and sustained a positive MST professional teacher identity. It was evident from her classroom practice during observation that she taught MST with confidence and insight. The formation and continuous development of her MST professional teacher identity was confirmed in her explanation that '*I have grown within myself and as a teacher. I believe it is necessary to be a lifelong learner*' (OR). She defined herself as a '*successful teacher*' (In2) and it seemed that her professional teacher identity reflected positive qualities and beliefs about mathematics teaching.

#### 4.2.6 THE CASE OF ANNE-MARIE

Anne-marie taught a reception year (Grade R) class of 33 children in a privately owned early childhood setting with many children from countries all over Africa. The language of instruction was English, although the children were from diverse cultural and language backgrounds. The school had a morning programme and used the National Curriculum Grade R curriculum guidelines.

**Background:** Anne-marie had had some exposure to mathematics and science, but did not have technology at school. Her experience of mathematics and science at school had not been particularly positive, 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). That early experience did not necessarily impact negatively on her notion of self as an MST teacher in the FP. Her idea of developing to become a successful teacher was always seen as a lifelong learning process.

**Teacher education programme:** Her perception of mathematics and science gradually changed during her university studies, when she '*realised that mathematics and science can be interesting*' (In1). Anne-marie admitted that during her extended teaching practice she '*unfortunately ... learnt very little about science and technology from my mentor teachers*' (NR 1). However, she insisted that the practical knowledge acquired from her training programme was important: '*I have learnt so much during my four years at university*' (OR); '*the knowledge acquired during my studies provides me with the background knowledge to my lessons*' (In1). She wondered, however, '*if all the theory we learnt will work in practice*' (In1). She was of the opinion that '*theory provides a necessary foundation for what lies ahead*' (In2) and therefore she would have liked to try '*new things with my children to see what can work, and what not, but also to see where I can adjust activities*' (OR). This element of professional identity formation corresponded with a constructivist learning paradigm.

**School context:** Anne-marie entered her first teaching position with '*creative energy and enthusiasm ... excited to teach*' (In1). For Anne-marie, becoming a professional MST teacher meant following a developmental path with many unknown challenges. Moving from being a student teacher to the reality of a classroom was a rude shock for Anne-marie, especially since '*you only realise what happens in a classroom when you stand alone on your own*' (In2). At the end of her first year of teaching she still sometimes felt that '*every day brings a new challenge that I can learn from*' (NR2).

The situation at school was difficult at first, as '*the principal opposed everything I (she) proposed*' and '*this had a devastating effect on me*'; '*one can only stand up for oneself up to a point, especially if she is the principal as well*' (In2). When '*she [the principal] left the school*', the situation changed. '*I was lucky enough not to have a*

*whole year of this'*. When the principal left the school, Anne-marie was left to her own devices and had more freedom: '*I have much more freedom and can set the classroom the way I want to*' (In2). Anne-marie's initial sense of developing a new identity as a successful teacher was a struggle within the context of her practice, partly because she had to make sense of opposing perspectives from the principal, and partly because of the way she wanted to teach and what she hoped to become as a reform-minded MST teacher. From a professional development perspective, her development was much more than an answer to the question 'Who am I now after my teacher education and training?' She also wanted to know who she wanted to become as an FP MST teacher. Professional teacher identity formation for her was a dynamic, ongoing process relating to her context and relationships. During observation she demonstrated her positive MST professional teacher identity by integrating MST with an art lesson where the children had to apply maths, science and technology to create design using patterning, burning the design into a styrofoam tile (combining science and technology) and making a symmetric print in different colours.

**Curriculum interpretation and implementation:** Because of the '*freedom that she gained as a result of the principal's leaving the school, Anne-marie freely interpreted and implemented the curriculum in line with her teaching philosophy*'. She could '*think of creative activities in which to get the children actively involved and interested*' (OR). During a visit to her classroom she presented an art activity integrated with MST. Each child designed and engraved his or her own pattern on a styrofoam tile, and printed four images using the concept of symmetry. With this activity she successfully integrated art, maths, science and technology.

**Teaching MST:** Anne-marie regarded mathematical knowledge and science and technology inquiry skills acquisition as an important focal point in her teaching. She stated that '*mathematics is the foundation subject*' for her and '*I integrate and apply mathematics, science and technology concepts in structured lessons*' (In1). She described the following learning activities after '*a parent brought a box full of silk worms*' to her class: '*A while ago I let the children design and build a house as part of my own research. 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' (NR 2).* She planned an integrated MST lesson around a real-life problem (the loss of habitat) where the children had to plan and design an appropriate habitat for a silkworm. She and the children also '*had to identify the right leaves (mulberry) to feed the worms'* (In2). To continue the real-life theme she '*started a small garden*' and '*a wormery*' she asked the children to bring '*potato peels and other material for the worm garden'* (NR2). For her the transition from theory to practice occurred through her teaching and classroom experimentation with imaginative activities. For instance, she encouraged children to learn experientially through discovery. '*I have a nature corner in my classroom where silkworms spin cocoons and shapes. We have birds, fish and a vegetable garden'* (NR2). During observation there was evidence of the implementation of exploration and discovery, as a nature corner displayed silkworms and bird nests. She proudly pointed out the vegetable garden and asked the children to tell about how they planned and planted the vegetables in the garden.

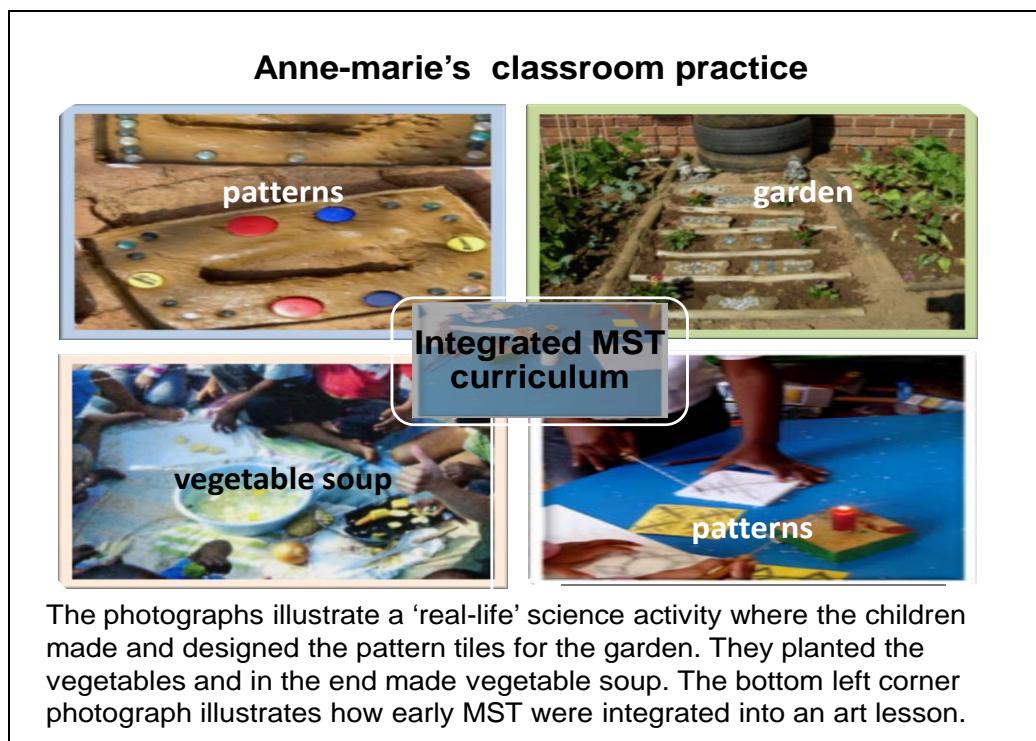
Her voice, her stories and the way she explained and enthused about providing imaginative hands-on inquiry-based MST activities for her learners, in essence constituted her 'core' identity, which at the same time was formed and informed by the classroom context. Her identity formation was a process of building practical knowledge in line with what she knew and viewed as relevant for inquiry-based ECE MST teaching.

**Institutional support:** Anne-marie found support for her ideas and worked closely with other teachers who held similar views about MST teaching at pre-primary level. She explained that she and her '*colleagues plan and work together ... One of my colleagues is an experienced teacher and she supports me very well'* (In2) and '*I have support for my ideas on teaching at pre-primary school because my colleagues feel exactly the same'* (In1). The centrality of her professional identity as pre-primary school MST teacher and one who wanted to become a successful teacher was further emphasised in what she believed and practised in the classroom.

**Classroom practice:** She explained that '*MST are important and I try to make the subjects interesting so that my children will realise the subjects are worthwhile and important'* (In1). She was convinced that '*one should have a passion for teaching'*

(In1) and '*I have a passion for children*' (In2); '*my identity is strong enough for me to be successful and to become a better teacher*' (In2). She valued her teaching experience and teaching culture and insisted that '*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 working environment had confirmed her initial ideas about teaching. She truly believed that she was '*... a good teacher because my children are happy, I am happy and we enjoy learning together*' (OR).

Anne-marie as observed, used hands-on, practical approaches and field trips to teach. She explained why, with reference to an observed science lesson. '*Not only did I enjoy the lesson ... my children enjoyed the lesson*' and '*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). The more central an identity is, the more difficult it is to change or lose that identity; this would appear to be true in Anne-marie's case.



**Figure 4.6: Anne-marie's classroom practice (observation and photo collages)**

Although for Anne-Marie the transition from student teacher to beginning teacher was initially an unstable period of coping and surviving the unpredictable realities of the new workplace, it was mostly a positive experience. Developing and sustaining her professional teacher identity was an ongoing process of integrating personal and professional issues of institutional support. She demonstrated the ongoing process of her professional teacher identity formation and growth through creative integrated MST teaching activities.

#### **4.3 SUMMARY OF IDENTITY PORTRAITS OF BEGINNING TEACHERS IN EARLY MST TEACHING AND LEARNING**

The main results of the six identity portraits are summarised in Table 4.1 (p.120) according to the identified main influences that affected the professional teacher identity formation of the beginning teachers. The main influences were (i) background or prior experiences, (ii) initial teacher education programme and (iii) MST classroom and school experiences as a first-year teacher. The MST classroom and school experience as a first-year teacher is presented according to:

- School context
- Institutional support
- Curriculum implementation and interpretation
- Teaching MST
- Classroom practice

**Tabel 4.1: Summary of six beginning teachers' professional teacher identity in MST teaching and learning**

Beginning teachers' professional teacher identity in MST teaching and learning (foundation phase and early childhood education)					
Bea	Riana	Lea	Gina	Jenna	Anne-Marie
Grade 1 class in township primary school (permanent post)	Grade 2 class in city primary school (permanent post)	Grade 2 class in city primary school (contract post)	Class: 3-4 years in early childhood setting (contract post)	Class: 5 years in early childhood setting (contract post)	Reception year class in early childhood setting (contract post)
<b>Prior experiences in MST</b>					
<ul style="list-style-type: none"> <li>❖ Mathematics at matric level.</li> <li>❖ Little background in science and technology.</li> <li>❖ Negative feelings towards mathematics.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Mathematics and science at matric level.</li> <li>❖ Technology is an unknown learning area.</li> <li>❖ Negative feelings towards science.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Mathematics at matric level.</li> <li>❖ Little background in science – only up to Grade 9 level and none in technology.</li> <li>❖ Negative feelings towards MST.</li> </ul>	<ul style="list-style-type: none"> <li>❖ MST at matric level.</li> <li>❖ Negative feelings towards technology.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Mathematics at matric level.</li> <li>❖ Little background in science and none in technology.</li> <li>❖ Negative feelings towards science and technology.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Mathematics at matric level.</li> <li>❖ Little background in science and none in technology.</li> <li>❖ Negative feelings towards mathematics.</li> </ul>
<b>Initial teacher education programme</b>					
<ul style="list-style-type: none"> <li>❖ Developed MST knowledge, skills and pedagogic content knowledge.</li> <li>❖ Exposure to MST teaching during internship.</li> <li>❖ Changed MST beliefs and attitude from negative to positive.</li> <li>❖ Views MST teaching as important.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Learnt the most about content and pedagogical knowledge in mathematics and technology, but not much in science.</li> <li>❖ Positive exposure to MST teaching during internship.</li> <li>❖ Changed MST beliefs from negative to positive.</li> <li>❖ Views MST teaching as important.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Increased MST knowledge, skills and developed pedagogic content knowledge.</li> <li>❖ Programme modules and 4<sup>th</sup>-year research project broadened her insight and changed her MST perceptions to positive.</li> <li>❖ Very little exposure to science and technology during the internship in the foundation phase.</li> <li>❖ Views MST teaching and learning as important.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Increased MST knowledge, skills and developed pedagogic content knowledge.</li> <li>❖ Positive about science, she chooses 'life sciences' as a three-year elective.</li> <li>❖ Programme module broadened her knowledge and insight in mathematics but science and technology had been inadequately dealt with.</li> <li>❖ Very little exposure to science and technology during the internship.</li> <li>❖ Views MST teaching and learning as important.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Learnt the most about c</li> <li>❖ Positive attitude towards mathematics. Her affinity for the subject is enhanced during her teacher education programme.</li> <li>❖ The MST modules provide grounding for teaching.</li> <li>❖ Very little exposure to science and technology during the internship.</li> <li>❖ Views MST teaching and learning as important.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Increased MST knowledge, skills and developed pedagogic content knowledge.</li> <li>❖ Changed MST beliefs and attitude from negative to positive.</li> <li>❖ Little exposure in science and technology during internship – negotiated teaching opportunities with mentor teachers.</li> <li>❖ Views MST teaching and learning as important</li> </ul>

Beginning teachers' professional teacher identity in MST teaching and learning (foundation phase and early childhood education)					
Bea	Riana	Lea	Gina	Jenna	Anne-Marie
<b>MST classroom and school experience as a first year teacher</b>					
<b>School context</b> <ul style="list-style-type: none"><li>❖ Reality shock – work is emotionally demanding and complex.</li><li>❖ Socio-economic factors like poverty, absenteeism affect MST teaching.</li></ul> <b>Institutional support</b> <ul style="list-style-type: none"><li>❖ Support and working environment at school have a positive influence.</li><li>❖ Initial problems with mathematics curriculum implementation.</li></ul> <b>Curriculum interpretation and implementation</b> <ul style="list-style-type: none"><li>❖ Experiences time constraints – tries to find time to teach science and technology. Science and technology not part of the school curriculum.</li></ul> <b>Teaching MST</b> <ul style="list-style-type: none"><li>❖ Regards mathematics as focus point. Numeracy programme is important as foundational knowledge.</li><li>❖ The fixed school culture in science and technology results in lack of teaching and learning opportunities</li></ul>	<b>School context</b> <ul style="list-style-type: none"><li>❖ Reality shock – work is emotionally demanding and complex.</li><li>❖ Negative experiences with older colleagues pressure on MST teaching.</li><li>❖ Under pressure from parents to conform to pedagogical approaches and the school culture requirements.</li></ul> <b>Institutional support</b> <ul style="list-style-type: none"><li>❖ Lack of support from experienced colleagues results in negative emotions and frustration.</li></ul> <b>Curriculum interpretation and implementation</b> <ul style="list-style-type: none"><li>❖ Experiences time constraints – Tries to find time to teach science and technology.</li></ul> <b>Teaching MST</b> <ul style="list-style-type: none"><li>❖ Regards mathematics as focus point. Numeracy programme is important as foundational knowledge.</li></ul>	<b>School context</b> <ul style="list-style-type: none"><li>❖ Reality shock – work is emotionally demanding and complex.</li><li>❖ Negative experiences with older colleagues. They did not value her ideas and pedagogical knowledge and approaches. She partially conforms and uses some pedagogical approaches that contradict her beliefs. She tries not to attract attention with innovative approaches.</li><li>❖ Parents apply some pressure on her.</li><li>❖ Negative experiences with older colleagues put pressure on MST teaching.</li></ul> <b>Institutional support</b> <ul style="list-style-type: none"><li>❖ Lack of support from experienced colleagues results in negative emotions and feelings of failure.</li></ul> <b>Curriculum interpretation and implementation</b> <ul style="list-style-type: none"><li>❖ Experiences time constraints – tries to find time to teach MST in an integrated way. Science and technology not part of the school curriculum.</li></ul>	<b>School context</b> <ul style="list-style-type: none"><li>❖ Reality shock – work is emotionally demanding and complex.</li></ul> <b>Institutional support</b> <ul style="list-style-type: none"><li>❖ Support and working environment at school have a positive influence.</li></ul> <b>Curriculum interpretation and implementation</b> <ul style="list-style-type: none"><li>❖ Science and technology not part of the school curriculum.</li></ul> <b>Teaching MST</b> <ul style="list-style-type: none"><li>❖ Regards MST as important for young children's development.</li><li>❖ Found teaching science and technology difficult at first; became easier later.</li><li>❖ Challenges were due to time constraints and the age of the children in her class, as well as the requirements of the school (principal, the parents and the age of the children).</li><li>❖ Experiences time constraints – tries to find time to teach MST in an integrated way.</li></ul>	<b>School context</b> <ul style="list-style-type: none"><li>❖ Reality shock – work is emotionally demanding and complex.</li></ul> <b>Institutional support</b> <ul style="list-style-type: none"><li>❖ Support and working environment at school have a positive influence on MST teaching.</li></ul> <b>Curriculum interpretation and implementation</b> <ul style="list-style-type: none"><li>❖ Finds it difficult at times to teach science and technology because she feels she does not always have enough knowledge.</li></ul> <b>Teaching MST</b> <ul style="list-style-type: none"><li>❖ Regards mathematics as important and as focus point for young children's development.</li><li>❖ Experiences time constraints – tries to find time to teach MST in an integrated way.</li></ul> <b>Classroom practice</b> <ul style="list-style-type: none"><li>❖ Uses hands-on, practical inquiry-based approaches in MST.</li></ul>	<b>School context</b> <ul style="list-style-type: none"><li>❖ Reality shock – work is emotionally demanding and complex.</li><li>❖ Initial negative experience with principal influences MST teaching and learning. This was solved when principal left.</li></ul> <b>Institutional support</b> <ul style="list-style-type: none"><li>❖ Finds support from like-minded colleagues. Negotiates and collaborates with other teachers.</li></ul> <b>Curriculum interpretation and implementation</b> <ul style="list-style-type: none"><li>❖ Curriculum: Integrates MST with art and language.</li></ul> <b>Teaching MST</b> <ul style="list-style-type: none"><li>❖ Regards MST as important.</li><li>❖ Mathematical knowledge and skills acquisition form the main focus of her teaching.</li></ul> <b>Classroom practice</b> <ul style="list-style-type: none"><li>❖ Positive and passionate MST teacher.</li><li>❖ Uses creative and research skills to plan and teach MST. Applies hands-on, practical approaches and field trips.</li></ul>

Beginning teachers' professional teacher identity in MST teaching and learning (foundation phase and early childhood education)					
Bea	Riana	Lea	Gina	Jenna	Anne-Marie
<p>Grade 1 class in township primary school (permanent post)</p> <ul style="list-style-type: none"> <li>◆ causing negative emotional effect and frustration.</li> <li>◆ Integrates science and technology into other subjects.</li> <li>◆ Positive and confident as MST teacher.</li> </ul> <p><b>Classroom practice</b></p> <ul style="list-style-type: none"> <li>◆ Uses hands-on, practical inquiry-based approaches in MST. Applies elements of the constructivist theory (Vygotsky).</li> <li>◆ Caring and committed to children, MST teaching and learning.</li> </ul>	<p>Grade 2 class in city primary school (permanent post)</p> <ul style="list-style-type: none"> <li>◆ Feeling of insecurity – the school culture frustrates her because she cannot teach MST as she wants to.</li> <li>◆ Integrates science and technology into other subjects.</li> </ul> <p><b>Classroom practice</b></p> <ul style="list-style-type: none"> <li>◆ Uses hands-on, practical inquiry-based approaches in MST.</li> <li>◆ Caring and committed to children's MST teaching and learning.</li> </ul>	<p>Grade 2 class in city primary school (contract post)</p> <p><b>Teaching MST</b></p> <ul style="list-style-type: none"> <li>◆ Regards mathematics as focus point. Numeracy programme is important as foundational knowledge.</li> </ul> <p><b>Classroom practice</b></p> <ul style="list-style-type: none"> <li>◆ Uses hands-on, practical inquiry-based approaches in MST.</li> <li>◆ Caring and committed to children, MST teaching and learning.</li> </ul>	<p>Class: 3-4 years in early childhood setting (contract post)</p> <p><b>Classroom practice</b></p> <ul style="list-style-type: none"> <li>◆ Uses hands-on, practical inquiry-based approaches in MST.</li> <li>◆ Caring and committed to children, MST teaching and learning.</li> </ul>	<p>Class: 5 years in early childhood setting (contract post)</p> <ul style="list-style-type: none"> <li>◆ Caring and committed to children, MST teaching and learning.</li> <li>◆ Positive and confident MST teacher.</li> </ul>	<p>Reception year class in early childhood setting (contract post)</p> <ul style="list-style-type: none"> <li>◆ Caring and committed to children, MST teaching and learning.</li> </ul>

#### 4.4 CONCLUDING REMARKS

In this chapter the data collected from the six beginning teachers were presented as results through individual narrative portraits. The six cases of professional teacher identity portraits were described according to the identified main influences that affected the six beginning teachers' professional teacher identity formation. The different influences crystallised through the data analysis process. In conclusion the results of the different cases were summarised in Table 4.1 according to these main influences.

In Chapter Five, the findings of the study are presented and discussed. These findings will be presented and positioned against existing literature and the conceptual framework. Finally the new insights that emerged from this study are presented.

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